SESUG 2018 Conference Program

Linda Sullivan
Academic Chair

Charlotte Baker
Operations Chair

www.sesug.org

Dear SESUG Friends!

Welcome to St. Pete Beach and the 26th Annual SouthEast SAS Users Group (SESUG) Conference!

We are so happy you are here to learn, share, and have a great time with SAS® colleagues from the across the Southeast!

Professional development and expanding your SAS skills is the name of the game. With over 150 presentations in 11 tracks, you'll be sure to gain new ideas and new skills to enhance and broaden your use of SAS. Look for SAS Super Demos on the conference schedule – these are presented by current SAS employees and give you the opportunity to ask questions of the SAS experts!

Plan time to visit our very important sponsors in the SESUG Exhibit Hall. You might meet a partner who has the very solution you need for a problem at work! While in the Exhibit Hall, check out the e-Posters on the monitors. You can meet the e-Poster authors during the various "Meet the Authors" times – look for those on the daily schedule.

A special opportunity you won't want to miss! Stop by the LinkedIn – Rock Your Profile booth in the SESUG Exhibit Hall on Monday, brought to us by SAS and LinkedIn, to learn tips and tricks on creating a polished profile! Get an updated headshot plus an individual consultation to make your profile rock!!

Please be sure to participate in the multiple networking opportunities that are available during the conference: Sunday night's opening mixer, Monday night's SAS customer appreciation reception, and the Big Event on Tuesday night – Beach Party!!

If there is anything we can do to help you make the most of your time at the conference, please don't hesitate to contact us!

Many thanks for joining us and we look forward to meeting you!

Linda Sullivan
Academic Chair
AcademicChair2018@sesug.org

Charlotte Baker
Operations Chair
OperationsChair2018@sesug.org

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Conference Chairs

OPERATIONS

Charlotte Baker

ACADEMIC

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A/V Coordinator

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Brian Varney

Charitable Event

Nushrat Alam
Karen Wallace

Food & Beverage

Charlotte Baker
Venita DePuy
Kristen Harrington

Grants

Barbara Okerson
Joy Smith
Chuck Kincaid

Graphics & Emails

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Chuck Kincaid
Matthew Bell

Webmaster

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SESUG Executive Council

Venita DePuy, *President*

Kristen Harrington, *Vice President*

Jason Brinkley, *Treasurer*

Barbara Okerson, *Secretary*

Charlotte Baker

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Meenal Sinha

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Rachel Straney

Abbas Tavakoli

Brian Varney

Sarah Woodruff

Special Thanks to the Following

SAS Liaison

Patsy Harbour

Academic Grants

Jenna Green

Post Conference: Downloadable zip file of conference papers available at www.sesug.org/SESUG2018

Ribbons

Some attendees have ribbons attached to their name badges. These indicate their type of participation in the conference. The ribbon colors and their meanings are:

Ribbon Color	Meaning
Jewel Blue	**Conference Chair**
Maroon	**SESUG Executive Council** Past, present and future conference chairs
Black	**Section Chairs** Organizers of facilities and presentations
Red	**Speakers** Presentation and Poster authors
Violet	**Registration** Registrars and Volunteers
Dark Blue	**SAS Institute Participants** Presenters and Exhibit Hall support staff
Gold	**Session Coordinators**
Peach	**Sponsors**
Navy Blue	**Academic Grant** Student/Faculty
Caramel	**Grant Recipients** Professional Development
White	**Guests**

The Conference Chairs and SESUG Executive Council members have been intimately involved with the planning of the conference. If you have any questions or comments about SESUG 2018, look for the people with the maroon ribbons and talk with them!

Remember: your input is essential to the continued success of the conference!

Conference Information and Special Events

Registration and Information

Location: Grand Palm Colonnade

Time:		
	Sunday	12:00 PM – 6:00 PM
	Monday	7:30 AM – 12:00 PM
	Monday	1:00 PM – 5:00 PM
	Tuesday	8:00 AM – 12:00 PM
	Tuesday	1:00 PM – 5:00 PM
	Wednesday	9:00 AM – 12:00 PM

Registration staff will be there to greet you, provide you with all your conference materials, and answer any questions you might have about the conference.

Section Chair Meeting

Location: Sawgrass
Time: Sunday 2:15 PM – 2:30 PM

Speakers Meeting

Location: Sawgrass
Time: Sunday 2:30 PM – 3:00 PM

Volunteer Meeting

Location: Sawgrass
Time: Sunday 3:00 PM – 3:30 PM

Getting the Most Out of SESUG

Location: Sawgrass
Time: Sunday 3:30 PM – 4:00 PM

There are three days of papers, over 150 papers, and the SAS Exhibit Hall too! At this session, experienced SESUG attendees will give you some helpful hints to help you get the most out of your SESUG experience! You don't have to be a newcomer to attend! There is information and fun for SESUG veterans as well.

Grant Recipient Meet and Greet

Location: Sawgrass
Time: Sunday 4:00 PM – 4:30 PM

Opening Session

Location: Pavilion
Time: Sunday 5:00 PM – 5:45 PM

SESUG Mixer

Location: Pavilion
Time: Sunday 6:00 PM – 7:00 PM

SAS presents LinkedIn Rock your Profile

Location: SESUG Exhibit Hall (Tarpon Key)
Time: Monday 9:00 AM – 12:00 PM
Monday 2:30 PM – 7:30 PM

Are your SAS skills adequately represented on LinkedIn? Whether you're searching for your next career move or wanting to follow other like-minded peers, a polished LinkedIn profile can make or break someone's digital first impression of you.

For tips and tricks to ensure your LinkedIn presence is both credible and approachable, visit the **LinkedIn ~ Rock Your Profile** booth in the **SAS Exhibits Area** in the Tarpon Key Room Monday from 9:00am -12:00pm and 2:30pm– 7:30pm.

Shelly Goodin, from SAS's Corporate Social Media Team, will be on hand for profile consultations, and a photographer will be available to take your headshot. For those unable or uninterested in a consultation, handouts with profile tips will be available at the booth and on the SAS Users Group Community website.

Attendee Lunch

Location: Pavilion
Time: Monday 12:00 PM – 1:30 PM
Tuesday 12:00 PM – 1:30 PM

Grantee Lunch (Ticket Required)

Location: Banyan Breezeway
Time: Monday 12:00 PM – 1:00 PM

SAS Customer Appreciation Reception

Location: Exhibit Hall, Grand Colonnade
Time: Monday 6:00 PM – 7:30 PM

User Group Lunch (Ticket Required)

Location: Banyan Breezeway
Time: Tuesday 12:00 PM – 1:30 PM

Beach Party

Location: Breck Deck North
Time: Tuesday 7:30 PM – 10 PM

Breakfast and Thank you

Location: Pavilion
Time: Wednesday 8:00 AM – 9:15 AM

Join us while we say thank you to everyone for making this a great conference. There will be a preview of next year's conference. Academic sessions will resume after breakfast.

Academic Grant Winners

In early spring, SESUG accepted applications from college students and faculty for grants to attend the conference. Students and faculty using SAS were encouraged to apply and submit a paper for presentation at the conference. With support from SAS, the SESUG grant include a waived registration, limited funding to assist with hotel accommodation expenses, and a special luncheon.

From the list of well qualified applicants, we selected the following people to receive the scholarships. Check out the recipients papers at the conference. Look for the Grant Winner icon next to their names in the Presentations section of the program. Also, visit the Poster Area to view the scholarship winners' profiles.

Student Grantees

Camillia Comeaux	Florida Agricultural and Mechanical University
Jennifer Richards	Florida Agricultural and Mechanical University
Justin Williams	Florida Agricultural and Mechanical University
Alyssa Venn	Kennesaw State University
Apoorva Chandrasekaran	Oklahoma State University
Shreyas Dalvi	University of South Florida
Clarissa Harris	University of Florida
Sujit Kunwor	University of Alabama
Isaac Yi	Middle Tennessee State University
Michelle Fedrick	Florida Agricultural and Mechanical University

Faculty Grantees

Anil Aggarwal	University of Baltimore
Daniel Brinton	Medical University of South Carolina
Duff Cooper	New College of Florida
Mehmet Kocak	The University of Tennessee Health Science
Jason Black	Florida Agricultural and Mechanical University
Luma Akil	Jackson State University
Vincent Mendy	Jackson State University

Professional Development Grants

SESUG, with support from SAS, is providing professionals with grants to attend this conference. SAS professionals, who have been using SAS in their jobs for less than 3 years, were encouraged to apply. Paper presentations were encouraged, but not required. From the list of well-qualified applicants, the following professionals were selected to receive these grants.

Name	**Company**
Jenna Cody	IQVIA
Mykhael Walker	University of Central Florida
Kelly Smith	Central Piedmont Community College
Eleanor McCoy Carter	Valencia College
Yolanda Ingram	Wake Technical Community College
Robert Wilcox	University of North Carolina
Jonathan Swanson	HQMC Manpower and Reserve Affairs USMC
Carrie Underwood	Rock Hill Schools
Blake Barrett	Department of Veterans Affairs
Rachael Peters	State of Tennessee/TennCare

Educational Opportunities

Academic Presentations

Location:

Time:		
	Monday	8:30 AM – 12:00 PM
	Monday	1:30 PM – 5:30 PM
	Tuesday	8:30 AM – 12:00 PM
	Tuesday	1:30 PM – 5:30 PM
	Wednesday	9:30 AM – 12:30 PM

SESUG has always been about education, and the main focus of our conferences is the academic presentations. Presentations are 10, 20, and 50 minutes followed by a few minutes to transition to the next speaker. Presentations are grouped into Academic Sections and each section is assigned to a specific room each day. Feel free to switch rooms as needed; no advance sign-up is required. Most papers can be found in the Conference Proceedings that can be downloaded at www.sesug.org/SESUG2018.

Hands-On Workshops

Location:	Blue Heron	
Time:	Monday	8:30 AM – 11:30 AM
	Monday	1:30 PM – 5:30 PM
	Tuesday	9:00 AM – 10:45 AM
	Tuesday	1:30 PM – 4:30 PM
	Wednesday	9:30 AM – 12:15 PM

Hands-On Workshops are 75 minutes and are taught by well-known experts in the SAS community. Due to a limited number of computers, admission to Hands-On Workshops will be on a first-come, first-serve basis.

e-Posters

Location:	SESUG Exhibit Hall (Tarpon Key)	
Time:	Monday	8:30 AM – 12:00 PM
	Monday	1:30 PM – 5:00 PM
	Tuesday	8:30 AM – 12:00 PM
	Tuesday	1:30 PM – 5:30 PM

Posters are available on monitors in the SESUG Exhibit Hall. Please stop by during Meet the Authors on Monday and Tuesday to learn more about these topics from the experts that created the posters! See the times to meet them in the Schedule at a Glance (SAAG).

Code Doctors

Location:	Grand Colonnade	
Time:	Monday	9:30 AM – 11:00 AM
	Monday	3:00 PM – 4:30 PM
	Tuesday	9:30 AM – 11:00 AM
	Tuesday	3:00 PM – 4:30 PM

SESUG Exhibit Hall

Location: Tarpon Key

Time:	Monday	8:30 AM – 12:00 PM
	Monday	1:30 PM – 5:30 PM
	Tuesday	8:30 AM – 12:00 PM
	Tuesday	1:30 PM – 5:30 PM
	Wednesday	9:30 AM – 12:30 PM

Our sponsors would love to connect with you while you attend SESUG! Be sure to meet with our sponsors, including SAS, and learn about the latest software, services, training and books.

- Meet the sponsors that help make SESUG happen and learn what they can do to improve your SAS experience!
- Tap in to SAS expertise and resources as well as connect through communities.
- Talk one-on-one with SAS experts.
- Learn how to enhance your skills with SAS Training & Certification and SAS Books.

SAS Super Demos at SESUG

All Super Demos will take place in Spotted Curlew.

Date	Time	Presenter	Topic	Abstract
10/15/2018	2:30 – 2:50 PM	Shankar, Charu	Sandwich Your SAS Data to Excel Pivot Tables	Excel is universally loved. SAS has a way to bring excel into SAS so that you can analyze your data. Users now ask "Great, I can analyze my data in SAS, but my end users don't have SAS on their desktops. How can I give them SAS data in excel form". We'll go even further, instead of taking SAS into a standard Excel workbook, what if you could take SAS to an excel pivot table? Now you can. In this demo watch how quickly you can take a SAS dataset to excel pivot tables. See how in minutes, the Excel table shapes and forms right under your own eyes.
10/16/2018	9:00 – 9:20 AM	Peters, Amy	The Future of SAS Enterprise Guide and SAS Studio	Get insights into the roadmap for the two interfaces and how they are converging.
10/16/2018	10:00 – 10:20 AM	Parker, Chevell	What's New in the ODS Excel Destination	This demo highlights some of the newer features of the ODS Excel destination along with reasons to move to the ODS Excel destination if you have not already.
10/16/2018	2:00 – 2:20 PM	Stokes, Maura	Propensity Score Methods for Causal Inference	Learn about propensity score analysis with the PSMATCH procedure.
10/16/2018	3:30 – 3:50 PM	Norris, Ryan	What's New in SAS Visual Analytics	The next release of SAS Visual Analytics on SAS Viya is an exciting one. The user experience is modern, and the application is written entirely in HTML5. Visual Analytics unifies Visual Analytics Explorer, Visual Analytics Designer, and Visual Statistics into a single application. Pie Charts, Histograms, and Linear Regressions meld together. Traditional exploration tasks such as auto charting and summary tables sit alongside classic reporting features like a rich layout system and display rules. In this super demo we'll demonstrate all of this plus many more new features available in SAS Visual Analytics on SAS Viya.
10/17/2018	10:00 – 10:20 AM	Parker, Chevell	Creating Pivot tables using ODS Markup	This demo demonstrates how quickly you can generate pivot tables and pivot graphs from your SAS data. Also demonstrated is the ability to automate this process by creating a task using SAS Studio to generate pivot tables and graphs.

Conference Courtesies

Recording, taping or photographing any portion of any presentation is not allowed without the express permission of the presenter.

Turn off the ringers of cell phones, beepers and watch alarms, and keep conversation low and to a minimum during presentations.

Please help us make the 2018 SESUG Conference green! Please use your reusable water container and recycle any unwanted conference materials.

Finally, when you leave the room, please take your glass, cup or plate with you and place it in an appropriate location.

Thank you for your help!

SESUG Policies

The annual SouthEast SAS® Users Group (SESUG), Inc., Conference is primarily an educational gathering for the benefit of its attendees. SESUG recognizes that the majority of attendees are present as representatives of their employers for this purpose. Accordingly, SESUG does not condone, endorse, or encourage activities that may conflict with the educational nature of the conference. All attendees and sponsors are expected to abide by the Policies and Procedures set forth in this document.

Paper Content: Users are urged to present papers describing real-world applications using SAS software. SESUG also accepts a limited number of theoretical and general overview papers. Acceptance of all presentations is at the discretion of the Conference Co-Chairs. Oral presentations and written papers describing projects or services of a commercial nature may only be presented at the conference if they describe how the product relates to the use of SAS Institute software; and they do NOT include price lists, support commitments, or other material of a promotional or sales nature.

Right of Withdrawal: The SESUG Executive Council and the Conference Co-Chairs reserve the right to determine if any activity is in violation of these guidelines. They may, at their option, direct the withdrawal of a presentation or demonstration or the dismissal of a SESUG attendee from the conference.

Marketing and Recruiting: Any person or entity wishing to market their products or services or whose presence is primarily to recruit attendees at the annual SESUG conference must register as a sponsor. Registered sponsors are expected to conduct themselves with professionalism. The SESUG Executive Council reserves the right to refuse any or all sponsor registrations. In addition to, or in lieu of, a physical presence at the annual SESUG conference, sponsors may choose to have a virtual presence through means of advertising. Planned activities beyond interaction at a sponsor booth need to be approved in advance by the Conference Co-Chairs.

The Conference Program may include printed sponsor advertisements. Sales literature and promotional items may only be distributed to conference attendees in an approved manner, usually in the form of a conference bag insert or distributed from the sponsor's booth. Program advertisements and items for distribution must be shipped to a designee of the Conference Chairs and are subject to prior approval of form and content. Fees associated with advertising are included in various sponsor package options posted on the website.

Sponsors will be recognized in accordance with the sponsorship guidelines and package options posted on the website. Specific requirements (e.g., content, deadlines, and costs) for sponsor promotional opportunities are included in the sponsor program documents on the website or will be provided in a timely fashion.

SESUG reserves the right to approve any sponsor related activities involving attendees such as hospitality suites, recruitment or other similar activities. In the event any questions of interpretation arise, the decision of the Conference Chairs will apply.

Unless explicitly invited by SESUG, non-registered companies, their agents or individuals may not engage in any direct marketing or sales effort at the conference.

Section Descriptions

Application/Macro Development

Co-Chairs: Andrea Lewton
G. David Maddox

The Applications Development section will present a wide array of papers on topics including SAS macro design, maximizing performance, and data cleaning. Presentations on the different ways that SAS can be customized, extended, and used in concert with other software packages to develop or improve a process will also be included. Other speakers will describe how to exploit SAS modules that can significantly improve performance and sustainability. Authors from different industries will give step-by-step instructions describing a process. This is an outstanding opportunity to see how a project or industry-specific solution is accomplished, including projects involving drug development, predictive modeling, customer retention, healthcare, insurance or other business applications.

Building Blocks

Co-Chairs: John Cohen
Chuck Kincaid

Building Blocks is intended for SAS programmers at all levels, from beginner to advanced, and includes SAS topics that are key to becoming an expert SAS user. Appropriate topics include fundamentals such as DATA step manipulations and simple SAS procedures (PROC REPORT, PROC FORMAT, etc.) as well as advanced topics in ODS, Macro programming, SQL, and programming efficiency. These presentations will provide beginners with a greater understanding of how to use SAS and will help more advanced programmers implement enhanced techniques to build on the power and flexibility afforded by SAS software. Programming topics across all fields and industries are encouraged and welcome.

Coder's Corner

Co-Chairs: Louise Hadden
Harry Droogendyk

Every SAS programmer from the beginner to the expert has found new or unusual ways to solve problems with SAS. Coders' Corner is the place to share tips and tricks, useful nuggets of programming, or techniques that make jobs easier. Presentations are 10 minutes in length and can come from any of a broad range of topics. Come and learn what simple tricks can unlock a SAS mystery?

Data Management/Big Data

Co-Chairs: Brian Varney
Carlos Piemonti

Since the beginning, data manipulation and integration have been mainstays of SAS software. Over time SAS has grown to include a full suite of data management capabilities like Data Quality, Data Flux, Data Governance, Master Data Management, and Data Federation. This section intends to highlight the capabilities of traditional Base SAS and SAS Data Management as well as the various ways SAS leverages Big Data. These presentations will include case studies demonstrating various data management techniques and implementations, while providing helpful insights and lessons learned along the way.

e-Posters

Co-Chairs: Kristen Harrington
Brandon Welch

The E-Poster Section covers any area including: SAS fundamentals; statistics; business intelligence; medical research, data mining; survey/panel results; social networking; and industry applications for the pharmaceutical, finance, education, environmental and entertainment industries; and all other uses of SAS software. E-Posters will be displayed electronically on a wide screen monitor. In addition, a corresponding paper based upon the poster may be published in the conference proceedings. There will also be a time to meet authors to discuss their E-Posters with conference attendees (Meet the Author session). Attendees will have the opportunity to examine E-Posters at their own pace and revisit displays a number of times during the conference.

Education/Institutional Research

Co-Chairs: Lesa Caves
Janice McBee

Papers in Education and Institutional Research section will focus on the use of SAS software to find solutions for reporting and analysis in the education community. This section will present techniques, best practices, and solutions for data needs in primary, secondary, and postsecondary education. Possible topics include:

- Data management in school systems
- Automated IPEDS reporting
- Managing and evaluating admissions data
- Forecasting enrollment
- Standardized testing metrics
- Data visualization and reporting

Hands On Workshops

Co-Chairs: Jason Brinkley
Rachel Straney

Hands On Workshops (HOW) provide an engaging forum to share a variety of SAS skills in an interactive setting. These sessions are typically 75 minutes in length. Presenters will demonstrate SAS code and procedures in real time with a specific task or goal in mind. The datasets and code should be made available for download prior to the session, enabling attendees to run the code on their personal computers, if desired. Any SAS topics that are better explained in an interactive setting are ideal for Hands On Workshops. These sessions are not reserved for complicated or elaborate SAS techniques only. Popular sessions in previous SESUG meetings have focused on a wide range of topics including SAS DATES/TIMES, proc sql, macros, formats, ODS and other unique or nonstandard features in SAS.

A power point presentation as well as sample code for the demonstration is needed for the workshop. The following platforms are available for these interactive and extended sessions:

- Base SAS
- SAS Enterprise Guide
- SAS/Access
- SAS/Graph
- SAS/Stat

Life Sciences/Healthcare/Insurance

Co-Chairs: DeDe Schreiber-Gregory
Meenal Sinha

Papers in the Life Sciences/Healthcare/Insurance section will focus on using the SAS® System to find solutions for analysis and reporting as it relates to drug/device discovery, disease prevention, patient care and satisfaction, insurance risk and operations. Possible topics include:

- Discussions of the use of SAS® Drug Development, SAS® Clinical Data Integration and SAS Patient Safety.
- Various aspects of implementing CDISC standards such as the Study Data Tabulation Model (SDTM) and the Analysis Data Model (ADaM).
- Solutions to reporting and data processing requirements.
- The use of healthcare data to evaluate quality of care, possible fraud and patient satisfaction.

Planning/Administration

Co-Chairs: Tricia Aanderud
Richann Watson

If all or part of your SAS® time includes supporting users, whether through systems architecture and administration or through consulting, training, and hiring, this section is the place for you to share your experiences with other members of the SAS community. This section will include guidelines, best practices, techniques, and resources for working efficiently and effectively in the SAS support community. Possible topics are:

- SAS Systems architecture and administration, including:
- Installation, deployment, and migration
- Virtualization
- Performance monitoring and tuning
- Other SAS systems support, including:
- Recruiting, hiring and maintaining qualified staff
- Training and skill development
- SAS help desk support
- Project planning and management

Reporting and Visualization/JMP

Co-Chairs: Barbara Okerson
Nat Wooding

The Reporting and Information Visualization/JMP section invites presentations that demonstrate unique and innovative ways to visualize data and output. SAS provides many tools for visualizing and reporting data and results including Visual Analytics, SAS/Graph, SAS SG procedures, and DSGI. JMP was designed to explore and discover hidden stories and trends in data.

Presentation topics include but are not limited to:

- SAS graphics procedures, styles, templates, Output Delivery System (ODS) and Graphics Template Language (GTL)
- Customized reports, dashboards, scorecards, graphs, and maps
- SAS Visual Analytics
- JMP applications
- SAS and/or JMP integration with Microsoft Windows, Mac OS, R, Python, and MATLAB

Statistics/Data Analysis

Co-Chairs: Melvin Alexander
Abbas Tavakoli

Presentations in the Statistics and Data Analysis section address ways of transforming raw data into useful information that uncover important relationships and patterns in data to help gain insights for effective, data-driven decision-making. This section will include topics that will interest a wide range of SAS users, including statistical analysts, statistical programmers, statisticians, and DATA step programmers. Papers do not need to present new statistical methods, although such topics are always welcome. Presentations are sought that involve the application of methods that many users of SAS statistics may not commonly see, such as methods for categorical, longitudinal, or censored data. Methods to facilitate analysis of very large data arrays, such as those that result from genetic studies or national surveys, are also sought for this section. Topics in this section should be of interest to a broad spectrum of SAS practitioners, including analysts, developers, statisticians, and DATA step programmer.

Application/Macro Development

116 *Saving and Restoring Startup (Initialized) SAS® System Options*

Kirk Paul Lafler

Processing requirements sometimes require the saving (and restoration) of SAS® System options at strategic points during a program's execution cycle. This paper and presentation illustrates the process of using the OPTIONS, OPTSAVE, and OPTLOAD procedures to perform the following operations:

- Display portable and host-specific SAS System options;
- Display restricted SAS System options;
- Display SAS System options that can be restricted;
- Display information about SAS System option groups;
- Display a list of SAS System options that belong to a specific group;
- Display a list of SAS System options that can be saved;
- Save startup SAS system options;
- Restore startup SAS System options, when needed.

Kirk Paul Lafler is an entrepreneur and founder at Software Intelligence Corporation, and has been using SAS since 1979. Kirk is a SAS consultant, application developer, programmer, certified professional, mentor, provider of SAS consulting and training services, advisor and adjunct professor at University of California San Diego Extension, emeritus sasCommunity.org Advisory Board member, and educator to SAS users around the world. As the author of six books including Google® Search Complete (Odyssey Press. 2014) and PROC SQL: Beyond the Basics Using SAS, Second Edition (SAS Press. 2013); Kirk has written hundreds of papers and articles; served as an Invited speaker, trainer, keynote and section leader at SAS user group conferences and meetings around the world; and is the recipient of 25 "Best" contributed paper, hands-on workshop (HOW), and poster awards.

127 *How to Avoid Hard Coding During Our Engine Development ---- Some Popular Methods of Automatic SAS Engines*

Kaiqing Fan

As a software developer, most time hard coding is a really tough time for us whatever modification, debugging, and especially using the code engines to process similar tasks when lots of parameters were changed, especially when the data variables and their values are changed, that is, variables are changed, added or removed, their values are changed, added, removed too; It will cause huge bulk of headaches, waste too much time, and labor for debugging, fixing and modification correspondingly once these conditions are changed. How to avoid hard coding, minimize parameters changes, modifications, maximize covering variables and their values changes, fulfill automation execution should be a very important topic for software developers. As a SAS developer, I would like to summarize some popular ways how to avoid hard coding during my developing.

1) Always Using Macro definitions
2) Appropriately using the information in data file to define as parameters
3) Appropriately using existing macro parameters to define other related parameters
4) Appropriately using SAS functions, Macro Functions and procedure options
5) Code Automation Generation Method to automatically cover variables and their values changes
6) Filter different situations Using If … then …; if … then do; end; else if … then do; end; Or %if … %then …; %If … %then %do; %end; %else %if … %then %do; %end;
7) Develop some specific Automatic Processing Engines to solve some specific Technical Challenges, use them anywhere needed.

I am a Sr. SAS Tech Lead, Sr. Data Scientist, Sr. SAS Developer Lead with 10 year experience in software programming, 3 year in statistical Analysis and developing SAS engines; 2 years' experience as Tech Lead. Expert in fitting predictive models by statistical analysis, predictive modeling, machine learning using SAS, R, UNIX/LINX and Python; Professional in handling big data, massive large data files, optimization of software engines, automation execution of software engines, hugely cutting of software engines' execution times. I got my 3 Master degrees of Statistics, Applied Mathematics and History from University of Wyoming, University of New Orleans, and East China Normal University.

144 ***Assigning agents to districts under multiple constraints using PROC CLP***
Stephen Sloan and Kevin Gillette

The Challenge: assigning outbound calling agents in a telemarketing campaign to geographic districts. The districts have a variable number of leads and each agent needs to be assigned entire districts with the total number of leads being as close as possible to a specified number for each of the agents (usually, but not always, an equal number). In addition, there are constraints concerning the distribution of assigned districts across time zones, in order to maximize productivity and availability.

Our Solution: uses the SAS/OR procedure PROC CLP to formulate the challenge as a constraint satisfaction problem (CSP), since the objective is not necessarily to minimize a cost function, but rather to find a feasible solution to the constraint set. The input consists of the number of agents, the number of districts, the number of leads in each district, the desired number of leads per agent, the amount by which the actual number of leads can differ from the desired number, and the time zone for each district.

Stephen Sloan has worked at Accenture in the Services , Consulting, and Digital groups and is currently a senior manager in the SAS Analytics area. He has worked in a variety of functional areas in Project Management, Data Management, and Statistical Analysis. He has had the good fortune to have worked with many talented people at SAS Institute.

Stephen has a B.A. in Mathematics from Brandeis University, M.S. degrees in Mathematics and Computer Science from Northern Illinois University, and an MBA from Stern Business School at New York University.

Kevin Gillette has been a SAS practitioner for more than 30 years, starting with SAS 2 on the old IBM mainframe computers. He is an applied mathematician and statistician with experience in multiple industrial sectors, including banking, transportation, telecommunications, venture capital, and retail. His motto is: "There are three kinds of people in this world – those who can count and those who can't." With an advanced degree in operations research, he reminds his co-workers that "Time sure flies when you optimize!"

158 ***Using SAS Macro Functions to Manipulate Data***
Ben Cochran

The SAS DATA step has the reputation for being one of the best data manipulators in the IT world. While the author of this paper agrees with this statement, it is possible to go beyond the capabilities of the DATA step by using SAS Macro functions. It would be difficult to show the full power of these Macro Functions in an hour presentation, so, this paper will look at a few commonly used Macro Functions and compare and contrast them to DATA step functions. These functions can be used not only to manipulate data, but to manipulate entire programs as well.

After more than 11 years with SAS in the Professional Services (as an Instructor) and Marketing Departments (as Marketing Manager for the SAS/EIS product), Ben Cochran left to start his own consulting and SAS Training business in the fall of 1996 – The Bedford Group.

As a Silver member of SAS Institute's Alliance Partner Program, Ben has been involved in many consulting projects over the last 20 years and has beenteaching SAS courses since 1985.

Ben has authored and presented dozens of papers as well as being an invited speaker at SUGI/SGF, regional and local user groups on a variety of topics since 1988.

159 *Create a SAS Program that Can Read the Contents of a Directory*

Ben Cochran

On occasions, a SAS user might find themselves in the position where they need to write a SAS® program that can read and process files in a specific directory. In this case, the contents are all excel spreadsheet files. All these files need to be read and converted into SAS datasets. This paper illustrates how to do this in a step by step process using the DATA step.

After more than 11 years with SAS in the Professional Services (as an Instructor) and Marketing Departments (as Marketing Manager for the SAS/EIS product), Ben Cochran left to start his own consulting and SAS Training business in the fall of 1996 – The Bedford Group.
As a Silver member of SAS Institute's Alliance Partner Program, Ben has been involved in many consulting projects over the last 20 years and has been teaching SAS courses since 1985.
Ben has authored and presented dozens of papers as well as being an invited speaker at SUGI/SGF, regional and local user groups on a variety of topics since 1988.

175 *Using PROC FORMAT to Automate Data correction process.*

Shreyas Dalvi

SAS has exceptional analytics capabilities, but to process data we often need to extract, transform, validate and correct the data that we get from various sources to make best use of its capabilities. Suppose in an application, we process customer data where we get information from data entry monthly, with multiple records having data entry errors. Periodically, we need to identify and correct those entries in the final SAS dataset as part of the data validation and correction process. It is time consuming to manually update each record monthly, therefore the need for an automated process arises in order to produce a final corrected data set. This paper demonstrates how we can update only the incorrect values in a SAS data set by using the external file which provides only the corrected values (finder file). This process does not make any data merges or SQL joins for the data correction. The process will use PROC format and will create the customized formats using CNTLIN for the finder file. Proc format will create the variable to be corrected and a unique master key having several variables concatenated to avoid errors in the correction process. Using this format, code will correct the invalid values in the variable and all remaining variables will remain the same. This paper is intended for intermediate level SAS Developers who want to build data validation and data correction programs using SAS.

Shreyas Dalvi is a pursuing Masters in Business Analytics and Information Systems at Muma School of Business, University of South Florida. He is also working as Graduate Assistant for Institutional Research and Analysis Department, University of South Florida. He is Analytics Professional having 5 years of experience in SAS on UNIX, Mainframe and windows environment. He has delivered several automated SAS/UNIX based applications for Fortune 100 Insurance and Life Sciences clients. Analytics, SAS Application/Macro Development and Automation are his areas of interest.

177 *A User Defined SDTM Data Quality Checking and Tracking System*

Zemin Zeng and Yunzhi Ling

The quality of Study Data Tabulation Model (SDTM) datasets plays a crucial role in clinical studies and regulatory submissions. Inspired by Pinnacle 21 report, a similar SDTM quality checking system with additional built-in features to effectively monitor database cleaning and SDTM mapping quality progress has been developed. The checking system consists of collecting checking rules in Excel, writing small SAS macros to check SDTM datasets, and using SAS data steps and ExcelXP tagset to generate issue summary report in Excel file. This user defined checking system can be easily maintained and expanded through SAS programs creation and modification, and can be shared from one study to another. The paper describes the development steps of the SDTM quality checking and tracking system in details.

Yunzhi Ling has been working at Sanofi since 2005, with increased responsibilities from programming project leader to programming manager for different therapeutic areas. Yunzhi has led her team to successfully complete 4 submissions by providing project leadership, strategic guidance, technical expertise and hands-on programming support, to ensure high quality and timely deliverables. She also has great interests in programming efficiency and process improvement, and programing resource optimization. Prior to Sanofi, Yunzhi worked at Novartis and Merck for many years.

184 *Knowing What You've Got*

Stephanie Thompson

Have you ever needed to use data from a large collection of files that you know nothing about? If so, this paper is for you. PROC FREQ is a handy way to look at the contents of your data but sometimes you just want to generate a summary of a bunch of tables all at one time. This paper uses a case study of over 700 tables from several databases and one simple, easy, and reusable method is presented. PROC DATASETS, PROC SQL, the MACRO facility, and even PROC IML are used. A dataset of table information and summaries of the populated variables in each table are the end result.

Stephanie has over twenty years of experience in applying statistical and modeling techniques to solve business problems in various commercial and academic environments. She really likes SAS.

197 ***A Sysparm Companion, Passing Values to a Program from the Command Line***
Ronald Fehd

SAS(R) software has sections in its global symbol table for options and macro variables. Sysparm is both an option and a macro variable. As an option, it can be assigned during startup on the command line; in programs, values can be assigned with the options statement; values are stored and referenced as a macro variable.
The purpose of this paper is to provide a general-purpose program, parse-sysparm.sas, which provides a method of deconstructing a list of comma-separated values (csv) into separate macro variables. This is a useful method of passing a set of parameter values from one program to another.

Ronald Fehd retired from a federal research agency in 2012.

He has a B.S. Computer Science, and 30+ years experience programming in SAS. He is the author of over 40 papers, available on LexJansen.com

He was the macro maven on SAS-L from 1997--2017, and stays active in the SAS community as a Theoretical Programmer. You can find him on communities.sas.com.

236 ***Web Scraping in SAS: A Macro-Based Approach***
Jonathan Duggins and Jim Blum

Web scraping has become a staple of data collection due to its ease of implementation and its ability to provide access to wide variety of free data. This paper presents a case study that retrieves data from a web site and stores it in a SAS data set. PROC HTTP is discussed and the presented technique for scraping a single page is also then automated using a SAS macro. The result is a macro that can be customized to access data from a series of pages and store the results in a single data set for further analysis. The macro is designed with a built-in delay to help prevent server overload when requesting large amounts of information from a single site. The macro is designed for both academic and industry use.

Jonathan is a professor at NC State University whose primary teaching effort is focused on statistical programming. Outside of the classroom, he coordinates a professional partnership program to build relationships with industry that produce internship opportunities for his students. Between stints in academia he worked as a biostatistician for several Clinical Research Organizations.

240 *Efficient Use of Disk Space in SAS® Application Programs*

Thomas Billings

A high-level overview of managing disk space for SAS® data sets and files created by or for the SAS system. Basic housekeeping is covered: keep files that are in-use and backup or discard files that are not in use. Backup methods are discussed, including the important question whether the operating system that your SAS site runs on might change in the future, necessitating use of the special transport format for backup files. SAS procedures that are commonly used for disk file management are described: PROC DELETE, DATASETS, and CATALOG. SQL DELETE and SAS DATA step functions for file management are also discussed. File compression is a very important tool for saving disk space, and the SAS features for this are described. Logical deletion of rows in a data set can waste disk space; prototype SAS code to detect files with this condition is supplied in an appendix. Multiple SAS programming techniques that promote efficient use of disk space are described, as well as suggestions for managing the SAS WORK library.

Thomas Billings has used the SAS system intermittently since the mid-1970's, in a variety of different industries and application areas. He is currently working in Banking, using SAS Enterprise Guide and other tools to build and analyze databases.

251 *Life in the Fast Lane: SAS Macro Language with Parallel Processing*

Merry Rabb

The SAS Macro language is widely used for implementing programs that are reusable, flexible and easily repeatable. When moving to a SAS Grid you gain the ability to run independent tasks within your SAS program in parallel in order to shorten run time. If those programs are built around SAS Macros used as code modules and SAS Macro variables used as parameters to control execution, some changes to or restructuring of your code may be needed to duplicate the program logic in a distributed environment.

When using Macro programming in conjunction with RSUBMIT blocks for parallel processing, the code inside a RSUBMIT block is executed in a remote session, but macro code can be compiled in the main SAS program task. If a block of code that you plan to submit to a remote session contains macro calls, macro programming logic or even just macro variable references, some thought needs to be given to how and when the macro processing should occur. This paper looks at methods for incorporating SAS Macro programming logic when using parallel processing.

Merry Rabb is a director of a team of programmers and RTI International where she has worked since 2011. She has used SAS for more than 30 years as an analytic programmer, application developer, product manager and technical trainer.

253 ***Case Study: Using Base SAS to Automate Quality Checks of Excel Workbooks that have Multiple Worksheets***

Lisa Mendez and Andrew Kuligowski

This case study provides a real world example of how Base SAS was used to read in over 185 Excel workbooks to check the structure of over 10,000 worksheets – and to repeat the process quarterly. It will illustrate how components such as the LIBNAME XLSX Engine, PROC SQL (to create macro variables), SAS Dictionary Tables, and SAS Macros were used together to create exception reports exported to MS Excel workbooks. The structure of the worksheets, such as worksheet names and variable names, were checked against pre-loaded templates. Values within the worksheets were also checked for missing and invalid data, percent differences of numeric data, and ensuring specific observations were included in specific worksheets. This case study describes the process from its inception to the ongoing enhancements and modifications. Follow along and see how each challenge of the process was undertaken and how other SAS User Group conference proceeding papers contributed to this quality check process.

Andrew T. Kuligowski has been a SAS user for over 25 years – WELL over. Currently a Sr. Business Analyst at Qurate Retail at their HSN offices in St. Petersburg, FL, he has augmented his professional coding experiences in the retail, media, insurance, and petrochemical fields by speaking at various SAS conferences and user group meetings. Andrew was conference chair of SAS Global Forum 2012 in Orlando, and co-chair for SESUG'97 in Jacksonville and Tennessee SAS Users Day in Knoxville. In his spare time, Andrew volunteers at the Florida Aquarium in Tampa.

270 ***Synchronized tracking of dataset versions with programs and logs using Proc PRINTTO and other SAS tricks.***

Laxminarayana Ganapathi

It is common to generate several versions of output data in a production environment. Quite often, the most important information, the program and its version that generated the data is documented manually. We describe an automated process that tracks each data set with a specific version of the code as well as the log file generated in the specific run. We will also demonstrate other uses of proc PRINTTO in tracking the versions of the production runs to make meaningful documentation of code and data in a production environment. Use of automatic macro variables generated by the system increases the reliability of versioning and audit trails. The process is suited for tracking minor changes implemented during a production run. It implicitly takes care of documenting any changes in the inputs to the program. Hence changes affected by running the same code in a changed environment can be dynamically documented. We will demonstrate the use of the process in a Linux as well as windows environment.

Laxminarayana (Gana) Ganapathi Ph. D. is a research programmer/analyst in the Center for Health Data Analytics at RTI International. He has worked in survey data collection, disease modeling and management of biological and clinical data repositories. Dr. Ganapathi has designed and developed telephone randomization systems for clinical trials. His recent work has involved working with large data from the Centers for Medicare & Medicaid Services (CMS) for program evaluations. He has used SAS for more than 15 years.

282 *Quick 'n Dirty - Small, Useful Utility Macros*

Harry Droogendyk

Macros are useful to define "canned" code that may be made available to other users in your organization. But, there's also simple, less sophisticated macros that are useful in your day to day coding efforts, if only to reduce keystrokes. This presentation will demonstrate a few of these macros, even ones that generate only partial statements:

%dups generate code snippet to identify duplicate observations
%fiscal return formatted SAS dates offset by fiscal year
%cleanup cleanup work datasets and/or global macro variables
%single resolve macro variables within single quotes

Harry has been an independent consultant since 1995, spending most of his time since the year 2000 using SAS. He enjoys participating in user group conferences like this one, recognizing the value they provide to the SAS user community.

283 *Building Neural Network model in BASE SAS® (From Scratch)*

Soujanya Mandalapu, Yan Wang and Xuelei Ni

Artificial Neural Networks are extremely popular in deep learning applications such as image recognition and natural language processing. They also find many applications in complex machine learning problems in finance, marketing and insurance domain. Most neural network models are implemented in Python, Java C++ and Scala. However, it is not available in Base SAS, while Base SAS is a preferred language in regulated environments such as finance and clinical trials. Financial modelers want to use Neural Networks to improve their models to gain efficiency. This paper is aimed at those modelers who would like to implement machine learning models using only BASE SAS and SAS macros. This paper is also extremely helpful to new machine learning enthusiasts who are interested to learn the step by step implementation of Neural Network algorithm. A standard one hidden layer feedforward backpropagation algorithm with three separate macros for each step was implemented in this paper. This algorithm is scalable to increase as many features and hidden nodes.

Soujanya Mandalapu was a Applied Statistics Graduate student at Kennesaw State University. She has over 5 years of work experience in IT domain.She is interested in model development, testing and validation in Financial and Healthcare sectors. She has been using SAS for more than 2 years Currently working as a Statistical Programming Analyst at Blue Cross Blue Shield of South Carolina.

288 *Sorting Arrays Using the Hash Object*

Paul Dorfman

Before the advent of the SAS Hash Object, two options had been available for sorting SAS arrays: (1) using the SORTN or SORTC call routines or (2) implementing a sorting algorithm, such as the quick sort, heap sort, etc. The first option is limited by its dependence on the data type and inability to handle duplicate keys and parallel arrays. The second option requires rather sophisticated custom programming. The SAS hash object, with its built-in ability to sort its hash items internally, is devoid of the above deficiencies. In this paper, we show how it can be used to sort SAS arrays simply and efficiently.

Paul began using SAS to compute some stuff pre-1990 while pursuing a degree in Physics. He went on to use it as a principal doing-whatever-with-data tool in a number of industries, such as telops, credit card/banking, pharma, and health insurance. In 1998, he introduced hashing into SAS programming and implemented all classic hash algorithms based on SAS arrays. After the advent of the canned hash object, he was first to have begun using it as a DATA step programming tool, then started propagandizing it and wrote the first SUGI user paper on the subject. Paul invented a number of the hash object programming techniques likely unintended by the SAS R&D, such as "summary-less" aggregation, array sorting, dynamic data set splitting, and data portion disk off-loading to reduce hash memory footprint.

Building Blocks

107 *Mining Bitcoins: A Step-by-Data Step Simulation*

Seth Hoffman

Have you ever thought about investing in a crypto-currency, but first wanted to understand more about how they work? The best way to understand a computer program is to read its software code and see it run. This paper walks through a Base SAS(R) simulation of a Bitcoin miner to demonstrate all the parts needed to implement the Bitcoin payment system.

110 *Introduction to Data-driven Programming Techniques Using SAS®*

Kirk Paul Lafler

Data-driven programming, or data oriented programming (DOP), is a specific programming paradigm where the data, or data structures, itself controls the flow of a program and not the program logic. Often, data-driven programming approaches are applied in organizations with structured data for filtering, aggregating, transforming and calling other programs. Topics include how SAS® users can access metadata content to capture valuable information about the librefs that are currently assigned, the names of the tables available in a libref, whether a data set is empty, how many observations are in a data set, how many character versus numeric variables are in a data set, a variable's attributes, the names of variables associated with simple and composite indexes, access the content of read-only SAS metadata data sets called DICTIONARY tables or their counterparts, SASHELP views, and how SAS metadata can be dynamically created using data-driven programming techniques.

Kirk Paul Lafler is an entrepreneur and founder at Software Intelligence Corporation, and has been using SAS since 1979. Kirk is a SAS consultant, application developer, programmer, certified professional, mentor, provider of SAS consulting and training services, advisor and adjunct professor at University of California San Diego Extension, emeritus sasCommunity.org Advisory Board member, and educator to SAS users around the world. As the author of six books including Google® Search Complete (Odyssey Press. 2014) and PROC SQL: Beyond the Basics Using SAS, Second Edition (SAS Press. 2013); Kirk has written hundreds of papers and articles; served as an Invited speaker, trainer, keynote and section leader at SAS user group conferences and meetings around the world; and is the recipient of 25 "Best" contributed paper, hands-on workshop (HOW), and poster awards.

117 *A Beginner's Babblefish: Basic Skills for Translation Between R and SAS®*

Sarah Woodruff

SAS professionals invest time and energy in improving their fluency with the broad range of capabilities SAS software has to offer. However, the computer programming field is not limited to SAS alone and it behooves the professional to be well rounded in his or her skill sets. One of the most interesting contenders in the field of analytics is the open source R software. Due to its range of applications and the fact that it is free, more organizations are considering how to incorporate it into their operations and many people are already seeing its use incorporated into project requirements. As such, it is now common to need to move code between R and SAS, a process which is not inherently seamless.

This paper serves as a basic tutorial on some of the most critical functions in R and shows their parallel in SAS to aid in the translation process between the two software packages. A brief history of R is covered followed by information on the basic structure and syntax of the language. This is followed by the foundational skill involved in importing data and establishing R data sets. Next, some common reporting and graphing strategies are explored with additional coverage on creating data sets that can be saved, as well as how to export files in various formats. By having the R and SAS code together in the same place, this tutorial serves as a reference that a beginner can follow.

Sarah Woodruff has been programming in SAS professionally for twelve years. She works on reporting and analysis for the Population-based HIV Impact Assessments project through the CDC, the Agricultural Health Study through NCI and NIEHS, and on report development for Westat's Clinical Trials division. She is SESUG's primary registrar, has been SESUG's vice president, was the Operations Chair for SESUG 2012, and has section chaired many times. Her undergraduate work includes a BS in mathematics and statistics from Georgia State University and a BS in microbiology from University of Maryland as well as an MS in bioinformatics from UMUC.

131 ***A Quick Bite on SAS(r) Studio Custom Tasks***

Michael Kola and Girish Patel

Custom Tasks in SAS Studio help users generate reports through a point and click user interface (UI). As a developer, there will be a need to create custom tasks for non-SAS programmers as well as novice SAS users or programmers. After creating a custom task, it can be shared with stakeholders. Custom Tasks are saved as CTM (Custom Task Model) files or CTK (Custom Task Kit) files. CTK file is acting as front-end GUI application, and CTM file are back-end files. Both CTM and/or CTK files could be shared through email or by just placing it on a network shared area. The user simply has to run the file and it generates the User Interface, as the user navigates through the UI, the SAS code is generated simultaneously, which will help the user review the SAS code related to the UI. The task framework is flexible. All tasks use the same common task model and the Velocity Template Language. The task consists of task elements and they are: Registration, Metadata, UI, Dependencies, Requirements and Code Template. We will use all these elements to build our example custom task.

Michael Kola is a SAS Programmer at SalientCRGT where he has been for 2 Years. Michael uses SAS® in his daily responsibilities of SAS Support. He has used SAS for more than 10 years.

178 ***Twenty ways to run your SAS program faster and use less space***

Stephen Sloan

When running SAS® programs that use large amounts of data or have complicated algorithms we often are frustrated by the amount of time it takes for the programs to run and by the large amount of space required for the program to run to completion. Even experienced SAS programmers sometimes run into this situation, perhaps through the need to produce results quickly, through a change in the data source, through inheriting someone else's programs, or for some other reason. This paper outlines twenty techniques that can reduce the time and space required for a program without requiring an extended period of time for the modifications.

Stephen Sloan has worked at Accenture in the Services, Consulting, and Digital groups and is currently a senior principal in the SAS Analytics area. He has worked in a variety of functional areas in Project Management, Data Management, and Statistical Analysis. He has had the good fortune to have worked with many talented people at SAS Institute.

Stephen has a B.A. in Mathematics from Brandeis University, M.S. degrees in Mathematics and Computer Science from Northern Illinois University, and an MBA from Stern Business School at New York University.

179 *Table Taming – Using ODS to Simplify Data Presentation*

Emily Perry

PROC REPORT is a powerful tool, but may be much more than you need. It contains twelve statements and pages of options, making it difficult to display exactly what you want in exactly the way you want it. Consider an alternative method of implementing ODS TRACE and ODS OUTPUT. These SAS statements can be used to output the results of almost any PROC step into a dataset that can then be manipulated to your heart's content. You have more control over your analysis with a straightforward and intuitive method. In this article, we will discuss using these ODS methods in conjunction with typical PROC steps, such as PROC MEANS and PROC FREQ, along with data manipulation to create tables that you can be proud of.

Emily Perry is a Biostatistician at Rho, Inc., a contract research organization (CRO) based in North Carolina, where she has been since 2017. Emily has been a SAS® user for 3 years and enjoys using it on a daily basis to create datasets, data summaries, and displays in the pharmaceutical industry. Conveniently, she also enjoys long walks on the beach.

192 *Emulating FIRST. and LAST. SAS® DATA Step Processing in SQL? Concepts and Review*

Thomas Billings

The questions of whether and how FIRST. and LAST. BY variable SAS® DATA step processing can be emulated in SQL qualify as FAQs: frequently asked questions. We begin with an overview of terminology and explain the different environments involved. Then we cover the common approaches to this issue. #1: if the data rows are uniquely ordered by existing variable(s), those can be used to support emulation. #2: in SAS PROC SQL, DATA step views can be used to inject the values of FIRST. and LAST. BY variables; alternately the undocumented SAS function monotonic() can be used to inject a row number into the data, which can be used in approach #1. However as the order of pull can change from run to run in SQL, the results with monotonic() are not reproducible, hence problematic for data validation and audits. #3: most other SQL dialects have non-standard SQL extensions that will supply a row number; again the order of pull can change from run to run. Then we discuss whether this type of emulation makes sense; that is why the article title includes a question mark (?). We discuss some non-SQL alternatives, and specify the very narrow contexts where the emulation is reasonable. Finally, we note that DS2 supports BY, FIRST., LAST. processing and it can run in-database, making it a possible alternative to SQL and the DATA step.

Thomas Billings has used the SAS system intermittently since the mid-1970's, in a variety of different industries and application areas. He is currently working in Banking, using SAS Enterprise Guide and other tools to build and analyze databases.

196 *An Autoexec Companion, Allocating Location Names during Startup*

Ronald Fehd

Like other computer language SAS(R) software provides a method to automatically execute statements during startup of a program or session. This paper examines the names of locations chosen in the filename and libname statements and the placement of those names in options that enable all programs in a project to have standardized access to format and macro catalogs, data sets of function definitions and folders containing reusable programs and macros. It also shows the use of the global symbol table to provide variables for document design.

The purpose of this paper is to examine the default values of options, suggest naming conventions where missing, and provide both an example autoexec and a program to test it.

Ronald Fehd retired from a federal research agency in 2012.

He has a B.S. Computer Science, and 30+ years experience programming in SAS. He is the author of over 40 papers, available on LexJansen.com

He was the macro maven on SAS-L from 1997--2017, and stays active in the SAS community as a Theoretical Programmer. You can find him on communities.sas.com.

202 *Dating for SAS Programmers*

Josh Horstman

Every SAS programmer needs to know how to get a date... no, not that kind of date. This paper will cover the fundamentals of working with SAS date values, time values, and date/time values. Topics will include constructing date and time values from their individual pieces, extracting their constituent elements, and converting between various types of dates. We'll also explore the extensive library of built-in SAS functions, formats, and informats for working with dates and times using in-depth examples. Finally, you'll learn how to answer that age-old question... when is Easter next year?

Josh Horstman is an independent statistical programming consultant and trainer based in Indianapolis with 20 years' experience using SAS in the life sciences industry. He specializes in analyzing clinical trial data, and his clients have included major pharmaceutical corporations, biotech companies, and research organizations. Josh is a SAS Certified Advanced Programmer who loves coding as well as talking about coding at SAS Global Forum and other SAS User Group meetings.

221 *When Reliable Programs Fail: Designing for Timely, Efficient, Push-Button Recovery*

Troy Hughes

Software quality comprises a combination of both functional and performance requirements that together specify not only what software should accomplish, but also how well it should accomplish it. Recoverability—a common performance objective—represents the timeliness and efficiency with which software or a system can resume functioning following a catastrophic failure. Thus, requirements for high availability software often specify the recovery time objective (RTO), or the maximum amount of time that software may be down following an unplanned failure or a planned outage. While systems demanding high or near perfect availability will require redundant hardware, network, and additional infrastructure, software too must facilitate rapid recovery. And, in environments in which system or hardware redundancy is infeasible, recoverability only can be improved through effective software development practices. Because even the most robust code can fail under duress or due to unavoidable or unpredictable circumstances, software reliability must incorporate recoverability principles and methods. This text introduces the TEACH mnemonic that describes guiding principles that software recovery should be timely, efficient, autonomous, constant, and harmless. Moreover, the text introduces the SPICIER mnemonic that describes discrete phases in the recovery period, each of which can benefit from and be optimized with TEACH principles. Software failure is inevitable but negative impacts can be minimized through SAS® development best practices.

Troy has been a SAS practitioner for over 15 years, has managed SAS projects in support of federal, state, and local government initiatives, and is a SAS Certified Base, Advanced, and Clinical Trials Programmer. He is the author of the 2016 John Wiley and Sons groundbreaking book: SAS Data Analytic Development: Dimensions of Software Quality. He is a frequent presenter at SAS Global Forum, SAS Analytics Experience, WUSS, MWSUG, SCSUG, SESUG, and PharmaSUG.

Troy has an MBA is information systems management and additional certifications, including: Project Management Professional (PMP), Risk Management Professional (PMI-RMP), Professional in Business Analysis (PMI-PBA), Agile Certified Professional (PMI-ACP), Certified Information Systems Security Professional (CISSP), Certified Secure Software Lifecycle Professional (CSSLP), ITIL Foundation, Certified ScrumMaster (CSM), Certified Scrum Developer (CSD), Certified Scrum Product Owner (CSPO), and Certified Scrum Professional (CSP).

255 *Tips and Tricks for Ensuring Accurate Routine Data Processing when Logs are Redirected to Text Files*

Davia Moyse

SAS users often develop and maintain a set of codes that process the same expected inputs through to expected outputs and that are run on a routine basis as datasets are updated with new observations. A common efficiency implemented in this data management scenario is to redirect SAS log contents to a permanent text file, rather than display in the terminal log window. This efficiency does provide processing time savings, but may lead to oversight of processing errors when inputs or outputs stray from their expected formats. This paper will discuss techniques that may be implemented to aid a SAS user in reviewing redirected processing logs and the success of processing, especially when no errors or warnings present themselves. Topics will include automatically opening and programmatically reviewing the redirected log text file and checking the intended structure of input, intermittent, and output datasets. Focus will be given to directing some messages back to the terminal log window in the middle of processing, as well as ensuring that all observations are processed through conditional IF-ELSE IF processing. These techniques utilize PROC CONTENTS, PROC SQL, CALL SYMPUT, %SYSEXEC, and %SYSFUNC.

Mrs. Moyse is a data manager and statistician with over 7 years of experience in survey research, specifically in managing and analyzing complex data from multiple survey cycles and from multi-modal data collection efforts, including secondary data sources. She specializes in developing efficient and automated analytical systems for data processing, statistical analysis, and reproducible reporting. She has a Masters in Quantitative Methods in the Social Sciences from Columbia University and is a SAS® 9 Certified Base Programmer.

266 *Proc SQL in Twenty Minutes*

John Cohen

Proc SQL can be a valuable addition to your SAS tool set. While the syntax will seem foreign to experienced Data Step programmers, the Structured Query Language can be quite elegant in its own right. Further, unlike a requirement for us to "computer engineer" our Data Step for efficiency, our friends in Cary have built-in intelligence to allow us to submit generic SQL and optimization under the covers does at least some of the rest.

The SQL Procedure makes certain tasks easier (such as Cartesian Products), is a requirement for pulling data from many external databases (to link via "proc SQL pass-through" to link to Oracle, Teradata, MS/Access, and the like), and for many is a preferred tool for common tasks (such as capturing record counts, accessing SAS Dictionary Tables, creating views and indexes, and capturing summary statistics for loading into SAS macro variables).

Finally, in today's complex IT environments, having some familiarity with SQL will allow one to better engage in this broader environment. We will not turn you into an overnight expert, but we will lay a foundation for you to continue to explore and learn on your own.

John first used SAS in Graduate School when Big Data took TWO boxes of punch cards. He has worked in a variety of academic, government, and business settings including banking and reinsurance, Pharma Clinical/R&D, and epidemiology. More recently he worked in Commercial Pharma in Marketing and Sales managing large datasets with a particular focus on Managed Care Analytics. In his current assignment he is supporting Credit Card Operations and is active in several SAS user groups. He lives in Newark, DE with his wife, dog, and two cats. In his spare time he likes to eat and sleep.

284 *Hash Beyond Lookups - Take Another Look*

Elizabeth Axelrod

Using the hash object in SAS – beyond table lookup and data retrieval – enables you to do some pretty cool stuff, solving complicated problems with code that runs efficiently and flows intuitively. And… it's easy to maintain and modify. What's not to like?

This is an updated version of my original paper "Hash Beyond Lookups - Your Code Will Never Be the Same". It provides a further exploration of some useful HASH techniques, and offers more situations that can be elegantly solved using Hash. The main message? Don't be afraid of Hash!

Elizabeth Axelrod has been using SAS for over 36 years, and she's been a SAS fan(atic) for almost that long. She is a Lead Programmer Analyst at Abt Associates Inc., where she constructs large-scale research files in the Health Policy area. As a co-director of Abt's Data Management and Analytic Computing Methods Center she developed guidelines for quality assurance, reproducibility, and documentation. She is currently the President of BASUG – the Boston Area SAS Users Group.

285 *The Categorical Might of PROC FREQ*

Jinson Erinjeri and Saritha Bathi

PROC FREQ is essential to anybody using Base SAS® for analyzing categorical data. This paper presents the various utilities of the FREQ procedure that enable in effective data analysis. The cases presented include a range of utilities such as finding counts, percentages, unique levels or records, Pearson chi-square test, Fisher's test, McNemar test, Cochran-Armitage trend test, binomial proportions test, relative risk, and odds ratio. In addition, this paper will show the ODS features available to effectively display your results. All the cases presented in this paper will prove the categorical might of PROC FREQ beyond doubt.

Jinson has been using SAS for 12+ years. He has used SAS in academic, market-research and clinical-trial settings. He has presented in prior SESUG's and SAS Global Forums.

114 *A Visual Step-by-step Approach to Converting an RTF File to an Excel File*

Kirk Paul Lafler

Rich Text Format (RTF) files incorporate basic typographical styling and word processing features in a standardized document that many programs and applications are able to read. In today's high-tech arena sometimes the contents of an RTF file needs to be viewed as, and even converted to, an Excel file. You would think that since both RTF and Excel are Microsoft standards that this would be a simple process to achieve, but you may be surprised to find out that it is not. This paper and presentation highlights a visual step-by-step approach to converting an RTF file to an Excel File using the SAS® software.

Kirk Paul Lafler is an entrepreneur and founder at Software Intelligence Corporation, and has been using SAS since 1979. Kirk is a SAS consultant, application developer, programmer, certified professional, mentor, provider of SAS consulting and training services, advisor and adjunct professor at University of California San Diego Extension, emeritus sasCommunity.org Advisory Board member, and educator to SAS users around the world. As the author of six books including Google® Search Complete (Odyssey Press. 2014) and PROC SQL: Beyond the Basics Using SAS, Second Edition (SAS Press. 2013); Kirk has written hundreds of papers and articles; served as an Invited speaker, trainer, keynote and section leader at SAS user group conferences and meetings around the world; and is the recipient of 25 "Best" contributed paper, hands-on workshop (HOW), and poster awards.

122 *When SAS Doesn't Behave As Expected*

Megan McNeill and Gregory Weller

SAS does not always behave in a way a programmer would expect. Sometimes this is due to errors in programming, while other times this is due to how SAS processes data and performs computations.

This paper will provide two examples of instances where SAS does not provide the result a programmer was expecting, and give tips on how to program defensively in order to avoid such issues. One example will highlight a case where the result computed from SAS's internal process differs from the mathematically correct result. The other example will touch on a broader issue of SAS processing date variables differently between a data step and a macro. This paper will cover different processing methods and the importance of knowing how SAS behaves in these situations.

138 *Easily Updating Programs with the SAS® Macro Language: an EDFacts Example*

Aaron Brown

Many times, a programmer may have to generate the same report several times, such as weekly, monthly, or annually. If these reports have minor changes, making the necessary updates can be time-consuming and cause bugs or errors due to typos. This paper describes examples of how to easily update programs by using the SAS® macro language, using the example of the annual EDFacts data submissions (which state Departments of Education must are required to send to the federal Department of Education). This paper utilizes both macro variables (using the %let statement) and macros.

Aaron Brown works at the South Carolina Department of Education, where he uses SAS to manage data submissions to the federal Department of Education. He has Base, Advanced, and Statistical Business Analyst SAS certifications, and he is working on a Master's of Applied Statistics.

140 ***Matching SAS Data Sets with Hash Objects: If at First You Don't Succeed, Match, Match Again***

Imelda Go

Two data sets can be matched by using a number of techniques available in SAS. If the goal is to match as many records as possible between two data sets, then the matching process may have to be repeated several times between the two data sets by using different sets of matching criteria. Although programmers new to hash objects will need to learn a few things before they can feel confident about using the technique, the resulting ease of use/maintenance of the code is well worth the effort.
{This is the hash-object version of two prior papers on the same topic: the 2009 SESUG paper focused on PROC SQL and the 2004 SESUG paper focused on the DATA step.)

Imelda "Mel" C. Go, PhD, is a SAS Programmer with Questar Assessment, Inc.'s Psychometrics and Research group. Prior to that she was employed by the SC Department of Education for 15 years and by two SC public school districts for 7 years. She has been using SAS since 1989 to analyze student test data and to perform high-stakes calculations.

148 ***Using a Picture Format to Create Visit Windows***

Richann Watson

Creating visit windows is sometimes required for analysis of data. We need to make sure that we get the visit/day in the proper window so that the data can be analyzed properly. However, defining these visit windows can be quite cumbersome especially if they have to be defined in numerous programs. This task can be made easier by applying a picture format, which can save a lot of time and coding. A format is easier to maintain than a bunch of individual programs. If a change to the algorithm is required, the format can be updated instead of updating all of the individual programs containing the visit definition code.

Richann Watson is an independent statistical programmer and CDISC consultant. She has been using SAS since 1996. She is also a member of the CDISC ADaM team and various sub-teams. In addition, she is the chairperson for the local SAS user group in her area and is actively involved with SAS Global Forum, PharmaSUG, MWSUG and other SAS User Groups.

154 ***Improving Query performance by saying "NO" to Heterogeneous Joins***

Suryakiran Pothuraju and Kiran venna

Heterogeneous joins between SAS dataset and DBMS table is a common requirement most SAS programmers often come across. SAS/ACCESS support for DBMS temporary tables has the ability to retain DBMS temporary tables across multiple SAS steps. If you can make the process happen in the DBMS in some certain situations, the overall performance will enhance immensely. In this paper we will discuss how to access small subset of data from extremely large Database table, depending on the key variables from a SAS Table.

155 ***You're Doing It Wrong! Volume 001***

Shane Rosanbalm

You might think that you're a good programmer. But you're not. It's not just that you're doing it differently than I would do it. It's that you're actually doing it in a way that is unquestionably, incontrovertibly wrong!

But, take heart. I am here to set you on the righteous path. Listen to me, and you will be adored by your coworkers, accepted by SUG section chairs, and solicited by recruiters. The focus of volume 001 will be on the appropriate naming of macro parameters.

Shane Rosanbalm is a Senior Biostatistician at Rho. He became a SAS user while studying biostatistics at the University of North Carolina at Chapel Hill in a time before there were hybrid cars, GPS, or texting.

168 ***"Use SAS® PROC Tabulate to create a PDF with Bookmarks"***

Barbara Felts, Chuchun Chien and Susan Myers

Recently our client requested a report of cross frequencies containing many variables to compare and review their data. Our original thought was to run a cross frequency however this created a very long output. While this initial output met the client's request, the information was difficult to review and did not contain a defined structure.

It was determined the final report needed to provide a structure to the end user which would allow easy access to the comparisons within the report and have a finished appearance. We discovered that you can do so much more to improve the look and readability of the report by using ODS and SAS® Proc tabulate.

This paper will explain our progression from a plain SAS® output of a simple cross frequency to a PDF and then to a more user friendly PDF with meaningful bookmarks using macros, SAS® ODS and SAS® Proc Tabulate. We will show you how to take your simple Cross Frequencies beyond simple output to this next level of a finished report.

Chuchun is a research systems programmer analyst at RTI International where she has been since 1999. Chuchun uses SAS® in her daily responsibilities of data processing and quality control. She has used SAS for almost 20 years.

189 ***Automated Comparison Tables using PROC REPORT***

Evan Kwiatkowski

Comparison tables showing rows of summary statistics for continuous and categorical variables (e.g. age and gender) across columns of a categorical variable (e.g. treatment vs. placebo) are ubiquitous in clinical research. Many SAS procedures are used to generate these data summaries and associated tests of statistical significance (e.g. PROC FREQ, PROC TTEST). Other pertinent information, such as formatted variable names and number of non-missing observations per variable, are often included in the final report. This paper presents a one-step macro for producing reports that contain summary statistics, tests for significance, and other relevant information in a comparison table in RTF format.

193 ***Password Protection of SAS® Enterprise Guide® Projects***

Thomas Billings

SAS® Enterprise Guide® lets a user assign a password to a project, after which any/all users must enter the correct password to be able to open and run the project. In this paper we test the security of password protected projects against 2 hacks. We first present a sample project that has multiple types of Tasks that will be used for testing. Before assigning a password to the project, we demonstrate a simple hack that facilitates the examination of some of the internal metadata of a SAS Enterprise Guide project, i.e., a .egp file. Then we assign a password to the sample project and repeat the hack on the password-protected project, with the result that the hack does not work. Next, we try another simple hack - viewing the .egp file in a text editor - and find that this does not work either. The tests here provide independent confirmation that password-protected .egp files are secure against the 2 hacks demonstrated. We end with a brief discussion on .egp file metadata and its role in the SAS ecosystem. SAS products: SAS Enterprise Guide. User-level: beginner.

Thomas Billings has used the SAS system intermittently since the mid-1970's, in a variety of different industries and application areas. He is currently working in Banking, using SAS Enterprise Guide and other tools to build and analyze databases.

194 ***Do the Loop De Loop !***

Jennifer Lindquist

Like the break neck speed of a rollercoaster careening through loops, barreling through programs using SAS Do loops instead of repetitive code can shorten your programming time and lines of code.

An introduction to arrays and loop processing covers the basics. The first step is to recognize a pattern when arrays/loops may be applicable. An explanation of simple loop processing presents the concept of a loop index, as well as the syntax for declaring an array. All leading up to the construct of a simple iterative do loop. Other loop constructs including Do Over, Do While and Do Until will be presented as alternative approaches.

Make going around in circles work for you!

213 ***Accessing Password Protected Microsoft® Excel Files in A SAS® Grid Environment***

Brandon Welch and Travis Mason

Microsoft® Excel continues as a popular choice for data storage and manipulation. Extracting data from Excel files is often challenging. If a file is password protected, the challenge intensifies. The classic approach to reading password protected files is through DDE (Dynamic Data Exchange). The DDE approach fails in a SAS grid environment. This paper illustrates an alternative by using a Visual Basic Scripting (VBScript) file. The script is built within a SAS program then executed with a X command. The text file is then accessed via data step or PROC IMPORT. The methods presented in this paper highlight SAS techniques that will educate programmers at all levels. In addition the reader will learn how to build a simple VBScript file.

Brandon Welch, a Principal Statistical Programmer, has over 15 years of experience in statistical analysis and data handling. He received his MS in statistics from the University of Arkansas at Fayetteville. His career experiences span a variety of areas including biostatistics, social science, and survey statistics. Although originally a statistician, Brandon is also fluent in a variety of programming and scripting languages including Python, JavaScript, R, SPSS, Stata, and VB.NET.

218 *Using PROC SQL to Generate Shift Tables More Efficiently*

Jenna Cody

Shift tables display the change in the frequency of subjects across specified categories from baseline to post-baseline time points. They are commonly used in clinical data to display the shift in the values of laboratory parameters, ECG interpretations, or other categorical variables of interest across visits. The "into:" statement in PROC SQL can be used to create macro variables for the denominators used in these tables. These macro variables can be accessed throughout the program, allowing for easy computation of percentages and the ability to call the same macro variable to display the subject count value in the header. This paper will outline the steps for creating a shift table using an example with dummy data. It will describe the process of creating macro variables in PROC SQL using the "into:" step, creating shift table shells using the DATA step, conducting frequency tabulations using PROC FREQ, calling the macro variables in a DATA step to calculate and present the count and percent, and using the macro variables for the subject count value in the headers. It will then discuss the efficiency of the use of PROC SQL to create macro variable denominators over other methods of calculating denominators, such as in the PROC FREQ step. Code examples will be provided to compare shift table generation techniques.

Jenna Cody holds an MS degree in Biostatistics from the University of North Carolina at Chapel Hill and a BA degree in Neuroscience from Swarthmore College. She works as a Biostatistician at IQVIA (formerly Quintiles and IMS Health) and previously worked as a Statistical Programming Intern. She enjoys working collaboratively, mastering new skills, and making improvements to current processes. In her spare time, she enjoys long-distance running, reading, and spending time with friends. This is her first conference and she is looking forward to meeting everybody!

224 ***Abstracting and Automating Hierarchical Data Models: Leveraging the SAS® FORMAT Procedure CNTLIN Option To Build Dynamic Formats That Clean, Convert, and Categorize Data***

Troy Hughes

The SAS® FORMAT procedure "creates user-specified formats and informats for variables." In other words, FORMAT defines data models that transform (and sometimes bin) prescribed values (or value ranges, in the case of numeric data) into new values. SAS formats facilitate multiple objectives of data governance, including data cleaning, the identification of outliers or new values, entity resolution, and data visualization, and can even be used to query or join lookup tables. SAS formats are often hardcoded into SAS software, but where data models are fluid, formats are best defined within control files outside of software. This modularity—the separation of data models from the programs that utilize them—allows SAS developers to build and maintain SAS software independently while domain subject matter experts (SMEs) separately build and maintain the underlying data models. Independent data models also facilitate master data management (MDM) and software interoperability, allowing a data model to be maintained as a single instance, albeit implemented not only with SAS but also Python, R, or other languages or applications. The CNTLIN option (within the SAS FORMAT procedure) facilitates this modularity by creating SAS formats from data sets. This text introduces the BUILD_FORMAT macro that greatly expands the utility of CNTLIN, allowing it to build formats not only from one-to-one and many-to-one format mappings but also from multitiered, hierarchical data models that are built and maintained externally in XML files. The numerous advantages of BUILD_FORMAT are demonstrated through successive SAS code examples that rely on the taxonomy of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5).

Troy has been a SAS practitioner for over 15 years, has managed SAS projects in support of federal, state, and local government initiatives, and is a SAS Certified Base, Advanced, and Clinical Trials Programmer. He is the author of the 2016 John Wiley and Sons groundbreaking book: SAS Data Analytic Development: Dimensions of Software Quality. He is a frequent presenter at SAS Global Forum, SAS Analytics Experience, WUSS, MWSUG, SCSUG, SESUG, and PharmaSUG.
Troy has an MBA is information systems management and additional certifications, including: Project Management Professional (PMP), Risk Management Professional (PMI-RMP), Professional in Business Analysis (PMI-PBA), Agile Certified Professional (PMI-ACP), Certified Information Systems Security Professional (CISSP), Certified Secure Software Lifecycle Professional (CSSLP), ITIL Foundation, Certified ScrumMaster (CSM), Certified Scrum Developer (CSD), Certified Scrum Product Owner (CSPO), and Certified Scrum Professional (CSP).

233 ***Recursive Programming Applications in Base SAS®***

Jinson Erinjeri and Pratap Kunwar

Programmers employ recursive programming when faced with tasks which are structured hierarchically. Recursive programming involves the call of the same program or function within itself to solve such tasks. For the recursive program to execute effectively, it requires an entry condition, a recursive sequence and an exit condition. Recursive programming can be employed in base SAS® and this paper presents some of the cases where recursive programming can be applied. In addition, the cases presented in the paper can help instill a programmer of how and when to take the recursive approach while programming.

Jinson has been using SAS for 12+ years. He has used SAS in academic, market-research and clinical-trial settings. He has presented in prior SESUG's and SAS Global Forums.

235 *Investigation of Impact on Tobacco Use due to Vaporizing Nicotine in High Schools*

Justin Williams

Approximately 431,000 deaths each year are attributed to nicotine use in the United States. This is directly responsible for more than US $100 billion in healthcare and indirect costs. Nicotine is very addictive. However, nicotine has evolved to be consumed in many forms, one of which is in the form of vapor (vaping). Nicotine vapor consumption has become somewhat of a social trend amongst high school students, due to the assumption that consuming nicotine through vaporization is less hazardous to their health than smoking cigarettes. This paper will demonstrate the use of the Chi-Square Test, T-Test, and Regression Analysis in SAS to examine the phenomenon of vaping amongst the teenage population.

Originally from St. Louis, MO Justin Williams moved to Atlanta in 1996 to pursue a Bachelor's of Science Degree in Chemistry. After that Justin obtained a Master's of Science in Public Health form Tulane University School of Public Health and Tropical Medicine. Justin is now currently a Doctoral of Epidemiology Student at Florida A&M University, Institute of Public Health.

238 *A Macro to Add SDTM Supplemental Domain to Standard Domain*

Pratap Kunwar

Many pharmaceutical and biotechnology industries are now preferring to setup Study Data Tabulation Model (SDTM) mapping in the beginning of the study rather at the end, and use SDTM datasets to streamline the flow of data from collection through submission. With having SDTM datasets in disposal, it is a logical choice to use them for any clinical reports. Getting information from supplemental (SUPP) domain back to parent domain is a regular step that programmers can't avoid. But, this step can be very tricky when either (1) SUPP domain contains multiple types of identifying variables, or (2) SUPP domain empty or does not exist.

In this presentation, I will present an easily understandable macro that will produce correct results in every possible scenario.

Pratap Kunwar is a SAS Programmer at EMMES Corporation where he has been since 2012. Pratap uses SAS® in his daily responsibilities and has used SAS for more than 10 years.

239 *SAS Generated Dashboard - Useful Tool for A SAS Programmer*

Pratap Kunwar

Being savvy in SAS technical skills is a key to become a top SAS programmer, but at the same time it is important to possess other supporting tools that can provide related project and other information instantly during programming. A SAS generated HTML based dashboard page with relevant information and instant navigation to such as project folders, people, other documents and any related html links, is highly desirable, resulting in saving time during the work day.
In this presentation, first I will share my dashboard that I have generated using SAS. Second, because of its popularity among my colleagues and non-programmers, I will show how I have setup a SAS program for non-programmer so dashboard can be generated from Excel with SAS interface, not necessarily even opening SAS in interactive mode.

Pratap Kunwar is a SAS Programmer at EMMES Corporation where he has been since 2012. Pratap uses SAS® in his daily responsibilities and has used SAS for more than 10 years.

242 *Order, Order! Four Ways to Reorder Your Variables, Ranked by Elegance and Efficiency*

Louise Hadden

SAS(r) practitioners are frequently required to present variables in an output data set in a particular order, or standards may require variables in a production data set to be in a particular order. This paper and presentation offer several methods for reordering variables in a data set, encompassing both data step and procedural methods. Relative efficiency and elegance of the solutions will be discussed.

Louise Hadden has been using, and loving, SAS since the days of punch cards and computers the size of a not so tiny house. She spends most of her time in support of health policy analytics at Abt Associates Inc., and loves a good SAS reporting challenge. She is also the girl with the SAS tattoo!

244 ***Divide and Conquer: A Macro to Split Data Based on Duplicate Values***
Meredith Tayshetye and David Eppler

Have you ever had a dataset that needed to be split into smaller datasets so that one variable did not have duplicate values? An email program the team was using did not allow more than one email to an address within the same send. So, if one email address was listed multiple times for multiple records, the program would only send an email to one record, excluding the others. As a workaround, team members would manually copy duplicates into different files and treat each duplicate file as a separate send. While we could not solve for the limitations of the email program, we could make it easier to split the files.

Using SAS Enterprise Guide 7.13, we have created a macro that solves this problem. The macro will determine the maximum number of times any particular value appears and will create that many files. Though an email address can be linked to multiple records, you may not initially know the maximum number of times an address appears. For example, if a file has one email address linked to ten different records, there will be ten output files. The macro will automatically determine the maximum number of files needed. Then, it will write out the necessary number of files to a specified directory where they can be used for other purposes such as an input to the email program.

This macro is customizable to a variety of data and industries. It is easy to use and can save companies valuable time and manual work.

256 ***Quote the SASLOG***
Andrew Kuligowski

"For every action, there is an equal and opposite reaction." Sir Isaac Newton was talking about physics, but the concept also applies to other areas of life - including quotation marks in SAS code.

Unfortunately, SAS coders do not always properly provide balanced quotation marks while coding. SAS will detect possible occurrences of this problem, signaling its concern with a SASLOG message:

WARNING: The quoted string currently being processed has become more than 262 characters long. You might have unbalanced quotation marks.

This presentation contains a few coding suggestions to identify unbalanced quotation marks in SAS code.

Andrew T. Kuligowski has been a SAS user for over 25 years – WELL over. Currently a Sr. Business Analyst for Qurate Retail at their HSN offices in St. Petersburg, FL, he has augmented his professional coding experiences in the retail, media, insurance, and petrochemical fields by speaking at various SAS conferences and user group meetings. Andrew was conference chair of SAS Global Forum 2012 in Orlando, and co-chair for SESUG'97 in Jacksonville and Tennessee SAS Users Day in Knoxville. In his spare time, Andrew volunteers at the Florida Aquarium in Tampa.

261 *Tips for Pulling Data from Oracle® Using PROC SQL® Pass-Through*

John Cohen

For many of us a substantial portion of our data reside outside of SAS®. Often these are in DBMS (Data Base Management Systems) such as Oracle, DB2, or MYSQL. The great news is that the data will be available to us in an already-structured format, with likely a minimum of reformatting optimized database effort required. Secondly, these DBMS' come with an array of manipulation tools of which we can take advantage. The not so good news is that the syntax required for pulling these data may be somewhat unfamiliar to us.
We will offer several tips for making this process smoother for you, including how to leverage a number of the DBMS tools. We will take advantage of the robust DBMS engines to do a lot of the preliminary work for us, thereby reducing memory/work space/sort space, data storage, and CPU cycles required of the SAS server – which is usually optimized for analytical work while being relatively weaker (than the DBMS) at the heavy lifting required in an increasingly Big Data environment for initial data selection and manipulation. Finally, we will make our SAS Administrators happy by reducing some of the load in that environment.

John first used SAS in Graduate School when Big Data took TWO boxes of punch cards. He has worked in a variety of academic, government, and business settings including banking and reinsurance, Pharma Clinical/R&D, and epidemiology. More recently he worked in Commercial Pharma in Marketing and Sales managing large datasets with a particular focus on Managed Care Analytics. In his current assignment he is supporting Credit Card Operations and is active in several SAS user groups. He lives in Newark, DE with his wife, dog, and two cats. In his spare time he likes to eat and sleep.

267 *PROC SQL - GET "INTO:" IT!*

Kelly Schlessman

The "INTO:" clause within PROC SQL is an extremely useful tool, but may be a mystery to those unfamiliar with SQL. A SELECT statement paired with the INTO clause in PROC SQL provides a simple method of storing data in a macro variable - or many macro variables! What can go into these macro variables? Values of selected variables from a dataset, summary statistics, and delimited lists of values, to name a few. A task that may require multiple steps in traditional DATA STEP programming can be achieved in a single line of PROC SQL code. All that is required to harness the power of the INTO clause is basic knowledge of SELECT statements in PROC SQL. This paper will provide an introduction to the INTO clause for novice PROC SQL users, and demonstrate some useful ways in which it can be put to work in your code.

268 ***A beginner's take on conditional logic using SAS Enterprise Guide 7.15 and SAS Macros.***

Mykhael Walker

Learning any new system can be a daunting task, but learning a system that has multiple ways to solve the same problem can be refreshing and frustrating at the same time. When I was introduced to SAS Enterprise Guide 7.15, I was overwhelmed by all the features that were available. Once the initial shock subsided, it was time to put the tools to work. A task that commonly comes up when trying to solve a problem is the scenario: If A happens, then do B…conditional logic. SAS Enterprise Guide 7.15 provides a way for the user to manipulate conditional logic in a visual way and SAS code provides multiple ways to manipulate conditional logic via code. In this paper I will discuss how I used the conditional logic capability built in SAS Enterprise Guide 7.15 to solve an issue. I will also discuss how I used macros in SAS code to solve the same issue, but with a little more flexibility.

Mykhael Walker is a programmer analyst in the Office of Institutional Knowledge Management at the University of Central Florida. Mykhael has only been working with SAS for one year but has been programming in higher education for over eight years.

273 ***Automation Methods: Using SAS to Write the Code for Repetitive Quality Control Checks***

Imelda Go

This paper illustrates how you can use a SAS data set, which we will call a quality control specifications (QCS) data set, to store the information on how each variable in the data set will be scrutinized via QC methods. For example, we will need to run PROC FREQ for variables A to Z and run a PROC MEANS for variables X1-X100. Let us suppose we have an existing data set we need to run quality control checks on. We first apply PROC CONTENTS to this data set to get the complete list of variables in the data set. We then focus on adding to this data set the variables that identify which QC methods apply to each variable. Once this information has been added to the data set, this becomes our QCS data set. We then use SAS to process the information in it so that SAS creates the programming statements required to execute the QC checks. This simplifies the task tremendously for the programmer because the programmer can focus on making sure that each variable has been marked with all the required QC checks and be assured that SAS will create the code for you.

Imelda "Mel" C. Go, PhD, is a SAS Programmer with Questar Assessment, Inc.'s Psychometrics and Research group. Prior to that she was employed by the SC Department of Education for 15 years and by two SC public school districts for 7 years. She has been using SAS since 1989 to analyze student test data and to perform high-stakes calculations.

274 ***Automation Methods: Using SAS to Write PROC SQL Joins for You***
Imelda Go

When the number of variables involved is large and there are a number of aliases, it can actually take some time to type the join code even though the task is inherently simple. We first apply PROC CONTENTS to the two data sets to be joined in order to get a full list of variables for each data set. We then focus on adding to each data set indicator variables that show us which variables are to be included in the join. We can also specify aliases, identify which variables will be used for the join, and in general, specify other information that could be useful for the join. We then use SAS to process the information in these data sets so that SAS creates the programming code required for the join. This method allows the programmer to focus on specifying the features of the join instead of focusing on typing the SAS code flawlessly.

Imelda "Mel" C. Go, PhD, is a SAS Programmer with Questar Assessment, Inc.'s Psychometrics and Research group. Prior to that she was employed by the SC Department of Education for 15 years and by two SC public school districts for 7 years. She has been using SAS since 1989 to analyze student test data and to perform high-stakes calculations.

301 ***Panel Discussion: Tip Top Top Tier SAS® Tips: What makes a great SAS tip***
Louise Hadden

Tip Top Top Tier SAS® Tips: What makes a great SAS tip

Four panelists and a moderator

Louise Hadden has been using, and loving, SAS since the days of punch cards and computers the size of a not so tiny house. She spends most of her time in support of health policy analytics at Abt Associates Inc., and loves a good SAS reporting challenge. She is also the girl with the SAS tattoo!

Data Management/Big Data

118 *Reducing the Length of Character Variables in a SAS ® Data Set*

Bruce Gilsen

In the big data era, reducing the defined length of character variables to their actual maximum length in any observation is one way to reduce disk storage use and improve processing time with no loss of information. A simple way to do this is with the FIXLENG macro, which determines the maximum length for each character variable, and if any character variables have a maximum length smaller than their defined length does the following:

1. Prints a summary report listing the defined length and maximum length for each character variable.
2. Based on the value of a user-specified parameter either (1) reduces the size of all character variables to their maximum length, or (2) generates and displays SAS ® code that would reduce the size of all character variables to their maximum length.

FIXLENG provides a simple alternative to compression, which is commonly used to reduce disk storage. One advantage of the FIXLENG macro is that it is only executed once, whereas a data set must be compressed every time it is written and uncompressed every time it is read.

Bruce Gilsen has worked at the Federal Reserve Board for over 35 years. He spends most of his time as an in-house SAS consultant. His Bruce Force fantasy baseball team will be battling for its 6th league title in 31 years in 2018.

130 *SAS Techniques to Handle Large Files And Reduce Execution times*

Kaiqing Fan

As a SAS Developer or SAS user, we are always struggling with too long execution time of our SAS engines, sometimes it would be couple hours, other times more than 20 or 30 hours, or even much longer. In my eyes, too long execution time is not acceptable. Actually we have many SAS technical skills, if you can use them properly, we can hugely shorten the execution time. I did it. I successfully shortened the execution time from 36 hours to around 5 hours (expected execution should be less than 1 hour); from 3 hours to 6 minutes. Here I want to summarize most of the technical skills I used and share them with you.

I am a Sr. SAS Tech Lead, Sr. Data Scientist, Sr. SAS Developer Lead with 10 year experience in software programming, 3 year in statistical Analysis and developing SAS engines; 2 years' experience as Tech Lead. Expert in fitting predictive models by statistical analysis, predictive modeling, machine learning using SAS, R, UNIX/LINX and Python; Professional in handling big data, massive large data files, optimization of software engines, automation execution of software engines, hugely cutting of software engines' execution times. I got my 3 Master degrees of Statistics, Applied Mathematics and History from University of Wyoming, University of New Orleans, and East China Normal University.

139 *Data Integration Best Practices*

Harry Droogendyk

The creation of and adherence to best practices and standards can be of great advantage in the development, maintenance, and monitoring of data integration processes and jobs. Developer creativity is always valued, but it is often helpful to channel good ideas through process templates to maintain standards and enhancement productivity. Standard control tables are used to drive and record data integration activity. SAS® Data Integration Studio (or Base SAS®) and the judicious use of auto-call utility macros facilitate data integration best practices and standards. This paper walks you through those best practices and standards.

Harry has been an independent consultant since 1995, spending most of his time since the year 2000 using SAS. He enjoys participating in user group conferences like this one, recognizing the value they provide to the SAS user community.

142 *Reducing the space requirements of SAS data sets without sacrificing any variables or observations*

Stephen Sloan

The efficient use of space can be very important when working with large SAS data sets, many of which have millions of observations and hundreds of variables. We are often constrained to fit the data sets into a fixed amount of available space. Many SAS data sets are created by importing Excel or Oracle data sets or delimited text files into SAS and the default length of the variables in the SAS data sets can be much larger than necessary. When the data sets don't fit into the available space, we sometimes need to make choices about which variables and observations to keep, which files to zip, and which data sets to delete and recreate later.

There are things that we can do to make the SAS data sets more compact and thus use our space more efficiently. These things can be done in a way that allows us to keep all the desired data sets without sacrificing any variables or observations.
SAS has compression algorithms that can be used to shrink the space of the entire data set. In addition, there are tests that we can run that allow us to shrink the length of different variables and evaluate whether they are more efficiently stored as numeric or as character variables. These techniques often save a significant amount of space; sometimes as much as 90% of the original space is recouped. We can use macros so that data sets with large numbers of variables can have their space reduced by applying the above tests to all the variables in an automated fashion.

Stephen Sloan has worked at Accenture in the Services, Consulting, and Digital groups and is currently a senior principal in the SAS Analytics area. He has worked in a variety of functional areas in Project Management, Data Management, and Statistical Analysis. He has had the good fortune to have worked with many talented people at SAS Institute.

Stephen has a B.A. in Mathematics from Brandeis University, M.S. degrees in Mathematics and Computer Science from Northern Illinois University, and an MBA from Stern Business School at New York University.

143 *Fuzzy Matching Programming Techniques Using SAS Software*

Stephen Sloan and Kirk Paul Lafler

Data comes in all forms, shapes, sizes and complexities. Stored in files and data sets, SAS users across industries know all too well that data can be, and often is, problematic and plagued with a variety of issues. When unique and reliable identifiers are available, users routinely are able to match records from two or more data sets using merge, join, and/or hash programming techniques without problem. But, what happens when a unique identifier, referred to as the key, is not reliable or does not exist. These types of problems are common and are found in files containing a subscriber name, mailing address, and/or misspelled email address, where one or more characters are transposed, or are partially and/or incorrectly recorded? This presentation introduces what fuzzy matching is, a sampling of data issues users have to deal with, popular data cleaning and user-defined validation techniques, the application of the CAT functions, the SOUNDEX (for phonetic matching) algorithm, SPEDIS, COMPLEV, and COMPGED functions, and an assortment of programming techniques to resolve key identifier issues and to successfully merge, join and match less than perfect or messy data.

Stephen Sloan has worked at Accenture in the Services, Consulting, and Digital groups and is currently a senior manager in the SAS Analytics area. He has worked in a variety of functional areas including Project Management, Data Management, and Statistical Analysis. Stephen has had the good fortune to have worked with many talented people at SAS Institute. Stephen has a B.A. in Mathematics from Brandeis University, M.S. degrees in Mathematics and Computer Science from Northern Illinois University, and an MBA from Stern Business School at New York University.

Kirk Paul Lafler is an entrepreneur and founder at Software Intelligence Corporation, and has been using SAS since 1979. Kirk is a SAS consultant, application developer, programmer, certified professional, mentor, provider of SAS consulting and training services, advisor and adjunct professor at University of California San Diego Extension, emeritus sasCommunity.org Advisory Board member, and educator to SAS users around the world. As the author of six books including Google® Search Complete (Odyssey Press. 2014) and PROC SQL: Beyond the Basics Using SAS, Second Edition (SAS Press. 2013); Kirk has written hundreds of papers and articles; served as an Invited speaker, trainer, keynote and section leader at SAS user group conferences and meetings around the world; and is the recipient of 25 "Best" contributed paper, hands-on workshop (HOW), and poster awards.

152 ***A Shorter Path to Moving Data Profiles from SAS® Data Management Studio to SAS® Data Management Server***

Wayne Hileman

Typically, one uses SAS® Data Management Studio to develop and run a data profile on a much smaller subset of data than the final target data set. Once the profile is ready for prime time or you need to profile a large data set, the data profile is run on the SAS® Data Management Server through a batch job using SAS® Data Integration Studio.
This presentation covers the steps to move a data profile from the user's machine to the SAS® Data Management Server and run through a DataFlux® Batch Job, in SAS® Data Integration Studio. Also covered are recommendations to follow that are helpful to know in advance, rather than hindsight, in getting my first data profile to run successfully. Before scaring you away, the intended audience is anyone who has access to SAS® Data Management Studio, SAS® Data Management Server, SAS® Data Integration Studio, and a simple data set that you would like to profile. Experience with either application is minimal.

Wayne currently serves as the Primary SAS Platform Administrator for the South Carolina Department of Education. He is a lover of all things SAS since 2013 and considers his role more as a SAS Solution Architect.

153 ***Obtain better data accuracy using reference tables***

Kiran Venna and Suryakiran Pothuraju

Data accuracy can be improved tremendously by using reference tables, especially when data is loaded from external files into target tables. Metadata and data quality checks can be easily performed with help of these reference tables. Data accuracy for many files can be performed by using a single reference SAS table with help of macro. In this paper we will discuss step by step approach how to build this reference tables and way to automatize the data accuracy checks.

171 ***Taking XML's Measure: Using SAS® to Read In and Create XML for Analytic Use and Websites***

Louise Hadden

XML has become a standard over the years for populating websites and transferring information. This presentation demonstrates how to parse mystery XML files, read in XML files that you can't right-click on and open with Microsoft Excel, read into Microsoft Excel using SAS®, and how to use maps and schemas to input and output various XML representations.
Constructing and outputting "measure code" data sets from input data to maximize the flexibility of XML data representation and usage is discussed. Metrics comparing using the hierarchical measure code structure to standard, more rectangular XML structures are presented.

Louise Hadden has been using, and loving, SAS since the days of punch cards and computers the size of a not so tiny house. She spends most of her time in support of health policy analytics at Abt Associates Inc., and loves a good SAS reporting challenge. She is also the girl with the SAS tattoo!

222 ***Parallel Processing Your Way to Faster Software and a Big Fat Bonus: Demonstrations in Base SAS®***

Troy Hughes

SAS® software and especially extract-transform-load (ETL) systems commonly include components that must be serialized due to real process dependencies. For example, a transform module often cannot begin until the data extraction completes, and a corresponding load module cannot begin until the data transformation completes. While process dependencies such as these cannot be avoided in many cases and necessitate serialized software design, in other cases, programs or data can be distributed across two or more SAS sessions to be processed in parallel, facilitating significantly faster software. This text introduces the concept of false dependencies, in which software is serialized by design rather than necessity, thus needlessly increasing execution time and deprecating performance. Three types of false dependencies are demonstrated as well as distributed software solutions that eliminate false dependencies through parallel processing, arming SAS practitioners to accelerate both their software and salaries.

Troy has been a SAS practitioner for over 15 years, has managed SAS projects in support of federal, state, and local government initiatives, and is a SAS Certified Base, Advanced, and Clinical Trials Programmer. He is the author of the 2016 John Wiley and Sons groundbreaking book: SAS Data Analytic Development: Dimensions of Software Quality. He is a frequent presenter at SAS Global Forum, SAS Analytics Experience, WUSS, MWSUG, SCSUG, SESUG, and PharmaSUG.

Troy has an MBA is information systems management and additional certifications, including: Project Management Professional (PMP), Risk Management Professional (PMI-RMP), Professional in Business Analysis (PMI-PBA), Agile Certified Professional (PMI-ACP), Certified Information Systems Security Professional (CISSP), Certified Secure Software Lifecycle Professional (CSSLP), ITIL Foundation, Certified ScrumMaster (CSM), Certified Scrum Developer (CSD), Certified Scrum Product Owner (CSPO), and Certified Scrum Professional (CSP).

281 *How To Dupe a Dedup*

Paul Dorfman

Many ETL transformation phases begin with cleansing the extracted data of duplicate data. For example, transactions with the same key but different dates may be deemed duplicate, and the ETL needs to select the latest transaction. Usually, this is done by sorting the extract by the key and date and then choosing the most recent record. However, this technique is quite resource-costly, particularly when the non-key variables are numerous and/or long and the result needs to be resorted back into the original order. In this paper, we show how the same goal can be achieved via a principally different algorithm based on modifying the extract file by marking the duplicate records for deletion and thus obviating the need to sort the entire extract even once. For large extract files and relatively sparse duplicate records, this approach may result in cutting the processing time by an order of magnitude or more.

Paul began using SAS to compute some stuff pre-1990 while pursuing a degree in Physics. He went on to use it as a principal doing-whatever-with-data tool in a number of industries, such as telops, credit card/banking, pharma, and health insurance. In 1998, he introduced hashing into SAS programming and implemented all classic hash algorithms based on SAS arrays. After the advent of the canned hash object, he was first to have begun using it as a DATA step programming tool, then started propagandizing it and wrote the first SUGI user paper on the subject. Paul invented a number of the hash object programming techniques likely unintended by the SAS R&D, such as "summary-less" aggregation, array sorting, dynamic data set splitting, and data portion disk off-loading to reduce hash memory footprint.

305 *Speed up your SAS processing automatically with no change to code*

Dana Rafiee and Shailesh Manjrekar

Long running SAS jobs have been a big problem for many SAS users and organizations. With absolutely no change to SAS code, Destiny will discuss business use cases and Vexata, a disruptive technology certified by SAS Institute that takes SAS data step, procedures, and model processing from many days and hours down to minutes, making job execution faster and simpler than ever before.

e-Posters

105 *Using SAS® to test the Psychometric Properties of Computer-Based Prostate Cancer Screening Decision Aid Acceptance Scale among African-American Men*

Abbas Tavakoli, Otis Owens and Nikki Wooten

Prostate cancer incidence and mortality rates among African-American men are 1.5 and 2.5 times greater than Whites, respectively, in the southeastern United States. Prostate cancer screening could result in early detection and potentially reduce cancer health disparities. This study tested the psychometric properties of the Computer-Based Prostate Cancer Screening Decision Aid and Acceptance Scale (PCDAA). We analyzed baseline data from a purposive sample of 352 African-American men aged 40 years and older who resided in South Carolina. Exploratory factor analysis (EFA) was conducted using maximum likelihood, squared multiple correlation, and Promax rotation. Internal consistency reliability was assessed using Cronbach's alpha. Pearson's correlation assessed the association between factors and subscale items. A Scree plot and item statistics assessed factor loadings. EFA revealed the optimal factor structure of the PCDAA among African American men was a 24-item, 3-factor model. Factor loadings ranged from 0.32 to 0.94 with 11 items loading on Factor 1, 8 items on Factor 2, and 5 items on Factor 3. A negative weak correlation between Factors 1 and 3, a strong positive correlation between Factors 1 and 2, and no correlation between Factors 2 and 3. A positive correlation between factors and the total subscale ranging from .32 to .85. Scale reliability in this study was examined by estimating the Cronbach's alpha. The reliability of each subscale ranged from 0.87 to 0.94 with a total scale reliability of 0.87. The PCDAA is a reliable measure of prostate knowledge, decision self-efficacy, and intention to make an informed decision among African American men.

Abbas Tavakoli currently work as Clinical Associate Professor with college of Nursing at the University of South Carolina. He has worked with office of research College of Nursing since 1992. He worked with Health Statistics at Raleigh (NC) from 1990 to 1992. His job entails teaching, involves with research, and using many statistical procedures. He has taught Statistics courses for doctoral nursing students since 2004. I taught Bios700 (introduction to Biostatistics) and Bios710 (Effective Data management in Public Health) for graduate students in the School of Public Health. He has served as a data manager, biostatistician, and research team member for five previous NIH-funded R01 grants and many smaller grants that have required data management, display and analysis plans. He has assisted principal investigators to collect, manage, analyze, and present high quality data. He has involved many research project and manuscript.

145 *Let's Get FREQy with our Statistics: Data-Driven Approach to Determining Appropriate Test Statistic*

Richann Watson and Lynn Mullins

As programmers, we are often asked to program statistical analysis procedures to run against the data. Sometimes the specifications we are given by the statisticians outline which statistical procedures to run. But other times, the statistical procedures to use need to be data dependent. To run these procedures based on the results of previous procedures' output requires a little more preplanning and programming. We present a macro that dynamically determines which statistical procedure to run based on previous procedure output. The user can specify parameters (for example, fshchi, plttwo, catrnd, bimain, and bicomp), and the macro returns counts, percents, and the appropriate p-value for Chi-Square versus Fisher Exact, and the p-value for Trend and Binomial CI, if applicable.

Richann Watson is an independent statistical programmer and CDISC consultant. She has been using SAS since 1996. She is also a member of the CDISC ADaM team and various sub-teams. In addition, she is the chairperson for the local SAS user group in her area and is actively involved with SAS Global Forum, PharmaSUG, MWSUG and other SAS User Groups.

160 *The Art of Accurate Reports*

Victoria Garcia

Many times, we find ourselves with an overwhelming amount of data at our fingertips. The goal of this presentation is to aid the user in creating accurate reports in SAS Enterprise Guide in a simple top-down approach using four steps; Envisioning, Planning, Creating, then Testing. For this paper, we will be working data from the Florida Fish and Wildlife Conservation Commission.

Although a presenter at the 2018 SAS Global Forum, Victoria Garcia is new to the field of data analytics. She is currently a full time student attending school to obtain her bachelors in Data Science and Analytics as well as being a full time employee at the Florida Fish and Wildlife Conservation Commission.

163 ***Creating and Implementing a SAS Visual Analytics Dashboard Style Guide***
Danae Barulich

The University of Central Florida's Institutional Knowledge Management (IKM) office is the official data source for the entire university. The office provides a variety of data reports ranging from simple ad hoc projects to complex multi-page interactive SAS Visual Analytics (VA) dashboards.

As the office has been tasked with creating a larger volume of interactive dashboards in last few years, it became apparent that a style guide was needed. The style guide serves two main purposes: to standardize the look and feel of IKM dashboards and to save time on dashboard development.

The style guide contains detailed information in the following areas: layout, color and font selection (including suggested color choices for frequently used data points), chart styling, and general guidance on dashboard organization.

The IKM VA Style Guide is currently being used for all new dashboard development.

166 ***Tips on Developing SDTM Datasets for Complex Long-Term Safety Studies***
Yunzhi Ling and Helen Wang

There is an increase tendency in clinical research practice to combine multiple studies' extension phases into one long-term safety (LTS) study, as the cost of conducting one LTS study is much lower than maintaining individual LTS study for each core study separately, from clinical operation point of view. However, such combination significantly increases the complexity of LTS study's Clinical Study Report (CSR) programming handling, especially in Study Data Tabulation Model (SDTM) datasets development. This paper illustrates the key areas that need to pay special attention, comparing with a typical study's SDTM datasets creation, when developing SDTM datasets in order to effectively facilitate LTS study's Analysis Data Model (ADaM) datasets creation and potential datasets pooling for integrated analyses.

Helen Wang holds a MS in Statistics and a MS in physics. She has over 20 year's extensive experiences in SAS programming and statistical analysis in different industries including pharmaceutical, financial, banking and telecom with most recent 15 years in pharmaceutical industry. She has proficient technical skills, strong project leadership skills and extensive experiences in CDISC and submission, ISS, and ISE and successfully led multiple large scale ISS, ISE and NDA/sNDA and BLA/sBLA submissions.

198 ***ODS Excel Tips for an Output Makeover***
Rita Slater and Amy Moseby

The interaction between SAS® ODS Excel statement and SAS PROC REPORT is amazing. With minimal manipulation, it is relatively easy to create visually informative and easy-to-read spreadsheets. The techniques we present show how a user can perform data error detection with color coding, formatting, and shading of cells. We will also present some additional items including filtering a column, adding super or subscripts, and adding hyperlinks to a footnote.

208 ***Consumer Emotional Loyalty – Measuring What Motivates Your Customers***

Sarah Queller and Kate Hogenson

In this world of price transparency and competition, why should customers choose you? They can easily pick up their phones and find the lowest price for sirloin steak, a car, or a vacation. Yet, some customers will buy a higher priced Tiffany diamond over a Costco diamond, even if the size and quality are exactly the same. Researchers and marketers have posited that this kind of behavior is motivated by Emotional Loyalty, which can produce 'stickier' consumer behavior, often with less cost than competing on price. Previous academic research posits that Status, Habit and Reciprocity contribute to consumer Emotional Loyalty (e.g., Henderson, Beck & Palmatier, 2011).

We make these claims actionable by creating an Emotional Loyalty Assessment. To create this scoring tool, we analyzed responses of 1200 loyalty program members on 60+ agree/disagree items intended to assess consumers' emotional loyalty motivations. Factor analysis (SAS proc factor) validated a 3 factor orthogonal solution with each customer having one score for Status, one for Habit, and one for Reciprocity. Importantly, the Emotional Loyalty Scores were significantly related to emotional attachment to companies, as well as to intentions to purchase and to promote products or services. (Analysis was multivariate regression using SAS proc reg with Type III SS, co-varying age and gender.)

We further validated the Emotional Loyalty Scores using an oversample of 200 actual hotel loyalty program members and found, as expected, that higher status scores were associated with increased Marriott/Star Preferred Guest loyalty program membership and higher Habit scores were associated with increased Choice loyalty program membership. (Analysis was logistic regression using SAS proc logistic, co-varying age and gender with Marriott/SPG as the target group; Status odds ratio = 1.88, p=.003; Habit odds ratio = 0.61, p=.015).

Emotional Loyalty Scores can be used to increase customer engagement and emotional loyalty to a company by ensuring that the messaging, benefits and offers customers see are relevant to what motivates them. When emotional loyalty motivations are related to behaviors such as churn, this can suggest important changes to marketing and messaging strategies to match what motivates your customers.

Dr. Queller uses her analytics skills and psychological expertise in how our minds work to connect customers to brands, providing insight on how people make decisions, establish self-worth, and identify with and influence others. She has worked with telecommunications, retail, finance, and high-tech clients, and has taught statistics and psychology at the college level.

250 ***Comparison of SAS®, SAS University Edition®, and Microsoft Excel® in Collaborative Data Analysis of Physical Properties by Scientist and Statistical Programmer***

John Schreiber and Elizabeth Schreiber

Calibration data for novel instrumentation and laboratory data were analyzed using common regression techniques presented in physics literature and a pooled regression respecting the underlying physical constraints of mechanical analysis. This paper compares and contrasts implementation of these techniques in SAS®, SAS University Edition®, and Microsoft Excel®.

John Schreiber is a PhD candidate in the University of South Florida Department of Physics. He as an MS in Education and a BS in Physics. He is a novice user of SAS University edition.

257 *Solving Problem of 5 Star Rating Method in a Recommendation System*

Surabhi Arya

Recommendation System are very popular in e-commerce industry as it offers personalization and customer satisfaction which finally increases credibility of website. Recommendation system is built on historical data of users' rating. Most commonly used rating system is 1-5 star rating, but there are some disadvantages associated with the system build on this data because ratings get averaged which further can be misleading and distract user from specific details. For example, Product A has 10 ratings, 9 of which are 5 stars and 1 is 1 star. Average rating of 4.6 stars. Product B has 100 ratings, 85 of which are 5 stars and 15 of which are 1 star. Average rating of 4.4 stars. Thus product A will be placed above product B. This is a major issue in movie rating websites.

This project aims at solving this issue by using users' sentiments along with 1-5 scale rating to build a recommendation system.

The dataset used for this project consisted of user_id, title_id, rating (1-5 star rating), feeling (in hashtag format like #clever, #mustwatch, #actionpacked, #tense, #stylish etc.) and many other parameters. Data was obtained from https://www.mymovierack.com and contains observation of 50,000 users out of which approximately 5,000 users are active.

Using SAS EM we built users' and movies profile(vector) and created a Movie by User Rating Matrix (columns – movie, rows - users) based on the feelings of users about movies.

Further, Cosine Similarity was conducted using the distance between each vector based on cosine similarity, ultimately clustering (Cluster Node in SAS EM) the users. Different clusters lead to grouping of users, which have similar feelings for a movie.

Lastly, these clusters were used to build recommendation system and dashboard to project movies' specific details based on reviews.

Lastly, as a final result of this project we were able to build a recommendation system which will assist the website to make refined and personalized recommendations to users.

Education/Institutional Research

106 *Enrollment Management Utilities*

Marla Mamrick and Philip Moore

With the increased demand for data-driven decision-making in higher education, institutional researchers are required to provide data analyses that extend well beyond dashboards and descriptive statistics. Limited resources preclude IR professionals from writing research reports for all campus constituents. Enrollment Management Utilities (EMU) was designed to address these issues by allowing select users to access institutional data via a point and click environment to perform typical data manipulation and analyses used to create IR reports. A manual and online help system are available to explain how to perform each function and how to interpret the results. The system is free of charge to any institution of higher education that has a single user SAS license for SAS Base, SAS Stat, and SAS Graph. This session will present an overview of the program as well as a simple example of the use of the software.

Phil Moore has been a SAS user for 44 years. He has a faculty appointment to the College of Education and has taught statistics and research courses in educational research. Before retiring from the university, Phil was an academic research consultant, a computer systems programmer, and the assistant provost for institutional research, compliance, and assessment. He currently works part-time as an enrollment management researcher at the University of South Carolina.

167 *Opportunities and Challenges of Visual Business Intelligence Course for MBA Students*

Anil Aggarwal

As social network diffuses so does the data generated through them. This data contains text, videos, graphs, pictures and many other varieties. Data is generated at the speed of light and organizations must take advantage of it. Organizations are demanding graduates who can understand, manage and make sense of such data. Universities are obligated to provide such skills to their graduates. Visualization is becoming an important tool for exploring big data. Visualization typically has 2 parts. Exploration and Explanation. First part deals with data analysis and second part deals with data modeling and validation. These parts are not mutually exclusive. Both parts should be included in a course. This creates challenges for professors who need to either offer a new course in visualization or at a minimum include it in an existing course. It is important that our students understand this new phenomenon in addition to existing systems. There are opportunities given that software like SAS, JMP and Tableau are making visualization a reality and challenges due to business background of students. The course needs to be data-driven with visualization to be useful to business students. This paper is an attempt in developing such new visualization course.

Dr. Aggarwal is a Professor in the Merrick School of Business at the University of Baltimore. Dr. Aggarwal was a Fulbright scholar and held Lockheed Martin Research and BGE Chair at the University of Baltimore. He has published in many journals, including Computers and Operations Research, Decision Sciences, Information and Management, Production and Operation Management, e-Service, Decision Sciences - Journal of Innovative Education, Journal of Information Technology Education: Innovations in Practice, Total Quality Management & Business Excellence, eService, International Journal of Web-Based Learning and Teaching Technologies and Journal of EUC and many national and international professional proceedings. He has published four edited books -- web-based education (2), cloud computing (1) and Big Data (1). His current research interests include Web-based education, big data, virtual team collaboration and cloud computing.

185 *Developing In-House Student Success Models*

Stephanie Thompson

The number of vendors providing solutions for predicting student success keeps increasing. Each claim to be able to use your data and predict the likelihood of retention or graduation for you. This all comes at both a financial cost as well as the time and effort needed to prepare and update data to feed their systems. Is creating an in-house system a better solution? This paper walks through one way to make that determination. If your institution has gone through changes impacting the continuity of data or has made other significant structural changes, finding an off the shelf solution may be more challenging. Should you include additional variables that the commercial products do not consider? A side benefit of creating the models in-house is validating multiple models on past students as well as working with those who will be using the model output to generate buy in. Rolling out a commercial solution is of no benefit if those using it do not trust the results. SAS® has the tools to do the modeling whether you use Base SAS®, SAS Enterprise Miner®, or SAS Visual Analytics®. Why not leverage what you have to support your student's success?

Stephanie has over twenty years of experience in applying statistical and modeling techniques to solve business problems in various commercial and academic environments. She really likes SAS.

201 *The "Why" and "How" of Teaching SAS to High School Students*

Jennifer Richards

Learning SAS for the first time as a budding epidemiologist in graduate school, I remember being amazed at how powerful and customizable SAS was in making sense of huge amounts of data. I also remember being very intimidated by all the moving parts involved in learning such a program! My study and use of SAS has continued since that time, specifically now as a Doctor of Public Health student. I have often wondered how much further along my research would be at this point, had I learned SAS in high school. When one of my professors recently told me that resources are available for teaching SAS at that level, it prompted me to ask a local high school teacher what she thought about teaching SAS to her students. When she replied that she thought it was a great idea but did not know how she could do this, I realized this was a gap that needed to be filled. The aim of this presentation is to raise the awareness of educators about the importance of, and resources available for, teaching SAS to high school students.

Jennifer Richards is a Doctor of Public Health student at Florida A & M University in Tallahassee, FL. She uses SAS almost every day in her research work. Her area of research interest is obesity and its related comorbidities.

212 *Redesigning Project Management Within Institutional Research in a SAS Environment*

Andre Watts

The University of Central Florida is a large metropolitan university located in Central Florida. Due to its size and scope, Institutional Knowledge Management (IKM) within the university processes a considerable number of requests by numerous constituents for data and analysis throughout the year. Like many institutional research offices, IKM is faced with an increasing demand for complex data analysis and the creation of interactive dashboards. Part of the department's challenge is managing and delivering these large-scale projects in a timely fashion when faced while also dealing with other ad-hoc and smaller projects. As such, over the past year, the office is in the process of overhauling its project management processes to improve delivery and meet university demands.

This presentation will cover how the UCF IKM office has integrated new project management processes to meet these demands and tighter deadlines within the current SAS suite of tools. We will show how these project management processes work with and alongside SAS products and have evolved due to the changing landscape of analytics at the institution. Attendees will hopefully come away with some ideas and approaches they can utilize in their organizations or institutions.

215 *Going from Zero to Report Ready with PROC TABULATE*

Rachel Straney

The TABULATE procedure in SAS® can be used to summarize your data into organized tables. This procedure can calculate many of the descriptive statistics that the MEANS, FREQ, and REPORT procedures do, but with the flexibility to display them in a customized tabulated format. At first, the syntax may seem difficult and overwhelming but with practice and some basic examples, you can go from zero to report ready in no time. This paper will discuss the benefits of using PROC TABULATE and identify the kinds of reports that this procedure is best suited. An example in a higher education setting will be used to illustrate the syntax and statements needed to generate a complex table. The table will include multiple classification variables as well as more than one numeric variable for various computed statistics. Readers will learn the functions of the CLASS, VAR and TABLE statements and how to include subtotals and totals with the keyword ALL. To make the finished table 'report ready,' examples of how to apply formats, labels, and styles will also be shared.

Rachel Straney is an analyst/programmer at the University of Central Florida. Her main responsibilities include the administration, collection, and reporting of student surveys. She also serves as a statistician to conduct assessments and evaluations which support decision making for university operations and student learning. She has been programming in SAS for over 15 years.

229 *From CSV to SAS®: Dealing with Empty Fields and Repeated Observations*

Kelly Smith and Paul Earls

Sometimes, higher education students need to register for classes before official transcripts from prior education institutions have arrived at their new institution. If a student needs to enroll in a class with prerequisites and official transcripts have not been evaluated, the student can obtain an override from an advisor, using unofficial documentation, in order to complete the registration process. At Central Piedmont Community College (CPCC) in North Carolina, information about student overrides is pulled from the institutional database as a CSV file. In a recent effort to standardize and improve student placement data maintained by Institutional Research, it was decided to transform the override CSV files into SAS data sets.

This paper summarizes the multi-step process involved in the data set creation. Producing the data set required the modification of student identification and date information into standard formats, the appropriate addition of student identification and date information to observations with missing values, and the creation of a condensed variable from multiple observations. Particular attention is paid to the use of IF THEN processing, the use of RETAIN and DROP in a DATA step, and the use of ARRAY to collapse a multiple-value variable. In addition, the use of internal check mechanisms within the SAS code is presented as a method for data validation. The creation of a SAS data set from institutional data is a beneficial step that maximizes the information's potential for later use.

Dr. Smith is a Research Analyst with the Office of Institutional Research at Central Piedmont Community College. Her research interests include developmental education and the evaluation of student success initiatives.

230 ***Student Placement: Using SAS® to Combine and Prioritize Information***

Kelly Smith, Paul Earls and Bobbie Frye

When a student applies to a North Carolina community college in order to take curriculum classes requiring college-level proficiency, it is still common for placement tests to be administered so the college-readiness of the student can be assessed. However, placement tests are not the only mechanism used to determine a student's final placement. Other considerations include state initiatives such as Multiple Measures, transfer credit from other institutions of higher education, and overrides provided by community college advisors. In a recent effort to standardize and improve student placement data, the Office of Institutional Research at Central Piedmont Community College (CPCC) revised the SAS code used to finalize student placement.

This paper summarizes the refinement of the student placement program. Final student placement is constructed from four data sets: (a) the testing file, which is based on information from the student test data files; (b) the curriculum students by term file, which contains all students who participated in the registration process for a particular academic term; (c) the transfer credit file, which contains all transfer credits awarded to students for a particular academic year; and (d) the overrides file, which contains all overrides provided to students who participated in the academic term. The correct determination of student placement requires the precise selection of appropriate information from the transfer and override data sets with WHERE, the careful use of MERGE procedures to combine data sets, the creation of flag variables to track merged information, and the meticulous application of IF THEN processing. The refinement of the SAS code for determining student placement illustrates the logic analysis required to construct SAS programs that generate accurate outcomes.

Dr. Smith is a Research Analyst with the Office of Institutional Research at Central Piedmont Community College. Her research interests include developmental education and the evaluation of student success initiatives.

241 *Undergraduate Student Retention, Can we catch them before they fall?*

Lohit Bhandari

Educational institutions are very concerned about the retention of students in their undergraduate programs. Until few years ago, the institutions focused only on storing and maintaining student data without utilizing it for making data informed decisions. With the availability of data mining techniques and tools, we can try to derive useful insights from such datasets. The datasets available for this study include demographic, admissions, financial, student employee and academic information. These datasets are available through the Institutional Research and Information Management division at Oklahoma State University. The study would focus on the factors that affect retention of first year freshman students. The factors or reasons for not being able to retain the students from their first semester into their second semester will be part of this study. The study would like to focus on how financial support affects the student's decision to continue their studies. The financial support includes the amount of financial aid provided to the student, and the availability of the on-campus employment opportunities helps those without the financial aid. The study will also include the demographic and other significant factors as part of the model. The technical approach planned is to cleanse, transform and consolidate the datasets in Base SAS. The final output dataset will be imported into SAS Enterprise miner. The predictive modeling techniques available in SAS Enterprise Miner will be used to assess if the above-mentioned financial indicators are significant towards student retention. This would help in improving the quality of decisions that affect the retention of students in higher education. Students, faculty, and program administrators all stand to benefit from such useful insights.

Lohit is a student at Oklahoma State University, currently pursuing a Master's in the Business Analytics program.

243 *Predicting the Risk of Attrition for Undergraduate Students using SAS® Enterprise Miner*

Sivateja Reddy Kandula

A larger number of undergraduate students drop out of college prior to their graduation despite the efforts of college management to improve the retention rates. In order to improve these retention rates, it is important to identify the significant factors that contribute towards students' attrition. In this paper, I will concentrate on various aspects that play an important role in a student's decision to drop out of college. According to surveys on student attrition, it is evident that students' incoming credentials like high school grades, demographic factors like gender, race, and distance from the college, financial factors, socio-economic factors, academic performance, and campus involvement of students play a pivotal role in students' decision to attrite from college. In this paper, I will mainly concentrate on students' attrition in the third semester meaning how likely a student drop out or transfer from a college before reaching the third semester. For this project the data is acquired from a large mid-west university for Fall 2016 - Fall 2017 and the model will be validated on data from Spring 2016 - Spring 2017. Variables mentioned above will be used along with some calculated fields to predict college attrition/retention. This paper focuses on analyzing student applicant data and their campus involvement within the first two semesters using SAS Enterprise Guide 7.1, SAS Enterprise Miner 14.1, and SAS Visual Studio. This project will determine the probability of attrition of each student. Results from this study will help university officials provide services to those students who may be at risk for drop out.

Siva is an experienced Data Scientist with 4 years of analytics experience in the fields of Finance and Energy Domains. He is involved in Attrition prediction, Revenue Forecasting, Customer Risk Assessment, and Clustering and Profiling of customers for a big payments company. His main focus areas are Machine Learning, Data Mining, and Forecasting.

246 *Text Mining to Predict College Admission Trends*

Shashikant Chebrolu

Any institution receives numerous applications for college admission. Out of those, a few lucky ones get an offer of admission to the college. But from the pool of students who are given out admits, there are many those who do not accept the offer. Due to this, a student who's deserving and willing to join the college losses out an opportunity to do so. This project aims at finding the link between the students who accept an admission offer and the interactions they have with college over emails to determine if there is a pattern that can be discovered to predict an acceptance with more accuracy. The data used has been provided by OSU's Institutional Research & Information Management which contains the data of all the communications between the student being offered the admit and the university for the past three years. SAS Enterprise Miner 14.2 has been used for the text analysis of this project. The ultimate goal of this project is to incorporate the text analytics results into a predictive model to detect if a student accepts the admit or not so more accurate decision making can be performed during the admission process.

Shashi is a current graduate student of Business Analytics at the Oklahoma State University. With a bachelors' in Computer Science from BITS Pilani - Dubai, Shashi has 3 years of professional experience in the field of data analytics. He is passionate about marketing in analytics and has worked on various projects in real time on SAS, R, Python and Tableau. He has also successfully completed Base SAS and SAS Predictive Modeler certifications.

252 ***ANALYSIS OF FACTORS INFLUENCING DROPOUTS IN SOPHOMORE ENROLLMENT***

Apoorva Chandrasekaran

Bill Gates called U.S colleges' staggering dropout rates as 'tragic' in his blog post about 'Putting students first'. The United States is leading in terms of the number of people who start college but is lagging far behind in terms of the number of people who actually finish college. As a matter of fact, only about 50% of these students really leave the college with a diploma. This situation can be remedied. Most of the students that dropout, usually do so before entering the sophomore year. This analysis is based on data from Oklahoma State University, Institutional Research and Information Management (IRIM) Department. In this analysis, we leverage the power of predictive analytics and SAS to predict whether or not a student will enroll for their sophomore year. It will take into consideration various influential factors such as financial background, scholarships, education history, family background, university services use while in college, student employment data and athletic status among others to determine students who are at-risk. Data preparation and predictive models will be handled by Base SAS and SAS Enterprise Miner. Preliminary findings show that an ensemble model is chosen as the best model to predict the target variable. This study hopes to provide an opportunity for institutions to detect and help at-risk students at an early stage, by determining the course of action they can take in order to avoid dropping out of college.

Apoorva was born and raised in Hyderabad, India. She has a Bachelor's degree in Commerce and Finance, and a Post Graduate Diploma in Business Management. She worked for 5 years as a tax consultant in Deloitte Tax and is currently pursuing Master's in Business Analytics with a focus in Human Resources from Oklahoma State University. Her goal is to use analytics to help corporates and businesses identify and fix issues related to employee retention, hiring and management.

260 ***Using SAS® to create HTML codebooks and more!***

Ethan Ritchie

With some basic knowledge of SAS® and HTML, you can create custom documents using your data and associated documentation by using a file statement and put statements to write to an HTML file. This paper provides an example of creating an organized and formatted HTML codebook based on a national education survey and the resulting data. The codebook is complete with variable labels, survey question wording, notes, value labels, and summary statistics. The process is dynamic (i.e., variable names do not need to be specified and the code does not need editing when documentation, variables, or values change). This allows the code to be ported between projects with minimal modification.

Hands on Workshops

113 ***Hands-on SAS® Macro Programming Essentials for New Users***

Kirk Paul Lafler

The SAS® Macro Language is a powerful tool for extending the capabilities of the SAS System. This hands-on workshop teaches essential macro coding concepts, techniques, tips and tricks to help beginning users learn the basics of how the Macro language works. Using a collection of proven Macro Language coding techniques, attendees learn how to write and process macro statements and parameters; replace text strings with macro (symbolic) variables; generate SAS code using macro techniques; manipulate macro variable values with macro functions; create and use global and local macro variables; construct simple arithmetic and logical expressions; interface the macro language with the SQL procedure; store and reuse macros; troubleshoot and debug macros; and develop efficient and portable macro language code.

Kirk Paul Lafler is an entrepreneur and founder at Software Intelligence Corporation, and has been using SAS since 1979. Kirk is a SAS consultant, application developer, programmer, certified professional, mentor, provider of SAS consulting and training services, advisor and adjunct professor at University of California San Diego Extension, emeritus sasCommunity.org Advisory Board member, and educator to SAS users around the world. As the author of six books including Google® Search Complete (Odyssey Press. 2014) and PROC SQL: Beyond the Basics Using SAS, Second Edition (SAS Press. 2013); Kirk has written hundreds of papers and articles; served as an Invited speaker, trainer, keynote and section leader at SAS user group conferences and meetings around the world; and is the recipient of 25 "Best" contributed paper, hands-on workshop (HOW), and poster awards.

135 *Introduction to Monte Carlo Simulation*

Jason Brinkley

Creating synthetic data via simulation can often be a powerful tool for a wide variety of analyses. The purpose of this workshop is to provide a basic overview of simulating data for a variety of purposes. Examples will include power calculations, sensitivity analysis, and exploring nonstandard analyses. The workshop is designed for the mid-level analyst who has basic knowledge of data management, visualizations and basic statistical analyses such as correlations and t-tests.

Jason Brinkley was the 2016 Academic Chair for SESUG in Cary, NC. He holds a PhD in Statistics and has been an avid SAS user for 15 years. He's been to every SESUG event for the past decade and has a great love for this community. His areas of expertise are biostatistics, statistical software, and rural health data. He has four kids and no pets.

147 *Animate Your Data!*

Richann Watson and Kriss Harris

When reporting your safety data, do you ever feel sorry for the person who has to read all the laboratory listings and summaries? Or have you ever wondered if there is a better way to visualize safety data? Let's use animation to help the reviewer and to reveal patterns in your safety data, or in any data!

This hands-on workshop demonstrates how you can use animation in SAS® 9.4 to report your safety data, using techniques such as visualizing a patient's laboratory results, vital sign results, and electrocardiogram results and seeing how those safety results change over time. In addition, you will learn how to animate adverse events over time, and how to show the relationships between adverse events and laboratory results using animation. You will also learn how to use the EXPAND procedure to ensure that your animations are smooth. Animating your data will bring your data to life and help improve lives!

Richann Watson is an independent statistical programmer and CDISC consultant. She has been using SAS since 1996. She is also a member of the CDISC ADaM team and various sub-teams. In addition, she is the chairperson for the local SAS user group in her area and is actively involved with SAS Global Forum, PharmaSUG, and other SAS User Groups.

157 *Using a Handful of SAS Functions to Clean Dirty Data*
Ben Cochran

This paper shows how to use SAS Functions to clean dirty data, as well as to make data more consistent. There are a series of examples that take the audience through a step by step process to make data clean and consistent.

After more than 11 years with SAS in the Professional Services (as an Instructor) and Marketing Departments (as Marketing Manager for the SAS/EIS product), Ben Cochran left to start his own consulting and SAS Training business in the fall of 1996 – The Bedford Group.
As a Silver member of SAS Institute's Alliance Partner Program, Ben has been involved in many consulting projects over the last 20 years and has been teaching SAS courses since 1985.
Ben has authored and presented dozens of papers as well as being an invited speaker at SUGI/SGF, regional and local user groups on a variety of topics since 1988.

164 *Working with the SAS® ODS EXCEL Destination to Send Graphs, and Use Cascading Style Sheets When Writing to EXCEL Workbooks*
William E Benjamin Jr

This Hands-On-Workshop will explore the new SAS® ODS EXCEL destination and focus on how to write Excel Worksheets with output from SAS Graph procedures and spice it up using Cascading Style Sheet features available on modern computer systems. Note that the ODS EXCEL destination is a BASE SAS product, which makes it available on all platforms. The workshop will be limited to the Windows platform, but it should be simple to port the code to other operating systems. The code will be on the computers and you will get a chance to see how it handles.

William E. Benjamin, Jr. his expertise includes Base SAS® Software, and SAS Macros. William has a BS degree in computer science from Arizona State University and an MBA from Western International University. He has been a SAS software user since 1983 and a computer programmer since 1973. His programming experience spans from vacuum tube mainframes, to current PC computers. William currently owns a consulting company called OWL Computer Consultancy, LLC in Phoenix AZ. His new SAS Press book titled "Exchanging Data between SAS and Microsoft Excel: Tips and Techniques to Transfer and Manage Data More Efficiently" was published in 2015 and his second book "Exchanging Data From SAS® to Excel: The ODS Excel Destination" is now available.

165 *The ODS Excel Destination: Assorted Tips and Techniques to Simplify Writing SAS(R) Data to Excel Workbooks.*

William E Benjamin Jr

This Hands on Work shop will introduce many of the Actions, Options and Sub-Options of the New ODS EXCEL Destination, and give the students experience visualizing the results of the new ODS EXCEL Destination outputs by executing code and viewing the results. This class will cover the some of the topics in the following subject areas:

- Differences between SAS Tagsets and SAS ODS Destinations
- SAS ODS EXCEL Destination Actions
- How to Set Excel Property Values
- Modifying Output Features Using Anchor, Style, and CSS
- Options that Apply to Titles, Footnotes, and Sheet processing
- Ways you can adjust Print Features like Headers and Margins
- Options that Impact Columns, Rows, and Cells

William E. Benjamin, Jr. his expertise includes Base SAS® Software, and SAS Macros. William has a BS degree in computer science from Arizona State University and an MBA from Western International University. He has been a SAS software user since 1983 and a computer programmer since 1973. His programming experience spans from vacuum tube mainframes, to current PC computers. William currently owns a consulting company called OWL Computer Consultancy, LLC in Phoenix AZ. His new SAS Press book titled "Exchanging Data between SAS and Microsoft Excel: Tips and Techniques to Transfer and Manage Data More Efficiently" was published in 2015 and his second book "Exchanging Data From SAS® to Excel: The ODS Excel Destination" is now available.

204 *Getting Started with the SGPLOT Procedure*

Josh Horstman

Do you want to create highly-customizable, publication-ready graphics in just minutes using SAS? This workshop will introduce the SGPLOT procedure, which is part of the ODS Statistical Graphics package included in Base SAS. Starting with the basic building blocks, you'll be constructing basic plots and charts in no time. We'll work through several different plot types and learn some simple ways to customize each one.

Josh Horstman is an independent statistical programming consultant and trainer based in Indianapolis with 20 years' experience using SAS in the life sciences industry. He specializes in analyzing clinical trial data, and his clients have included major pharmaceutical corporations, biotech companies, and research organizations. Josh is a SAS Certified Advanced Programmer who loves coding as well as talking about coding at SAS Global Forum and other SAS User Group meetings.

205 ***Doing More with the SGPLOT Procedure***

Josh Horstman

Once you've mastered the fundamentals of using the SGPLOT procedure to generate high-quality graphics, you'll certainly want to delve in to the extensive array of customizations available. This workshop will move beyond the basic techniques covered in the introductory workshop. We'll go through more complex examples such as combining multiple plots, modifying various plot attributes, customizing legends, and adding axis tables.

Josh Horstman is an independent statistical programming consultant and trainer based in Indianapolis with 20 years' experience using SAS in the life sciences industry. He specializes in analyzing clinical trial data, and his clients have included major pharmaceutical corporations, biotech companies, and research organizations. Josh is a SAS Certified Advanced Programmer who loves coding as well as talking about coding at SAS Global Forum and other SAS User Group meetings.

258 ***From Raw, Messy Data to a Clean Analytic Dataset: Common Data Management Techniques using SAS®***

Raymond B. Smith, Jason A. Schoeneberger, Andrea K Henderson and Bethany A. Bell

Despite the amount of quantitative research that exists in the social and behavioral sciences, many graduate programs do not offer classes focused on the multitude of steps necessary to manage quantitative datasets. Instead, this skill is often learned through trial and error with the beginning SAS user having to use multiple resources, including, but not limited to the plethora of proceedings papers from SAS Global Forum as well as regional users' groups as well as other SAS friendly resources such as UCLA's Institute for Research and Digital Education and SAS publications. Although these resources are incredibly useful when a SAS user knows what procedure he/she needs, they are less useful for the novice analyst who does not know where to begin. The focus of this paper is to help guide the novice user through common data management techniques to transform raw, messy data into an analytic dataset. This paper contains information on data management processes as basic as getting an external data set into SAS to more advanced techniques such as using a macro to examine missing data mechanisms as well as using PROC SURVEYSELECT to split the data into an exploratory sample and a holdout sample. We illustrate the various processes using Wave 1 public use data from the National Longitudinal Study of Adolescent to Adult Health (Add Health).

262 ***Working in SGPLOT: Understanding the General Logic of Attributes***
Jim Blum and Jonathan Duggins
ODS Graphics use common style elements for distinct graphical entities—text, symbols, fills and lines—through attribute options. Most graphical entities produced, either by default or requested via a specific option, can have their styles modified with an ATTRS-type option. The syntax of such options is built to be consistent across instances of these graphical entities for most plotting statements that generate them. Knowing what graphical entities are generated by various statements and options, along with understanding how SAS categorizes graphical entities and their style elements, can help make style modification much easier to understand. Examples will focus on the commonalities present across a wide variety of plotting statements and options within them. Some non-standard style elements will be considered.

Jim Blum is a Professor of Statistics at the University of North Carolina Wilmington where he has developed original courses in SAS programming for the university over the past 15 years. These courses cover topics in base SAS, SAS/GRAPH—recently transitioned to template-based graphics, SAS/SQL, SAS/STAT, and macro language. Jim will be a primary instructor in UNC Wilmington's Data Science program debuting in fall 2017.

Life Sciences/Healthcare/Insurance

102 ***Patient-Level Longitudinal Analysis Plots Showing Adverse Event Timelines and Dose Titration Levels***
John R Gerlach and Keith Brown
The analyses in a clinical trial often include subject-specific longitudinal plots that depict, for example, a lab measurement taken at various times during a study period. Because the study involves dose titration levels, the plots might include vertical lines indicating dose levels, which can increase and decrease during the study period. Perhaps the analysis includes another component: the timelines of adverse events, if any. Both the vertical reference lines and horizontal time lines are superimposed on the longitudinal plot. Obviously, the task becomes more intricate since each plot is subject-specific, having different measurements, dose titration levels, and adverse events. This paper explains how to produce this intricate graphical analysis.

John has been using the SAS System for 30 years specializing in the pharmaceutical industry. John has developed numerous applications for clinical trials. Also, John has written 50 SAS papers including two award winning papers at SAS conferences. John holds a BA in Italian Literature, studies classical piano, and drinks Heineken.

123 ***Hardcoding In Clinical Trials: A (Sometimes) Necessary Evil***

Gregory Weller

Hardcoding is generally considered to be a dirty word in the clinical trials programming world, especially in statistical programming. However, sometimes it is the only way to accurately report data that is known to be incorrect.

This paper will explore two examples from clinical trials where it was determined hardcoding post database lock was necessary to fix incorrect raw data. Every step of the hardcoding process will be explained, including identification of the problem, figuring out the appropriate solution, and the documentation involved. This paper will also explore examples of programmers unintentionally hardcoding while trying to handle problematic raw data values. While unintentional hardcoding is not done with malice, it is nonetheless a serious problem because: 1) it bypasses the steps required to properly validate and approve hardcoding, and 2) the code resulting from an unintentional hardcoding is unlikely to be useful beyond the specific version of raw data it was created for.

Gregory is a Sr. Statistical Programmer at Rho with 8 years of experience in statistical programming.

199 ***SDTM - Just a Walk in the (Theme) Park: Exploring SDTM in the Most Magical Place on Earth***

Christine McNichol

Most in the pharmaceutical industry know the basic concepts of SDTM. Let us now infuse some magic and take a virtual vacation to look at SDTM from a perspective inspired by an exciting vacation. Some of the basic as well as more complicated aspects of SDTM can be shown in examples of things encountered during a day at a theme park in Central Florida. With a little imagination, our virtual vacation can be equated to a clinical trial. Come along as the vacationers (subjects) take part in a vacation (study) where they will experience various rides and attractions (treatments). The manner in which these experiences could be mapped to SDTM will be examined, from describing the plan of the virtual vacation in the TDM, through capturing the events of the day in SDTM domains. Within this trip, some more common but important domain examples such as DM, AE, DS, VS and more will be discussed.

Additionally, some more advanced concepts in SDTM in areas within the vacation example, such as the usage of EX vs EC, basic trial design strategies to use in TDM creation, EDC and external data to support core study data, as well as a few applicable device domains will be detailed.

These concepts will be examined in a new and creative way as SDTM with a magical twist is explored.

Christine McNichol is a Principal Statistical Programmer at Chiltern with a background in Mathematics and Information Science with more than 20 years in the pharmaceutical industry. Christine has been using CDISC standards since 2005 and is a volunteer on the CDISC ADaM team and integration sub-team as well as a contributor to Covance's internal CDISC advisory team.

220 *Dynamic Program Tracker*

Tanmay Khole and Saigovind Chenna

A program tracking document for statistical programming in clinical trial is an essential document which gives us the progress report of the project. Maintaining this document is one of the prime responsibilities of a statistical programmer. By making the tracking document dynamic, we can check the development and validation status of programs which will in turn save time in assessing the status of the study with respect to statistical programming deliverables. A document which can dynamically track the process and alert the user of any process deviations can prove very helpful in statistical programming for clinical trial projects. Dynamic Program Tracker also greatly reduces the time and effort required to check if all programs are following the Program Development Life Cycle, as well as check for any issues with programs.

This paper will describe the design, features and comprehensive checks done by Dynamic Program Tracker. The code for Dynamic Program Tracker is developed in Microsoft VBA (Visual Basic for Applications) which is available within all Microsoft Office products - with no additional costs for new software. The purpose of this tracker is to check compliance and serve as a project management tool.

Tanmay Khole is currently working at Merck & Co. as a Senior Scientist, Statistical Programming. He has MS in Pharmacy Administration from University of the Sciences and MS in Statistics from Temple University.

245 *Predictive Modeling for Healthcare Professionals: The use of time-series analysis for health-related data and the application of ARIMA modeling techniques in SAS for Public Health Practice*

Camillia Comeaux

The use of time-series analysis in public health practice is an under-utilized tool that can aid in effective activities such as: program and health planning; appropriate health service and provider delivery; improved emergency preparedness action; and much more.

The ARIMA technique is a type of trend recognition tool in time-series analysis, that can sort through large amounts of data and create a statistical model for forecasting. Time-series models, such as ARIMA, were historically used in financial industries to assess risks and market changes overtime to predict future economic outcomes. The ARIMA technique is a process in which the stages of model identification, parameter estimation, and diagnostic checking are repeated to find the most appropriate fitting model for prediction (Chen, 2008). This modeling technique is operational when data is assumed to have stationarity, or without a trend, and uses longitudinal data with at least forty-five data points to increase the accuracy of forecasting (Chen, 2008).

Engle (2001) suggests that the utility of modeling techniques in time-series analysis, is their ability to factor in major shocks and volatility shifts over time; therefore, in the public health field, the social, the economic, and the ecological factors correlated to these shocks over time can be analyzed for health outcome forecasting and future population health planning.

This product gives a generalized overview of time-series analysis and its application to public health practice. Using the SAS statistical package, health professionals will be empowered to use time-series analysis, specifically ARIMA modeling techniques, to analyze and interpret large health data sets to predict or forecast factors that impact health outcomes on populations.

Camillia R. Comeaux hails from Kansas City, Missouri. She earned a Bachelor of Science degree in Biology and graduate certificate in Public Health from the University of Missouri-Columbia in May 2009 and May 2010 respectively. She then matriculated through the Masters of Science in Public Health Program at Meharry Medical College from 2010-2012. Also, Camillia participated as the second cohort of the Robert Wood Johnson Foundation Center for Health Policy at Meharry Medical College scholar. Presently, Camillia is a second-year Doctor of Public Health (DrPH) student at Florida A&M University. Her concentration is in behavioral sciences and health education. Camillia's interests include behavioral oncology in minority populations, and health care provider practices in cancer prevention and control.

Camillia has attended and presented at several past conferences and school-sponsored events. She is currently serving as a graduate researcher on a collaboration grant with Florida A&M University and the Florida Department of Health.

Furthermore, she is a proud member of the American Public Health Association and a Florida A&M University CREATE Fellow. Ms. Comeaux plans to continue addressing the needs of disadvantaged communities through program development, health education, the evaluation of healthcare delivery for impoverished and under-served populations.

269 ***Utilization of SAS® Input Statements for the Barell Injury Diagnosis Matrix to Categorize Senior Sports Injury by Body Region and Nature of Injury***

Kassandra McGlonn

The Barell Injury Diagnosis Matrix is used by a wide variety of health practitioners and researchers worldwide to identify, analyze, and communicate injury information. In this paper, we will present a thorough investigation of Florida statewide emergency department (ED) data for senior sports injuries using SAS® input statements that categorized injuries by body region and nature of injury per the Barell Injury Diagnosis Matrix for ICD-9-CM codes. This paper will detail practical use, benefits, limitations, and ease of use for Barell Matrix SAS® input statements.

287 ***Analyzing Hospital Medicare Cost Report Data Using SAS***

Kimberly Andrews

Medicare-certified institutional health care providers are required to submit annual cost reports, which are maintained by the Centers for Medicare and Medicaid Services (CMS) in the Healthcare Cost Reporting Information System (HCRIS). Medicare Cost Reports (MCR) contain provider information such as facility characteristics, utilization data, total and Medicare costs, inpatient and outpatient charges, Medicare payment data, and financial statement data. HCRIS includes the following subsystems: Hospital, Skilled Nursing Facility (SNF), Home Health Agency (HHA), End-Stage Renal Disease (ESRD) Facility, Hospice, Community Mental Health Center (CMHC), and Rural Health Clinic (RHC)/Federally Qualified Health Center (FQHC). Our discussion focuses on the MCR for Hospitals (the most complex of the cost reports) explaining how to access the SAS files; describing the characteristics of the data, and providing basic SAS program code which can be used to analyze the data.

290 ***SAS/STAT® 14.3 Round-Up: Modern Methods for the Modern Statistician***

Maura Stokes

The latest release of SAS/STAT® software has something for everyone. The new CAUSALMED procedure performs causal mediation analysis for observational data, enabling you to obtain unbiased estimates of the direct causal effect. You can now fit the compartment models of pharmacokinetic analysis with the NLMIXED and MCMC procedures. In addition, variance estimation by the bootstrap method is available in the survey data analysis procedures, and the PHREG procedure provides cause-specific proportional hazards analysis for competing-risk data. Several other procedures have been enhanced as well. Learn about the latest methods available in SAS/STAT software that can modernize your statistical practice.

Maura E. Stokes is a Senior R&D Director at SAS Institute. She received her DrPH in biostatistics from the University of North Carolina at Chapel Hill and has taught and written about categorical data analysis for over twenty-five years. She is a Fellow of the American Statistical Association.

Planning/Administration

101 ***What's the Difference? – Comparing SAS® Artifacts After a Migration or Upgrade***

Brian Varney

There are times when it is convenient to be able to compare two file system areas that are supposed to be equivalent. This could be during a migration activity involving changing servers and/or SAS® versions. This paper intends to cover techniques that can help facilitate the comparison of programs, logs, excel files, and SAS data sets as well as techniques for digesting the results.

Brian Varney has been a SAS consultant, trainer, and senior technical Manager for over 28 years with the Experis Business Intelligence & Analytics Group, a SAS Consulting Gold Alliance Member. Located in Kalamazoo, Michigan, he keeps busy with providing SAS training, consulting support and business development (plus a few hours a week for soccer & rugby).

162 ***Learnin' about Churnin'***

Victoria Garcia

What is churn? According to sources it's; "The percentage of customers who cut ties with your company". Churn rate tell a story. If you listen, you'll learn a lot more about your customers and company than you think. In this presentation, we will be taking a look at our agencies churn rate; how we got it, what we learned from it, and what we are doing to improve it. For this presentation, we will be working data from the Florida Fish and Wildlife Conservation Commission.

Although a presenter at the 2018 SAS Global Forum, Victoria Garcia is new to the field of data analytics. She is currently a full time student attending school to obtain her bachelors in Data Science and Analytics as well as being a full time employee at the Florida Fish and Wildlife Conservation Commission.

169 ***Get Smart! Eliminate Kaos and Stay in Control – Creating a Complex Directory Structure with the DLCREATEDIR Statement, SAS® Macro Language, and Control Tables***

Louise Hadden

An organized directory structure is an essential cornerstone of data analytic development. Those programmers who are involved in repetitive processing of any sort control their software and data quality with directory structures that can be easily replicated for different time periods, different drug trials, etc. Practitioners (including the author) often use folder and subfolder templates or shells to create identical complex folder structures for new date spans of data or projects, or use manual processing or external code submitted from within a SAS® process to run a series of MKDIR and CHDIR commands from a command prompt to create logical folders. Desired changes have to be made manually, offering opportunities for human error. Since the advent of the DLCREATEDIR system option in SAS version 9.3, practitioners can create single folders if they do not exist from within a SAS process. Troy Hughesi describes a process using SAS macro language, the DLCREATEDIR option, and control tables to facilitate and document the logical folder creation process. This paper describes a technique wrapping another layer of macro processing which isolates and expands the recursive logical folder assignment process to create a complex, hierarchical folder structure used by the author for a project requiring monthly data intake, processing, quality control and delivery of thousands of files. Analysis of the prior month's folder structure to inform development of control tables and build executable code is discussed.

Louise Hadden has been using, and loving, SAS since the days of punch cards and computers the size of a not so tiny house. She spends most of her time in support of health policy analytics at Abt Associates Inc., and loves a good SAS reporting challenge. She is also the girl with the SAS tattoo!

200 ***Are You Ready for It? Preparing for Your Next Technical Interview***

Christine McNichol

Whether you are interviewing for a position as an intern, programmer, statistician, standards expert, or technical manager, you are likely to come across… the technical interview.

Even if you have experience and know how to do your job inside and out, do you really need to spend time preparing for an interview? Yes!

Though you may feel it is just going to be questions about what you do every day, there are some points about preparation and presentation that should be considered. Whether you are about to graduate college and go on your first interview, or you have not interviewed since before smart phones, or even if you interview every few years, it does not hurt to be a little bit more prepared for an interview that may determine how and where you spend your days Monday through Friday.

We will cover topics and considerations from preparing for an interview through participating in and following up after a technical interview. Though each interviewer will have different styles, preferences and opinions, we will cover topics that will get you in the interview mindset and get you thinking about ways to present yourself and your skillset to an interviewer.

Christine McNichol is a Principal Statistical Programmer at Chiltern with a background in Mathematics and Information Science with more than 20 years in the pharmaceutical industry and 15 years of management and interviewing experience. Christine has been using CDISC standards since 2005 and is a volunteer on the CDISC ADaM team and is a contributor to Covance's internal CDISC advisory team.

203 *So You Want To Be An Independent Consultant*

Josh Horstman

While many statisticians and programmers are content with a traditional employment setting, others yearn for the freedom and flexibility that come with being an independent consultant. While this can be a tremendous benefit, there are many details to consider. This paper will provide an overview of consulting as a statistician or programmer. We'll discuss the advantages and disadvantages of consulting, getting started, finding work, operating your business, and various legal, financial, and logistical issues.

Josh Horstman is an independent statistical programming consultant and trainer based in Indianapolis with 20 years' experience using SAS in the life sciences industry. He specializes in analyzing clinical trial data, and his clients have included major pharmaceutical corporations, biotech companies, and research organizations. Josh is a SAS Certified Advanced Programmer who loves coding as well as talking about coding at SAS Global Forum and other SAS User Group meetings.

207 *Planning for Migration from SAS® 9.4 to SAS® Viya®*

Spencer Hayes, Michael Shealy, Rebecca Hayes and Don B. Hayes

SAS® Viya® is the new Analytics architecture based on the Cloud Analytic Services (CAS) In-Memory Engine delivered by the SAS Institute Inc. SAS Viya brings a change in the fundamental methodology of installing SAS by moving away from SAS Software Depots and towards industry-standard software deployment methods. This paper will compare and contrast SAS 9.4 with SAS Viya in several key areas for Administrators including Pre-Install Requirements, Installation processes, Administration tools and methods, and data source connectivity including library definitions. The paper will also discuss Upgrade and Migration Planning.

226 *Accredited, Bona Fide, Certified, Diploma'ed, and Edumacated: The ABCDEs of Automating the Validation and Monitoring of Professional Requirements for Employees and Job Candidates Through Dynamic, Data*

Troy Hughes

Job postings typically have stated requirements such as education, training, certifications, and other criteria. Some requirements must be met before a candidate is hired while others can be fulfilled after employment during a "grace period" of a specified duration. Because many certifications require periodic refresh or renewal, validation of professional requirements often continues after candidates are hired and throughout their careers. While validation and monitoring professional requirements for a small team might be accomplished in minutes, the effort increases with the number of employees, the diversity of employee roles, and the diversity of requirements that must be tracked. This text demonstrates a flexible, scalable, reusable macro (COMPLIANCE) that validates and monitors education, training, and professional certifications for job candidates or employees. The data-driven SAS® solution relies on an external data model (operationalized in an Excel spreadsheet) that specifies the requirements, desired achievements, and applicable grace periods. This software modularity—the separation of the data model from the underlying SAS software—ensures that the solution can be adapted to any industry, environment, or organization by modifying only the spreadsheet. COMPLIANCE creates dynamic, color-coded HTML reports that delineate personnel who meet requirements, who are within a grace period, who do not currently meet requirements but have met requirements in the past, and who have never met requirements, enabling immediate visual identification of top performers or non-compliant employees.

Troy has been a SAS practitioner for over 15 years, has managed SAS projects in support of federal, state, and local government initiatives, and is a SAS Certified Base, Advanced, and Clinical Trials Programmer. He is the author of the 2016 John Wiley and Sons groundbreaking book: SAS Data Analytic Development: Dimensions of Software Quality. He is a frequent presenter at SAS Global Forum, SAS Analytics Experience, WUSS, MWSUG, SCSUG, SESUG, and PharmaSUG.

Troy has an MBA is information systems management and additional certifications, including: Project Management Professional (PMP), Risk Management Professional (PMI-RMP), Professional in Business Analysis (PMI-PBA), Agile Certified Professional (PMI-ACP), Certified Information Systems Security Professional (CISSP), Certified Secure Software Lifecycle Professional (CSSLP), ITIL Foundation, Certified ScrumMaster (CSM), Certified Scrum Developer (CSD), Certified Scrum Product Owner (CSPO), and Certified Scrum Professional (CSP).

277 *How to HOW: Hands-on-Workshops Made Easy*

Chuck Kincaid

Have you ever attended a Hands-on-Workshop and found it useful? Many people do! Being able to actually try out the things that you're learning is a wonderful way to learn. It's also a great way to teach. You can see if they people can apply what they're learning.

Have you ever thought that it would be fun to teach other people in a hands on format? Maybe you weren't sure what it takes or how to approach the course. This presentation will help you with those questions and struggles. What to teach? How much to teach? How should I teach it? How is a Hands-on-Workshop different than lecture style? How much to put into PowerPoints? What if they ask me something I don't know? What if they have a computer problem?

All those questions that you have will be answered in this presentation.

Chuck is a Principal Data Scientist at Experis with the Business Intelligence and Analytics Practice. His Computer Science and Statistics degrees are from Kansas State University and PhD work in Statistics at the University of Florida.
Previously, he was the Senior Engagement Director for the Business Intelligence and Analytics Practice. Since 2002 he managed an eclectic analytics team in their Kalamazoo Center of Excellence, providing BI and Analytics services to almost every industry since the early 90's. Chuck often speaks at events like this one, including the International Workshop on "Advanced Analytics and Data Science" in Warsaw, Poland, as well as giving the keynote presentations for SESUG 2014 and 2016. All were awesome experiences for which he is humbly grateful.
His interests are in analytics talent, data science, analytics infrastructure, education and visualization.

292 *Comparing SAS® Viya® and SAS® 9.4 Capabilities: A Tale of Two SAS Platform Engines*

Amy Peters

SAS(r) Viya(r) extends the SAS(r) Platform in a number of ways and has opened the door for new SAS(r) software to take advantage of its capabilities. SAS(r) 9.4 continues to be a foundational component of the SAS Platform, not only providing the backbone for a product suite that has matured over the last forty years, but also delivering direct interoperability with the next generation analytics engine of SAS Viya. Learn about the core capabilities shared between SAS Viya and SAS 9.4, and about where they are unique. See how the capabilities complement each other in a common environment, and understand when it makes sense to choose between the two and when it makes sense to go with both. In addition to these core capabilities, see how the various SAS software product lines stack up in both, including analytics, visualization, and data management. Some products, like SAS(r) Visual Analytics, have one version aligned with SAS Viya and a different version with SAS 9.4. Other products, like SAS(r) Econometrics, leverage the in-memory, distributed processing of SAS Viya, while at the same time including SAS 9.4 functionality like Base SAS(r) and SAS/ETS(r) software. Still other products target one engine or the other. Learn which products are available on each, and see functional comparisons between the two. In general, gain a better understanding of the similarities and differences between these two engines behind the SAS Platform, and the ways in which products leverage them.

Hired as a SAS instructor in 1987, Amy Peters taught classes and developed courses before taking responsibility for course development and then managing SAS Education's Customer Service Department. She's now in product management at SAS, responsible for SAS programmer enablement which includes SAS Studio, SAS Enterprise Guide, and the SAS University Edition.

293 ***Achieving Your Cloud-First Mandate with SAS®***
Amy Peters
Public cloud offers organizations of all shapes and sizes the opportunity for cost reduction and flexibility, ubiquitous access, and ease of maintenance. This session highlights the SAS strategy for cloud-first initiatives. We also cover common patterns and best practices for organizations seeking to pursue their own cloud-first mandates, including transitioning existing workloads to public cloud infrastructure and highlighting the possibilities for building entirely new, cloud-based workloads.

Hired as a SAS instructor in 1987, Amy Peters taught classes and developed courses before taking responsibility for course development and then managing SAS Education's Customer Service Department. She's now in product management at SAS, responsible for SAS programmer enablement which includes SAS Studio, SAS Enterprise Guide, and the SAS University Edition.

299 ***Panel Discussion: Building Your Data Professional Career***
Kirk Paul Lafler, Shane Rosanbalm, Stephanie Thompson, Spencer Hayes and Richann Watson
This session features a moderator and panelists that are experienced industry leaders. We will discuss how to build your data career and answer questions about what moves careers forward and what causes them to stall out, should you try an independent path, and what to focus on at different parts of your career.

300 ***Panel Discussion: Building An Organization's Analytics Maturity Roadmap***
Chuck Kincaid, Louise Hadden, Amy Peters and Richann Watson
This session features a moderator and panelists that are leaders in companies implementing and executing on an analytics maturity roadmap. We will discuss how organizations build their analytics maturity roadmaps with respect to technology, process, culture, governance, and hiring & training

Reporting/Visualization/JMP

103 *Interrelationship Digraphs and Sociograms Using SAS®*

Melvin Alexander

This presentation is about two important visualizations: one used in quality management and planning (MP), the other for studying patterns of interactions between people in groups. The two tools are the Interrelationship Digraphs and Sociograms.

The Interrelationship Digraph (ID) or Relations Diagram is designed to clarify intertwined, causal relationships among a group of items, issues, problems, or opportunities. This tool helps analysts gain insights into potential complex relationships of root causes that may underlie recurring problems despite efforts to resolve them.

The Sociogram is a graphic representation of the connections or links that a person has with other persons in a social network. Sociograms are useful in analyzing interrelationships between people such as: determining which individuals direct most of their comments to others or the group, who interrupts others, which person is the center of attention, how members of the group are connected, and other observable, interpersonal relationships.

IDs and Sociograms are specialized applications of Graph Theory, and Social Network Analysis where connections and interactions between objects and systems are made.

My plan is to give some background about IDs; describe how to construct sociograms and the two standard forms of IDs using base SAS®, SAS/IML®, the %DS2CONST macro; and conclude with final notes and thoughts.

Melvin Alexander is an Operations Research Analyst with the Social Security Administration (SSA). He uses SAS® analytics to ensure proper payments go to eligible beneficiaries and project future workforce staffing needs of SSA's field offices.
He has presented numerous papers at JMP® and SAS® Users Group meetings and conferences. He co-chairs the Mid-Atlantic JMP® Users Group (MAJUG) and the Statistics/Data Analysis Section of SESUG 2018. He has used SAS since 1976.

104 *Does Anybody Really Know What Time It Is? Mapping Time Zones with SAS*

Barbara Okerson

In today's workplace, project teams are often virtual and spread across the country (or even the world). It is never a pleasant surprise to receive a meeting invitation two hours outside one's working hours. When planning for meetings and events, it is important for the organizers to know where and in what time zone the attendees are located. Along with many other mapping tools, SAS provides time zone information by zip code that can be used to map time zones and identify time for employee locations. This presentation will provide several examples of mapping time zones in SAS.

Barbara B. Okerson, Ph.D. has worked in healthcare analytics for over 20 years and has been a SAS user for over 25 years. She has served in leadership roles at SESUG and other professional and area SAS user groups. She is a SAS Certified Professional, a Certified Professional in Healthcare Quality, and a Fellow, Academy for Healthcare Management.

126 *Create Cupid Arrow into Two Love Hearts Image Using SAS PROC TEMPLATE --- For the Valentine's Day*

Kaiqing Fan

Each year, for all of our SAS programmers, we may be struggling on how to make our girlfriends happy. Buy a luxurious gift? Or give them a special gift? I would like to suggest to create something special to show our true heart and at the same time, show them our power on technical skills and intelligence.
Here is a good engine that using SAS skills to create a Cupid Arrow into Two Love Heart. This is a very special gift. You can also use it to create a single love heart with arrow.
Key words: SAS Enterprise Guide, PROC TEMPLATE, SERIESPLOT STATEMENT, Cupid Arrow with love hearts, Valentine 's Day

I am a Sr. SAS Tech Lead, Sr. Data Scientist, Sr. SAS Developer Lead with 10 year experience in software programming, 3 year in statistical Analysis and developing SAS engines; 2 years' experience as Tech Lead. Expert in fitting predictive models by statistical analysis, predictive modeling, machine learning using SAS, R, UNIX/LINX and Python; Professional in handling big data, massive large data files, optimization of software engines, automation execution of software engines, hugely cutting of software engines' execution times. I got my 3 Master degrees of Statistics, Applied Mathematics and History from University of Wyoming, University of New Orleans, and East China Normal University.

129 *How to Assembly Line Create Graphic Images Using PROC TEMPLATE in SAS Enterprise Guide? Part I*

Kaiqing Fan

In banking industry, all the variables, their values and requirements are keeping changing. As a SAS developer, we may be asked to create thousands or hundreds composite or single graphic images such as scatterplot, seriesplot, stepplot, vectorplot, barchart, linechart, piechart, waterfallchart, boxplot, densityplot, histogram, loessplot, Pbsplineplot, regressionplot using pipeline operation method through SAS graphic engines. To reach this purpose, it is impossible to manually modify many parameters or engines codes for each graphic image. Any manual interventions may cause horrible disasters or mass with the requirement of creating hundreds or thousands graphic images. Then question is coming: how to assembly line create composite or single graphic images using PROC TEMPLATE is the topic now. To reach this target, we need to automatically generate all or most parameters and cover expected changes if possible.

I am a Sr. SAS Tech Lead, Sr. Data Scientist, Sr. SAS Developer Lead with 10 year experience in software programming, 3 year in statistical Analysis and developing SAS engines; 2 years' experience as Tech Lead. Expert in fitting predictive models by statistical analysis, predictive modeling, machine learning using SAS, R, UNIX/LINX and Python; Professional in handling big data, massive large data files, optimization of software engines, automation execution of software engines, hugely cutting of software engines' execution times. I got my 3 Master degrees of Statistics, Applied Mathematics and History from University of Wyoming, University of New Orleans, and East China Normal University.

156 ***Backsplash patterns for your world: A look at SAS OpenStreetMap (OSM) tile servers***

Barbara Okerson

Originally limited to SAS Visual Analytics, SAS now provides the ability to create background maps with street and other detail information in SAS/GRAPH® using open source map data from OpenStreetMap (OSM). OSM provides this information using background tile sets available from various tile servers, many available at no cost. This paper provides a step-by-step guide for using the SAS OSM Annotate Generator (the SAS tool that allows use of OSM data in SAS). Examples include the default OpenStreetMap tile server for streets and landmarks, as well as how to use other free tile sets that provide backgrounds ranging from terrain mapping to bicycle path mapping. Dare County, North Carolina is used as the base geographic area for this presentation.

Barbara B. Okerson, Ph.D. has worked in healthcare analytics for over 20 years and has been a SAS user for over 25 years. She has served in leadership roles at SESUG and other professional and area SAS user groups. She is a SAS Certified Professional, a Certified Professional in Healthcare Quality, and a Fellow, Academy for Healthcare Management.

172 ***Wow! You Did That Map With SAS®?! Round II***

Louise Hadden

This paper explores the creation of complex maps with SAS® software, incorporating the wide range of possibilities provided by SAS/GRAPH and polygon plots in the SG procedures, as well as replays, overlays in both SAS/GRAPH and SG procedures, and annotations including Zip Code level processing. The more recent GfK maps now provided by SAS that underlie newer SAS products such as Visual Analytics as well as traditional SAS products will be discussed. The pre-production SGMAP procedure released with Version 9.4 Maintenance release 5 will be introduced and some exciting examples displayed.

Louise Hadden has been using and loving SAS since the days of punch cards and computers the size of a tiny house. She spends most of her time in support of health policy analytics at Abt Associates Inc. and loves a good SAS reporting challenge. She is an ardent life long learner and reads voraciously, loves photography and volunteers at the MSPCA Boston Adoption Center walking, training and photographing dogs.

180 ***Using PROC TABULATE and ODS Style Options to Make Really Great Tables***
Wendi Wright

We start with an introduction to PROC TABULATE, looking at the basic syntax, and then building on this syntax by using examples. Examples will show how to produce one-, two-, and three-dimensional tables using the TABLE statement. More examples cover how to choose statistics for the table, labeling variables and statistics, how to add totals and subtotals, working with percents and missing data, and how to clean up the table using options. A look at the three ways you can use the PRELOADFMT option is also covered. Next the ways to use the ODS STYLE= option in PROC TABULATE are covered. This option helps to customize the tables and improve their attractiveness. This option is very versatile and, depending on where the option is used, can justify cells or row and column headings, change colors for both the foreground and background of the table, modify lines and borders, controlling cell width, add a flyover text box in ODS HTML, or add GIF figures to the row or column headings.

Wendi Wright has extensive experience in writing custom analysis and reporting programs in the educational testing industry. She has worked at several educational testing companies, and is currently at Questar Assessment.

191 ***A Macro for Creating Time Trend Plots with Four Y Axes***
Dennis Beal

Time trend plots are used often in statistical analysis to see how variables change over time. SAS® can easily produce time trend plots with one or two Y axes, but displaying more than two Y axes can be challenging. If there are three or more Y variables with very different scales that are to be compared together across time on the same graph, placing these Y variables simultaneously on a two-dimensional graph can be done. This paper shows SAS code in a macro that uses annotation with PROC GPLOT to produce time trend graphs with four Y axes. This paper is for intermediate SAS users of Base SAS® and SAS/GRAPH.

The presenter is a senior statistician and risk scientist at Leidos in Oak Ridge, Tennessee. He supports a wide variety of projects for the U.S. Department of Energy, primarily in environmental cleanup of legacy wastes in Oak Ridge. He earned his Ph.D. in management science with a dissertation on statistical applications at the University of Tennessee in Knoxville. He also is an adjunct professor of statistics for several universities in the Knoxville area. He has used SAS for 29 years and has presented papers at SESUG every year since 2004.

214 ***Five Crazy Good Visualizations and How to Plot Them***
David Mintz

We all have our favorite visualizations. The best ones deliver a clear message to the intended audience. Over the years, there are a few that have won my affection. I would like to share my top five with you, along with the code and a few anecdotes about why they make the list. Some of these examples are static; others are interactive. This paper will cover SAS/GRAPH® and ODS Graphics procedures. It will also touch on a few basic elements of good graphical design.

David Mintz is a senior statistician at the U.S. Environmental Protection Agency. He manages EPA's AirData website, which uses SAS to query, process, and report outdoor air quality data. He has been a SAS user for more than 25 years.

225 ***The Doctor Ordered a Prescription…Not a Description: Driving Dynamic Data Governance Through Prescriptive Data Dictionaries That Automate Quality Control and Exception Reporting***

Troy Hughes

Data quality is a critical component of data governance and describes the accuracy, validity, completeness, and consistency of data. Data accuracy can be difficult to assess, as it requires a comparison of data to the real-world constructs being abstracted. But other characteristics of data quality can be readily assessed when provided a clear expectation of data elements, records, fields, tables, and their respective relationships. Data dictionaries represent a common method to enumerate these expectations and help answer the question What should my data look like? Too often, however, data dictionaries are conceptualized as static artifacts that only describe data. This text introduces dynamic data dictionaries that instead prescribe business rules against which SAS® data sets are automatically assessed, and from which dynamic, data-driven, color-coded exception reports are automatically generated. Dynamic data dictionaries—operationalized within Excel workbooks—allow data stewards to set and modify data standards without having to alter the underlying software that interprets and applies business rules. Moreover, this modularity—the extraction of the data model and business rules from the underlying code—flexibly facilitates reuse of this SAS macro-based solution to support endless data quality objectives.

Troy has been a SAS practitioner for over 15 years, has managed SAS projects in support of federal, state, and local government initiatives, and is a SAS Certified Base, Advanced, and Clinical Trials Programmer. He is the author of the 2016 John Wiley and Sons groundbreaking book: SAS Data Analytic Development: Dimensions of Software Quality. He is a frequent presenter at SAS Global Forum, SAS Analytics Experience, WUSS, MWSUG, SCSUG, SESUG, and PharmaSUG. Troy has an MBA is information systems management and additional certifications, including: Project Management Professional (PMP), Risk Management Professional (PMI-RMP), Professional in Business Analysis (PMI-PBA), Agile Certified Professional (PMI-ACP), Certified Information Systems Security Professional (CISSP), Certified Secure Software Lifecycle Professional (CSSLP), ITIL Foundation, Certified ScrumMaster (CSM), Certified Scrum Developer (CSD), Certified Scrum Product Owner (CSPO), and Certified Scrum Professional (CSP).

271 ***CONSORT Diagrams with SG Procedures: Adding Efficiencies***

Shane Rosanbalm

The PharmaSUG 2018 paper "CONSORT Diagrams with SG Procedures" was a major step forward in simplifying the process of creating CONSORT diagrams in SAS. The SGPLOT-based approach superseded the previous RTF approach, which was adequate but tedious and quirky. Unfortunately, the SGPLOT approach requires the user to specify a lot of metadata. In order to create a diagram with 15 rectangles the user has to specify 404 numeric values over 223 lines of code. In this paper we explore options for reducing this specification burden. The proposed modifications result in the specification of 142 numeric values over 123 line of code.

Shane Rosanbalm is a Senior Biostatistician at Rho. He became a SAS user while studying biostatistics at the University of North Carolina at Chapel Hill in a time before there were hybrid cars, GPS, or texting.

279 ***Active Students Filing an Intent to Graduate at the University of Central Florida (UCF)***

Carlos Piemonti

SAS® software is about improving ourselves as SAS developers, and as a consequence, is about always improving user experience. At Institutional Knowledge Management (IKM), official source of UCF institutional data, we strive in providing accurate, insightful, and actionable information, timely, to the university and the public. This paper will present you with a project converted from SAS® Enterprise Guide® to SAS® Stored Processes allowing users to select specific criteria via cascading prompts. These SAS Stored Processes are available through our SAS® Information Delivery Portal, providing a daily snapshot of the data on demand, instead of manually generating these reports involving many steps in the process. Challenges regarding the application of the new source of data being used are briefly addressed.

Carlos joined Institutional Research as Coordinator of Statistical Research to support the data needs of Student Development and Enrollment Services (SDES) in Spring 2011.

In Fall 2013, Institutional Knowledge Management (IKM) brought him onboard. Carlos uses SAS® in his daily responsibilities as a Decision Support Developer at UCF. He has used SAS for over 7 years.

286 ***Graph Visualization for PROC OPTGRAPH***

Andrew Henshaw, Lauren Staples and Dr. Joe DeMaio

PROC OPTGRAPH is an extensive set of tools for graph and network analysis, but the lack of visualization capability is limiting. We've developed a simple, yet powerful, online visualization that can be directly accessed using the SAS macro language. Our tool creates and renders various graph layouts using a tightly-linked external website and the Graphviz programming toolkit.

The external web service is programmed in Python and is easily integrated into an existing capability. A macro wrapper around PROC HTTP is used to push the output of the PROC OPTGRAPH procedure to the visualization web service. Node and edge-specific attributes (such as edge weight or node color) may be directly manipulated using added table columns. Whenever new data is pushed, the graph layout and the visualization are both updated automatically.

294 ***Tips and Techniques for Designing the Perfect Layout with SAS® Visual Analytics***

Ryan Norris

Do you want to create better reports but find it challenging to design the best layout to get your idea across to your consumers? Building the perfect layout does not have to be a rocky experience. SAS(r) Visual Analytics provides a rich set of containers, layout types, size enhancements, and options that enable you to quickly and easily build beautiful reports. Furthermore, you can design reports that work across different device sizes or that are specific to a particular device size. This presentation explores how to use the layout system, describes the feedback you will encounter, and finally demonstrates building several sample reports.

Ryan currently manages a team of SAS Visual Analytics client developers. He has served various roles in management and development at SAS throughout his 21 year career including working on multiple report authoring clients.

295 *Insights from a SAS Technical Support Guy: A Deep Dive into the SAS® ODS Excel Destination*

Chevell Parker

SAS is a world leader in the area of data analytics, while Microsoft Excel, with over 30 million active users, is a leader when it comes to spreadsheet packages. Excel spreadsheets are heavily used for calculations, information organization, statistical analysis, and graphics. SAS(r) can leverage the power of its world-class analytics and reporting capabilities to produce stylistic and highly functional Excel spreadsheets by using the Output Delivery System (ODS) Excel destination. This paper, relevant to anyone who uses Microsoft Excel, offers insights into the depths of the ODS Excel destination by illustrating how you can customize styles in Microsoft Excel worksheets and discusses common layout and reporting questions (including limitations). In addition, the discussion covers useful applications for automating and executing Excel worksheets. After diving deep into this discussion about the ODS Excel destination, you should understand the behavior and capabilities of the destination so that you can create aesthetic and effective Excel worksheets.

Chevell is a member of the Foundation SAS team in Technical Support. His main areas of support include The Output Delivery System and XML Technologies. Chevell joined SAS in 1993.

296 *Transformation of Patient Reported Outcome Survey Reponses Made Simple with JMP*

Mira Shapiro and Lorraine Johnson

JMP has a robust set of functions that facilitate data cleaning and transformation. This discussion will focus on use of the MATCH function to transform survey responses for use in subgroup analysis. Using data from the MyLymeData patient registry, JMP will be used to create a Likert Scale from patient survey responses and create visual representations of patient subgroups.

302 *Panel Discussion: Plotting in SAS - How to Pick the Best Method*

Barbara Okerson, Nat Wooding Wendi Wright, Jim Blum, and Mira Shapiro

Panel discussion on the ways to plot in SAS - GPLOT, SGPLOT, DSGI, JMP etc with panelists that regularly use one of the methods - sort of a back and forth debate with audience participation.

Barbara B. Okerson, Ph.D. has worked in healthcare analytics for over 20 years and has been a SAS user for over 25 years. She has served in leadership roles at SESUG and other professional and area SAS user groups. She is a SAS Certified Professional, a Certified Professional in Healthcare Quality, and a Fellow, Academy for Healthcare Management.

303 *Great Time to Learn GTL: a Step by Step Approach at Creating the Impossible*

RichAnn Watson

ODS Graphics, produced by SAS® procedures, are the backbone of the Graph Template Language (GTL). Procedures such as the Statistical Graphics (SG) procedures rely on pre-defined templates built with GTL. GTL generates graphs using a template definition that provides extensive control over output formats and appearance. Would you like to learn how to build your own template and make customized graphs and how to create that one highly desired unique graph that at first glance seems impossible? Then it's a Great Time to Learn GTL! This paper guides you through the GTL fundamentals while walking you through creating a graph that at first glance appears too complex but is truly simple once you understand how to build your own template.

Richann Watson is an independent statistical programmer and CDISC consultant. She has been using SAS since 1996. She is also a member of the CDISC ADaM team and various sub-teams. In addition, she is the chairperson for the local SAS user group in her area and is actively involved with SAS Global Forum, PharmaSUG, MWSUG and other SAS User Groups.

304 *A Map is Just a Graph Without Axes*

Nat Wooding

SAS' ® PROC GMAP can produce a variety of maps of varying complexity but to go beyond the basic capabilities of GMAP, it is necessary to use the ANNOTATE Facility in order to add additional information such as symbols in specific places. Furthermore, there are times that the desired map is simply a sketch of geographically related measurements that need to be displayed in a simulated, not to scale, map. A map is simply a collection of coordinates that are plotted but for which no X/Y axis system is typically shown (although items such as road atlases or military maps or charts may have a grid and axes to help locate specific points of reference). By remembering this, one can sometimes create an embellished map using PROC GPLOT without having to create an ANNOTATE data set. Furthermore, by using GPLOT with the axes, one can locate invalid map coordinates in user created map files. Finally, an example of creating a plotted outline map with dots showing environmental variables using ANNOTATE and PROC GPLOT is offered. ANNOTATE is used in the latter case since it was necessary to dynamically scale the dots that represent the location and magnitude of the plotted values.

Nat Wooding is a semiretired electric utility biologist who has embarked on a second career counting students at a community college. He has been using SAS since around 1972

Statistics/Data Analysis

119 *Using the R interface in SAS ® to Call R Functions and Transfer Data*

Bruce Gilsen

Starting in SAS ® 9.3, the R interface allows SAS users on Windows and Linux who license SAS/IML ® software to call R functions and transfer data between SAS and R from within SAS.

Potential users include both SAS/IML users and all other SAS users, who can use PROC IML just as a wrapper to transfer data between SAS and R and call R functions.

This paper provides a basic introduction and some simple examples. The focus is on SAS users who are not PROC IML users but wish to take advantage of the R interface.

Bruce Gilsen has worked at the Federal Reserve Board for over 35 years. He spends most of his time as an in-house SAS consultant. His Bruce Force fantasy baseball team will be battling for its 6th league title in 31 years in 2018.

128 *An Easy Way to Know When to Buy and When to Sell your Stocks Using SAS*

Kaiqing Fan

In the stock markets, we can find thousands of stocks. How to make extra money from the stock market is always an attractive topic for everyone.

We know that to make money, the best way is always to buy low and sell high. The question is how we could decide what is the appropriately low prices and high prices of the stocks? Here I have two simple ways. 1) Use the average price of each stock based on its historical price data which we can find online, then we can decide the low and high prices based on each user's appetite; 2) using the normal distribution them to decide the up 75% and low 25% of the prices, users can adjust the % too based on their appetites. Many people must have many questions about this methods. But if you are interested in, please join my presentations, I believe I could answer all or most of your questions.

I am a Sr. SAS Tech Lead, Sr. Data Scientist, Sr. SAS Developer Lead with 10 year experience in software programming, 3 year in statistical Analysis and developing SAS engines; 2 years' experience as Tech Lead. Expert in fitting predictive models by statistical analysis, predictive modeling, machine learning using SAS, R, UNIX/LINX and Python; Professional in handling big data, massive large data files, optimization of software engines, automation execution of software engines, hugely cutting of software engines' execution times. I got my 3 Master degrees of Statistics, Applied Mathematics and History from University of Wyoming, University of New Orleans, and East China Normal University.

133 *Forecasting: Something Old, Something New*

Dave Dickey

ARIMA (AutoRegressive Integrated Moving Average) models for data taken over time were popularized in the 1970s by Box and Jenkins in their famous book. SASTM software procedures PROC ESM (Exponential Smoothing Models) and PROC UCM (Unobserved Components Models which are a simple subset of statespace models – see PROC SSM) have become available much more recently than PROC ARIMA. Not surprisingly, since ARIMA models are universal approximators for most reasonable time series, the models fit by these newer procedures are very closely related to ARIMA models. In this talk, some of these relationships are shown and several examples of the techniques are given. At the end, the listener will find that there is something quite familiar about these seemingly new innovations in forecasting and will have more insights into how these methods work in practice. The talk is meant to introduce the topics to anyone with some basic knowledge of ARIMA models and the examples should be of interest to anyone planning to analyze data taken over time.

David Dickey is William Neal Reynolds Professor of Statistics, NC State University where he has been since 1976. He is a SAS books by users author, a contract instructor for SAS and a Fellow of the American Statistical Association. His research papers on time series have been cited over 50,000 times in the scientific literature according to Google Scholar. He is best known for the Dickey-Fuller test that appears in most time series packages including SAS PROC ARIMA. The third edition of SAS for Forecasting Time Series, by Brocklebank, Dickey and Choi, was released earlier in 2018.

134 *A Case Study of Mining Social Media Data for Disaster Relief: Hurricane Irma*

Bogdan Gadidov and Linh Le

In the wake of two recent hurricanes, Harvey and Irma, local, state, and federal governments are trying to provide relief to the millions of affected people. With projected property damage in the hundreds of billions of dollars, these recent natural disasters will have long-lasting effects on their respective areas where recovery could take years. This paper aims to use social media data, specifically Twitter, to analyze how people in the affected areas reacted to these natural disasters in the days leading up to the storm, during the storm, and after the storm. The goal is to see if there are any trends detected in the responses of affected citizens which can be used to help relief efforts in future natural disasters. For the most recent hurricane, Irma, we collected tweets in South Florida and analyze the discussed topics among civilians. Data was collected from Thursday (9/7/2017) to Wednesday (9/13/2017) (with the hurricane making landfall on Sunday morning). We use SAS® Enterprise Miner™ for the analysis of the tweets. Techniques such as stemming and lemmatization of words are used in the pre-processing of the text data. Topic modeling, text clustering, and time series are combined to better understand peoples' reactions throughout a storm event. This analysis is performed at the hourly level.

136 *Regression Models for Count Data*

Jason Brinkley

Outcomes in the form of counts are becoming an increasingly popular metric in a wide variety of fields. For example, studying the number of hospital, emergency room, or in-patient doctor's office visits has been a major focal point for many recent health studies. Many investigators want to know the impact of many different variables on these counts and help describe ways in which interventions or therapies might bring those numbers down. Traditional least squares regression was the primary mechanism for studying this type of data for decades. However, alternative methods were developed some time ago that are far superior for dealing with this type of data. The focus of this talk is to illustrate how count regression models can outperform traditional methods while utilizing the data in a more appropriate manner. Most of the first half of this presentation will focus on Poisson Regression techniques but some time will be devoted to using Negative Binomial Regression when the data are overdispersed and using Zero-Inflated techniques for data with many more zeroes than is expected under traditional count regression models. Time will be spent applying such models to example data so that the participant can see when and how to utilize these methods. A strong grasp of traditional linear regression methods is suggested.

Jason Brinkley was the 2016 Academic Chair for SESUG in Cary, NC. He holds a PhD in Statistics and has been an avid SAS user for 15 years. He's been to every SESUG event for the past decade and has a great love for this community. His areas of expertise are biostatistics, statistical software, and rural health data. He has four kids and no pets.

149 *Advanced Project Management beyond Microsoft Project, Using PROC CPM, PROC GANTT, and Advanced Graphics*

Stephen Sloan and Lindsey Puryear

The Challenge: Instead of managing a single project, we had to craft a solution that would manage hundreds of higher- and lower-priority projects, taking place in different locations and different parts of a large organization, all competing for common pools of resources.

Our Solution: Develop a Project Optimizer tool using the CPM procedure to schedule the projects, and using the GANTT procedure to display the resulting schedule. The Project Optimizer harnesses the power of the delay analysis feature of PROC CPM and its coordination with PROC GANTT to resolve resource conflicts, improve throughput, clearly illustrate results and improvements, and more efficiently take advantage of available people and equipment.

Stephen Sloan has worked at Accenture in the Services , Consulting, and Digital groups and is currently a senior manager in the SAS Analytics area. He has worked in a variety of functional areas in Project Management, Data Management, and Statistical Analysis. He has had the good fortune to have worked with many talented people at SAS Institute.

Stephen has a B.A. in Mathematics from Brandeis University, M.S. degrees in Mathematics and Computer Science from Northern Illinois University, and an MBA from Stern Business School at New York University.

Lindsey Puryear has worked for SAS Institute for fourteen years as an Operations Research Specialist. He has a B.S. and M.A. in Mathematics from Wake Forest University. He earned the Ph.D. in Operations Research at the University of North Carolina at Chapel Hill, with generous support from IBM Corp.

228 *Fight Human Trafficking with Text Analytics*

Stuti Mehrotra and Miriam McGaugh

Human trafficking is an international challenge and it affects every country. The United Nations defines it as the recruitment, transportation, transfer, harboring, or receipt of persons by improper means (such as force, abduction, fraud, or coercion) for an improper purpose including forced labor or sexual exploitation. It is a grave violation of human rights. The problem has escalated as human traffickers have now tapped into the power of online advertising. Online advertising is cost effective and has an exhaustive reach which allows human traffickers to operate on a global level and reach their targeted customers. Hundreds of online ads are posted on websites like Backpage.com where sex traffickers advertise their services.

In an attempt to tackle the problem this paper uses the power of text analytics to build a robust model for identification and categorization of potential human and sex trafficking ads. The ads were scraped from Backpage.com. They were categorized by human volunteers and SAS Text Miner. The categorization by volunteers was then used to validate the output from SAS Text Miner. While Backpage.com was closed down by the federal government, identification of online ads will help in identifying other malicious websites that promote such ads. Making it riskier for traffickers to reach their customers using online advertising thus affecting their demands.

Stuti has 3 years of experience working as a business intelligence developer. She is currently pursuing her masters degree from Oklahoma State University in Business Analytics. She has been using SAS for over a year now.

234 *Data Driven Approach in the NBA Pace and Space Era*

Tom Ferrara

Whether you're an NBA executive or Fantasy Basketball owner or a casual fan, you can't help but begin the conversation of who is a top tier player? Currently who are the best players in the NBA? How do you compare a nuts and glue defensive player to a high volume scorer? The answer to all these questions lies within segmenting basketball performance data.

A k-means cluster is a common used guided machine learning approach to grouping data. I will apply this method to human performance. This case study will focus on NBA basketball individual performance data. The goal at the end of this case study will be to apply a k-means cluster to identify similar players to use in team construction.

SAS Procedures utilized in this approach are proc standard, proc fastclus, proc gplot and proc anova.

Tom Ferrara is a Manager of Decision Sciences at Kobie Marketing where he has been since 2014. Tom uses SAS to provide actionable recommendations by means of customer/contact segmentation strategies, acquisition, retention modeling, and analyzing marketing program effectiveness. He has used SAS for more than 5 years.

247 ***Logistic and Linear Regression Assumptions: Violation Recognition and Control***
Deanna Schreiber-Gregory and Karlen Bader

Regression analyses are one of the first steps (aside from data cleaning, preparation, and descriptive analyses) in any analytic plan, regardless of plan complexity. Therefore, it is worth acknowledging that the choice and implementation of the wrong type of regression model, or the violation of its assumptions, can have detrimental effects to the results and future directions of any analysis. Considering this, it is important to understand the assumptions of these models and be aware of the processes that can be utilized to test whether these assumptions are being violated. Given that logistic and linear regression techniques are two of the most popular types of regression models utilized today, these are the are the ones that will be covered in this paper. Some Logistic regression assumptions that will reviewed include: dependent variable structure, observation independence, absence of multicollinearity, linearity of independent variables and log odds, and large sample size. For Linear regression, the assumptions that will be reviewed include: linearity, multivariate normality, absence of multicollinearity and auto-correlation, homoscedasticity, and measurement level. This paper is intended for any level of SAS® user. This paper is also written to an audience with a background in theoretical and applied statistics, though the information within will be presented in such a way that any level of statistics/mathematical knowledge will be able to understand the content.

Deanna is a Data Analyst and Research Associate through the Henry M Jackson Foundation. She is currently contracted to USUHS and Walter Reed National Military Medical Center in Bethesda, MD. Deanna has an MS in Health and Life Science Analytics, a BS in Statistics, and a BS in Psychology. Deanna has presented as a contributed and invited speaker at over 40 local, regional, national, and global SAS user group conferences since 2011.

248 ***Regularization Techniques for Multicollinearity: Lasso, Ridge, and Elastic Nets***
Deanna Schreiber-Gregory and Karlen Bader

Multicollinearity can be briefly described as the phenomenon in which two or more identified predictor variables are linearly related, or codependent. The presence of this phenomenon can have a negative impact on an analysis as a whole and can severely limit the conclusions of a research study. In this paper, we will briefly review how to detect multicollinearity, and once it is detected, which regularization techniques would be the most appropriate to combat it. The nuances and assumptions of R1 (Lasso), R2 (Ridge Regression), and Elastic Nets will be covered in order to provide adequate background for appropriate analytic implementation. This paper is intended for any level of SAS® user. This paper is also written to an audience with a background in theoretical and applied statistics, though the information within will be presented in such a way that any level of statistics/mathematical knowledge will be able to understand the content.

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249 *Worker safety in energy production in America: A comparative analysis of fuel sources and accompanying occupational risk*

Alyssa Venn and Joe DeMaio

The world runs on energy. From light bulbs to cell phones to cars, energy is essential. In our increasingly technology-based society, its importance too is increasing. As our reliance on energy increases, the need to find safe and sustainable energy production sources only becomes more urgent. In the United States as of 2016, coal energy makes up about 30% of electricity generated, while hydroelectric provides about 7%. In 2007, the rate of fatal injuries for coal miners was almost six times the rate of fatal injuries in private industry, and it seems that every time you check the news, there are stories detailing occupational hazards in the US energy industry. In 2006, an explosion trapped thirteen miners underground in West Virginia, killing all but one. It is not just coal mining that comes with occupational risk: hydroelectric power carries the risk of the dams collapsing, possibly leading to catastrophic flooding, injury and death. In 1976, the Teton Dam in Idaho collapsed, flooding the surrounding area and resulting in fourteen deaths.

This project gathers domestic data on injuries (fatal and non-fatal) from the U.S. Bureau of Labor Statistics' website, and data on energy produced from the U.S. Energy Information Administration. The goal of this project is to compare and contrast occupational risks (neither health nor environmental) in energy production fields through the years. We also standardize the data relative to total energy produced, number of worksites, catastrophic events vs. day-to-day hazards, etc. For example, coal provides more energy than hydroelectric, and so it is natural to expect more injuries from coal mining. However, when standardized by energy produced, hydroelectric power is occasionally more dangerous, as occurred in the United States in 2005 and 2006, aligning with the passing of the Energy Policy Act of 2005. Since the act provided tax benefits to entities that avoid greenhouse gasses, it is possible that there was a surge in activity in hydroelectric plants, leading to workers being put in more danger. This research will look for explanations to other spikes and dips in the danger of each field.

264 *Understanding Crime Pattern in United States by Time Series Analysis using SAS Tools*

Soumya Ranjan Kar Choudhury

Crime, be it property or violent, personal or public, has always been a social evil and a drawback to the inclusive development of the society. United States specifically has had a significant reduction in both property and violent crime over the past quarter century. Uniform Crime Reporting, an organization within the FBI, has a data repository constituting different kinds of crimes for 20 years spanning 1995 through 2014 at a state level, collected by several city agencies across the country. Using this dataset, it is possible to forecast crime levels using Time Series analysis in order to understand the severity and provide a ballpark for crimes in the upcoming 3 years (from 2015 to 2017). This forecast can then be compared with the actual crime numbers to realize the accuracy of the forecast. SAS Enterprise guide is used for running the basic forecasting model by state and crime type. SAS Studio and SAS 9.4 are then used to build moving average auto-regressive models by state and crime type. As an end result, all these models are all packaged into one macro in order to facilitate easy viewing of all the models at one place. Several SAS tools are leveraged all through the project to showcase how a combination of SAS products can help build better systems and analytics. This paper illustrates the simplicity of explaining time series forecasting in SAS tools and since UCR doesn't forecast crimes on its website, the above process can be used to provide an estimation for future crime rates in all states. This will help FBI understand the trend of various types of crimes in all the states and thus necessitate preventive measures in accordance with the insights.

276 *Efficient DATA Step Random Sampling Out Of Thin Air*

Paul Dorfman and Lessia Shajenko

Many ETL and data analysis tasks require to generate a random sample of unique K out of N available integers such that K<<N. While it can be done using the SURVEYSELECT procedure, it needs an input data set with N observations. Unfortunately, when N is large enough, it is not a practical option. For example, at N=1E14, merely looping from 1 to N would take close to six days. However, the required sample can be created in a DATA step "out of thin air" using algorithms that require looping only from 1 to K regardless of how large N is. Moreover, their bookkeeping memory storage can be kept strictly bounded by K. In this paper, we will discuss a number of such algorithms and their DATA step implementations based both on arrays and the SAS hash object.

Paul began using SAS to compute some stuff pre-1990 while pursuing a degree in Physics. He went on to use it as a principal doing-whatever-with-data tool in a number of industries, such as telops, credit card/banking, pharma, and health insurance. In 1998, he introduced hashing into SAS programming and implemented all classic hash algorithms based on SAS arrays. After the advent of the canned hash object, he was first to have begun using it as a DATA step programming tool, then started propagandizing it and wrote the first SUGI user paper on the subject. Paul invented a number of the hash object programming techniques likely unintended by the SAS R&D, such as "summary-less" aggregation, array sorting, dynamic data set splitting, and data portion disk off-loading to reduce hash memory footprint.

289 *A Flexible Approach to Computing Bayes Factors with PROC MCMC*

Tyler Hicks

Whereas the classical approach to hypothesis testing focuses on the p-value, the Bayesian approach to hypothesis testing instead focuses on the Bayes factor. The Bayes factor (BF) quantifies the extent to which the observed data support one hypothesis over another. In empirical science, analytic derivation of the BF is frequently not trivial. In the past, the difficulty of the BF computation made the relatively easy to compute p-value procedure made classical testing preferable to Bayesian testing. Today, the recent arrival of Markov Chain Monte Carlo (MCMC) simulation effectively solved the old computation problem. MCMC simulation will compute the BF with any meaningful prior distribution. Although non-MCMC approaches for computing the BF are also feasible, they are limited to default prior distributions. However, there are frequent occasions where testers may not want to use default prior distributions. That is, to perform the most meaningful test they may want to use a "customized" prior distribution instead of a default one. After providing a rationale for preferring the Bayesian approach to hypothesis testing, this paper describes the steps for computing the BF with MCMC methods, regardless of prior distribution. Although BF computation is not a default option in PROC MCMC, the flexibility of this SAS/STAT® procedure supplies users with the perfect tool to quickly compute the BF. Several examples with annotated PROC MCMC code in this paper illustrate the proposed approach.

Tyler Hicks, Ph.D., is currently a statistician in the Life Span Institute at the University of Kansas (KU). As a member of the Research Design and Analysis Unit, he assists scientists across KU implement modern analytical approaches in research. In 2015, Dr. Hicks earned his doctorate at the University of South Florida, with double concentrations in special education and Measurement/Evaluation. At its best, his work explores approaches that unify the research methods, methodology, and philosophy that undergird social science.

291 *Modeling Longitudinal Categorical Response Data*

Maura Stokes

Longitudinal data occur for responses that represent binary and multinomial outcomes as well as counts. These data are commonly correlated and often include missing values, so any analysis needs to take both of these factors into consideration. This tutorial focuses on using generalized estimating equations for analyzing longitudinal categorical response data, but it also discusses the generalized linear mixed models approach. Strategies such as weighted generalized estimating equations for managing missing data are also discussed, along with the assumptions for these methods. Techniques are illustrated with real-world applications using SAS procedures such as GENMOD, GLIMMIX, and the GEE procedure.

*Experience with logistic regression is required for this tutorial.

Maura E. Stokes is a Senior R&D Director at SAS Institute. She received her DrPH in biostatistics from the University of North Carolina at Chapel Hill and has taught and written about categorical data analysis for over twenty-five years. She is a Fellow of the American Statistical Association.

298 *Computing Predicted Values and Residuals from Data Sets Containing Classification Variables with Large Numbers of Levels*

Ramon Littell

Estimation of linear models frequently requires adjusting to remove bias from parameter estimates and extraneous variation from estimates of random variation. This is usually accomplished by including terms in the model that account for the bias and extraneous variation. Large data sets typically contain observations from multiple sources, such as different locations, time periods or product types. If one or more of the model variables is a CLASS variable, then the required computations might overwhelm memory capacity. The ABSORB statement can be used to solve the memory problem, but at the expense of losing ability to compute predicted values and certain other estimates. This paper demonstrates a computational method that can be carried out in data steps that accomplishes the same objectives as the ABSORB, but enables computation of predicted values. An illustrative data set contains prices of machine products that are sold to multitudes of customers. The data were collected to estimate the effects of product cost, demand and a possible change in economic environment on price, adjusted for customer effects.

Ramon Littell is Associate Analyst at Info Techech Inc, Gainesville. He is Professor Emeritus of Statistics at the University of Florida, and has used SAS since 1974. His primary interest is linear models, and has published several books on the subject at SAS Institute.

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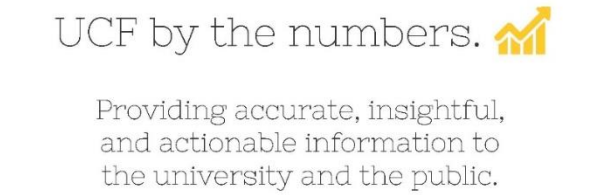

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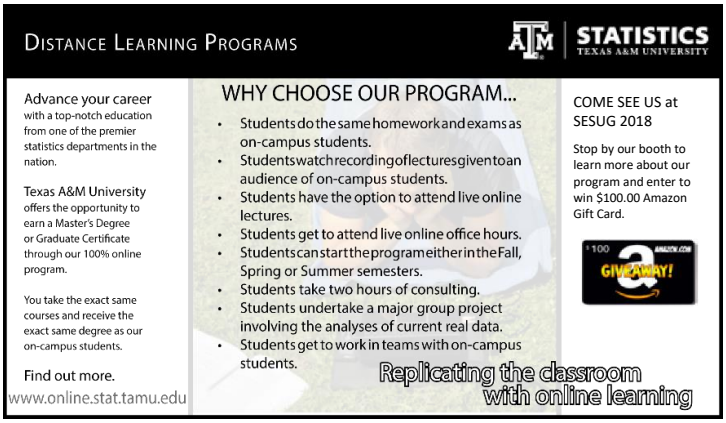
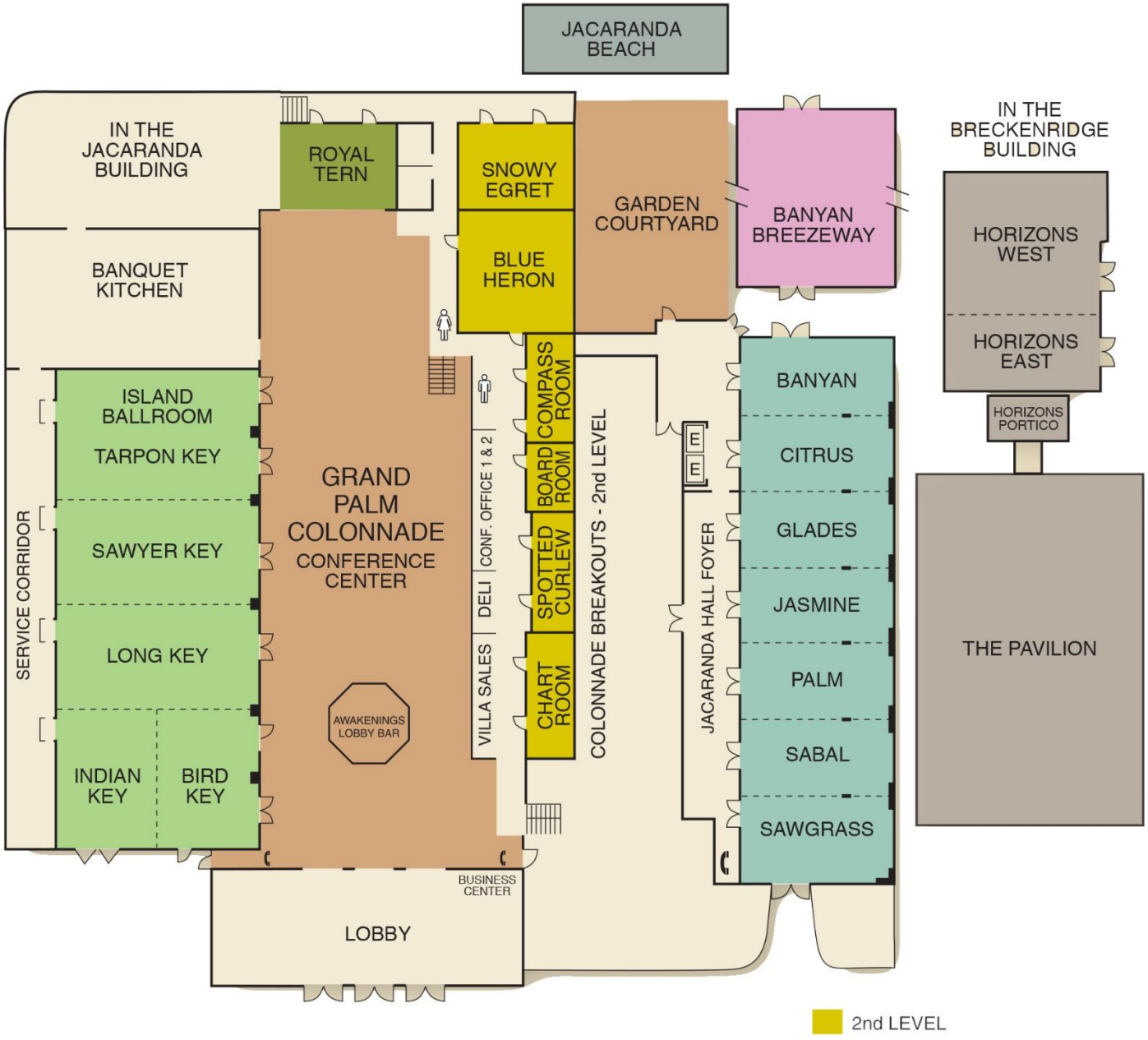


Hotel Map


GULF OF MEXICO
BEACH
W
S
N
E
Cabana Hut
South Beach Lawn
Jacaranda Beach
Flying Bridge
SeaBreeze Terrace
Conclave
Poinciana
Salty's Beach Bar
ADULT POOL
Breck Deck North
Bermudas
Beef 'O' Brady's
Pizza Hut Ice Cream
Body Works Salon
Breckenridge Bldg.
Horizons
West
East
Beakers Tropical Outfitters
Fitness Center
Portico
Allamanda Bldg.
Jacaranda Bldg.
Garden Courtyard
Banyan Breezeway
POOL & HOTTUB AREA
Hibiscus
Hibiscus
Pet Play Zone
Sharktooth Tavern
Parking
Palm Court
Island Ballroom
Grand Palm Colonnade CONFERENCE CENTER
Lobby
Jacaranda Hall
Paddleboat Landings
Pirate Island
POOL AREA
Activities
Tennis Courts
The Pavilion
Parking
South Parking
Cypress Villa
Parking
Admin Offices (5600)
North Parking
Magnolia Offices
Parking
HERTZ CAR RENTAL
GULF BLVD.
GUY HARVEY OUTPOST

Meeting room layout



Hear Ye! Hear Ye!

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All perfons having any CLAIMS on the prefentations of teckniques, cafe ftudies and examples of Statiftical Arithmetick are most humbly prefumed upon, by their good Nature, to bring fuch prefentations to His Majefty's CALL for PAPERS. Thefe prefentations will be a fhew of your fignal Proof of Kindnefs for your friends and numerous acquaintances, fuch as you defire.

Let us learn wifdom, and lay hold of the prefent opportunity

- Thomas Paine

But the benevolent mind of a virtuous man, if pleaf'd, when it if inform'd of good and generous actions, in what part of the world foever they are done.

- Poor Richard

His Majesty's Representatives

M[S] Rachel Straney
AcademicChair2019@sesug.org

Chuck Kincaid, Esq.
OperationsChair2019@sesug.org

WANTED,

A young MAN or LADY who can be well recommended and has been regularly brought up to refpect the SESUG Volunteers. She or He fhould have no objection to engaging in Section COORDINATOR activities, fupporting the REGISTRATION particulars, apprenticing as HAIR-DRESSER or WIG-MAKER, or engaging in our Refpected FIFE & DRUM Corps. Thefe volunteers will meet with good Encouragement from the Subfcriber.