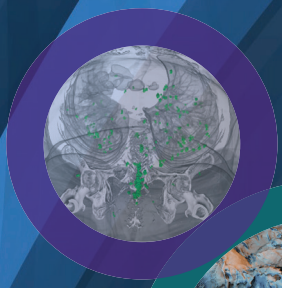
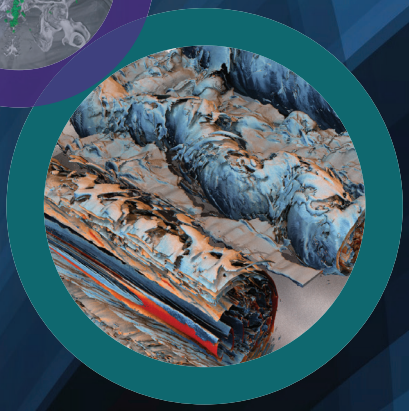
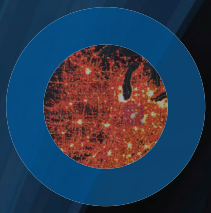


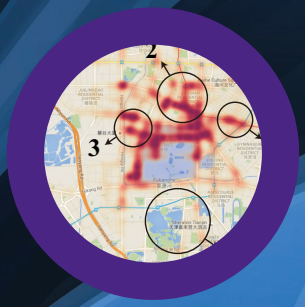


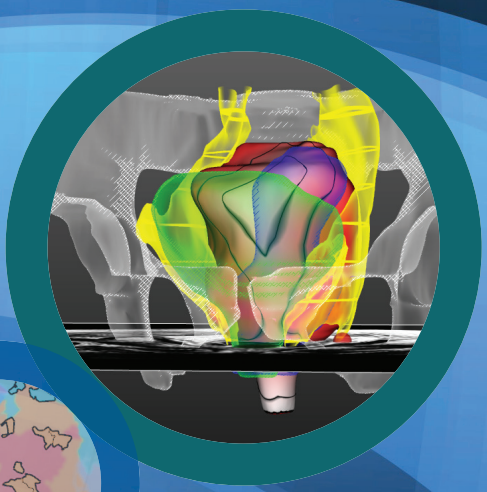
VAST • INFOVIS • SCIVIS

VIS 2016

23-28 OCTOBER 2016 • BALTIMORE, MARYLAND







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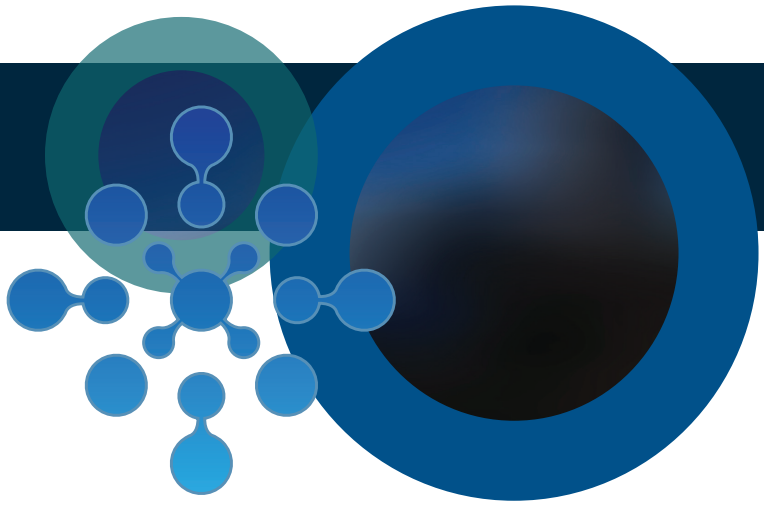

Welcome to IEEE VIS 2016!

After ten years, we are excited to be returning to Baltimore, Maryland. Known by locals as "Charm City", Baltimore has wonderful attractions as part of the Inner Harbor district near the conference hotel. Maryland is known for its creativity and energy. The state is home to some great universities and supports some of the most advanced medical research in the world. Maryland has other personality traits: for instance, the state sport is jousting. Try the local fare: craft beer and steamed spicy blue crabs.

The conference includes programs for students, academics, artists, industry and commercial practitioners, government researchers, and anyone with interests in visualization and data analytics. VIS2016 expects to draw over 1,000 participants from dozens of countries to a week of research presentations, tutorials, workshops, panels, demonstrations, posters, and exhibitions.

This year, we have extended our mission to better serve our community, developing new approaches to helping employers meet with hopeful job-seekers, adjusting our exhibition to include a week of job fair activities along with the traditional trade show. We have become excited as new supporters have joined the conference to share in the adjusted vision.

We invite you to participate in IEEE Visual Analytics Science and Technology (VAST), IEEE Information Visualization (InfoVis), IEEE Scientific Visualization (SciVis), and our art program, along with the thought-provoking array of workshops, symposia, panels, tutorials, and other events that share our week. We hope that you brought your imagination, your data, your problems, your solutions, your research, insights, experience, and enthusiasm. We have endeavored to create a week-long celebration where you can mingle and connect with one another, helping to accelerate discovery in our field.

Terry Yoo, *National Institutes of Health*
VIS 2016 General Chair

Baltimore

Hilton Baltimore Hotel holds a prime place in the Inner Harbor, next door to Camden Yards and across the street from M&T Stadium. Baltimore's Inner Harbor is a hub of activity. In just a few city blocks, you can unearth dinosaurs at the Maryland Science Center, get a history lesson at the Reginald F. Lewis Museum of Maryland African American History & Culture, pay respects to pop culture at Geppi's Entertainment Museum, or submerge yourself in exotic sealife at the National Aquarium. Other attractions include the American Visionary Art Museum, the Babe Ruth Museum, and the Port Discovery Children's Museum.

Baltimore's Inner Harbor has loads of restaurants, pubs, hotels and shops, many of them at the popular Harborplace shopping and entertainment center just steps from the Hilton. The Water Taxi at the Inner Harbor can also take you to surrounding neighborhoods, and the free Charm City Circulator provides daily bus service through several downtown routes.

From family-friendly museums and restaurants to satisfy every palate, to exciting nightlife, cultural experiences and spectacular people-watching, Baltimore's Inner Harbor offers more to see and do than you can imagine.

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IEEE Visualization and Graphics Technical Committee (VGTC)

For information on awards, national initiatives, conferences and symposia, and a comprehensive membership directory, please visit **http://vgtc.org/**.

HILTON BALTIMORE HOTEL

1 Conference Registration

Located on 2nd Fl, East Foyer
Saturday, 6:00–8:00 PM
Sunday & Tuesday, 7:00 AM–4:30 PM
Monday, Wednesday, Thursday, 7:30 AM–4:30 PM
Friday, 7:30–10:30 AM

2 Tutorials, Workshops, Meetups

Located on 1st Fl, Peale, Johnson, Latrobe, Ruth
Sunday–Monday, 8:30 AM–5:55 PM

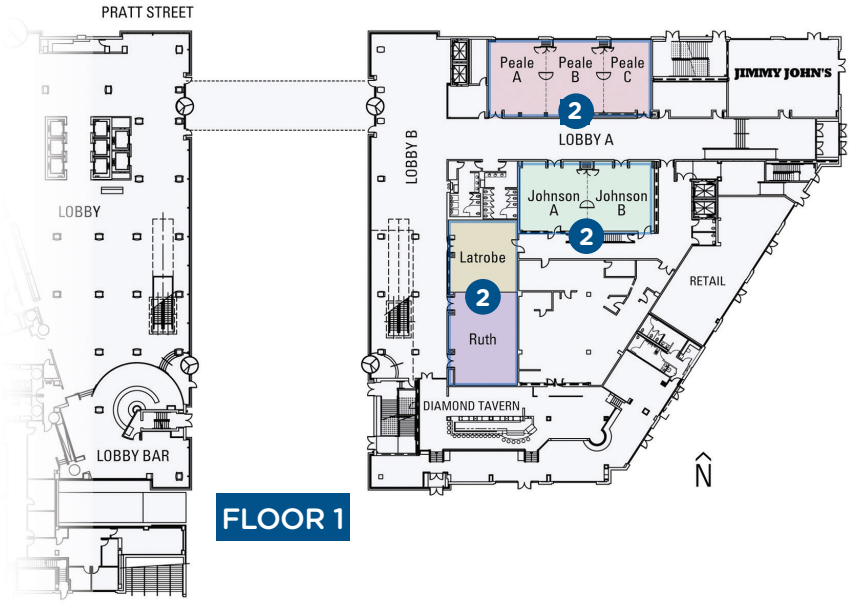
3 Conference Sessions

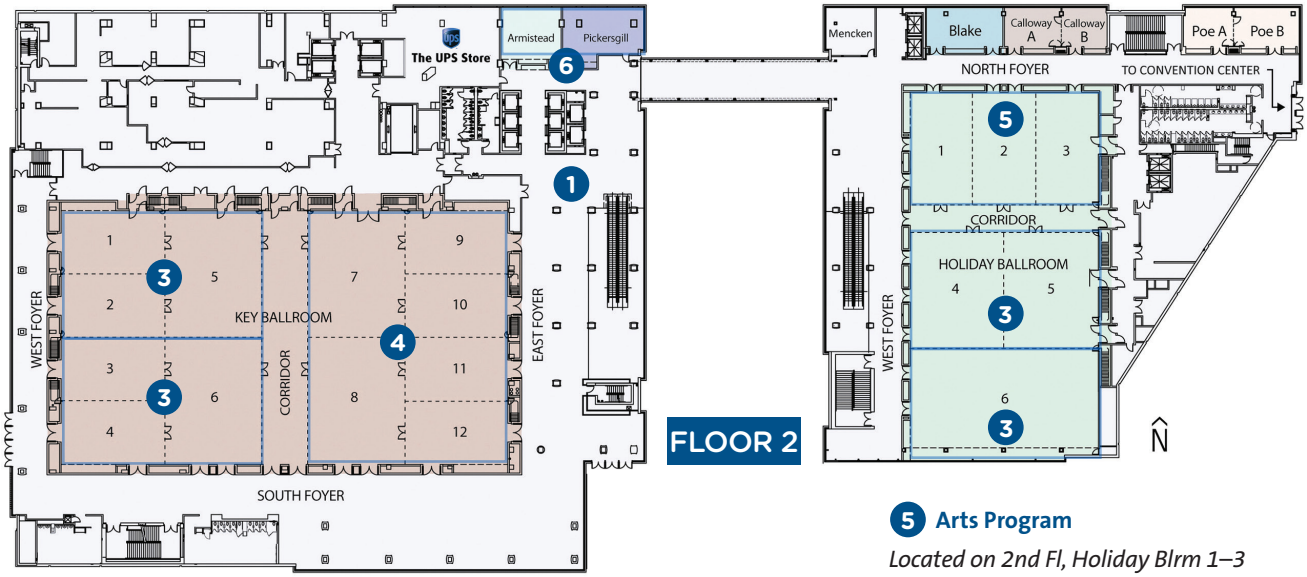
Located on 2nd Fl,
Key Blrm 1–6 & Holiday Blrm 4–6
Sunday–Thursday, 8:30 AM–5:55 PM
Friday, 8:30 AM–12:00 PM

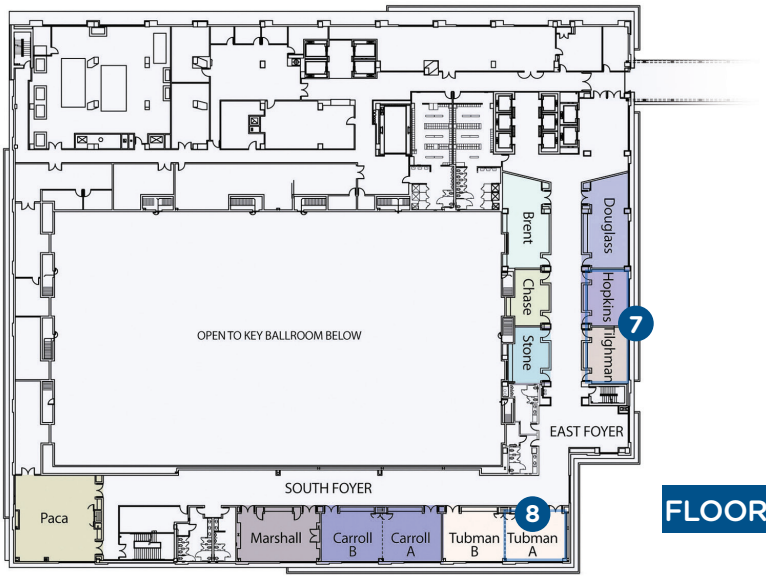
4 Posters and Exhibitions

Located on 2nd Fl, Key Blrm 7–12
Posters:
Sunday, Wednesday, 8:30 AM–9:00 PM
Monday, Tuesday, Thursday, 8:30 AM–5:55 PM

Exhibitions:
Tuesday, 10:00 AM–5:55 PM
Wednesday, Thursday, 8:30 AM–5:55 PM







5 Arts Program

Located on 2nd Fl, Holiday Blrm 1–3
Sunday–Thursday, 8:30 AM–5:55 PM
Tuesday, 8:30 AM–9:00 PM

6 Speaker Preparation

Located on 2nd Fl, Armistead and Pickersgill
Sunday–Thursday, 8:30 AM–5:55 PM
Friday, 8:30 AM–10:30 PM

7 Interview Rooms

Located on 3rd Fl, Hopkins and Tilghman
Saturday–Friday, Schedule at Registration Desk

8 Personal Consideration Room

Located on 3rd Fl, Tubman A
Saturday–Thursday, 8:30 AM–5:55 PM
Friday, 8:30 AM–12:00 PM

VIS KEYNOTE

Visualizing know how, technological diffusion and the wealth of nations

Ricardo Hausmann

Director at the Center for International Development & Professor of the Practice of Economic Development, Kennedy School of Government, Harvard University

Tuesday, 25 October, 2016, 8:30 AM – 9:30 AM @ *Key Ballroom*

Abstract

Recent theories of the wealth and poverty of nations put the accent on the accumulation of collective know how. The fundamental difference between rich and poor countries is not in the average level of individual skills of their citizens but in the kinds of things that can be done collectively. This creates an important visualization problem: how to measure and represent the differential levels of collective know how between countries and regions? How to visualize its evolution in time? How to identify more feasible and effective paths for progress? How can visualization help orient the efforts of the public and private sectors in enhancing progress?

Bio

Ricardo Hausmann is Director of Harvard's Center for International Development and Professor of the Practice of Economic Development at the Kennedy School of Government. Previously, he served as the first Chief Economist of the Inter-American Development Bank (1994-2000), where he created the Research Department.

He has served as Minister of Planning of Venezuela (1992-1993) and as a member of the Board of the Central Bank of Venezuela. He also served as Chair of the IMF-World Bank Development Committee. He was Professor of Economics at the Instituto de Estudios Superiores de Administracion (IESA) (1985-1991) in Caracas, where he founded the Center for Public Policy. His research interests include issues of growth, macroeconomic stability, international finance, and the social dimensions of development. He holds a PhD in economics from Cornell University.

VIS CAPSTONE

The three laws of communication

Jean-luc Doumont

Principiae

Friday, 28 October 2016, 10:30 AM – 11:30 AM @ *Key Ballroom*

Abstract

Useful as each of them can be, a large body of tips and tricks is impossible to remember, at least in a practical, usable way, unless it is structured into a balanced, meaningful hierarchy. This talk proposes and illustrates three simple yet solid ideas that lead to more effective communication and that underpin every other guideline: easy to remember, readily applicable, and always relevant—in short, valuable for the rest of your life.

Bio

An engineer (Louvain) and PhD in applied physics (Stanford), Jean-luc Doumont is acclaimed worldwide for his no-nonsense approach, his highly applicable, often life-changing recommendations on a wide range of topics, and *Trees, maps, and theorems*, his book about "effective communication for rational minds." For additional information, visit www.principiae.be.

2016 AT-A-GLANCE

SUNDAY, 23 OCTOBER

	Key 7–12	Holiday 1+2+3	Key 1+2+5	Key 3+4+6	Holiday 4+5	Peale A+B+C	Holiday 6	Johnson A+B	Ruth	Latrobe
8:30 AM	Posters	Art Program	BioVis: Biological Data Visualization	LDAV: Large Data Analysis and Visualization	Workshop: VAST Challenge	Workshop: Eye Tracking and Visualization (ETVIS)	Workshop: C4PGV: Creation, Curation, Critique & Conditioning of Principles & Guidelines in Vis	Tutorial: Information Theory in Visualization	Tutorial: Feature-Based Flow Vis and Analysis ✪	Workshop: LIVVIL: Logging Interactive Visualizations & Visualizing Interaction Logs
10:10 AM BREAK										
10:30 AM										
12:10 PM										
LUNCH										
2:00 PM							Tutorial: Visualization Analysis and Design ✪	Workshop: Innovations in the Pedagogy of Data Vis	Tutorial: Human Vision, Cognition and Visualization	Tutorial: Sketching Designs using the Five Sheets Methodology ✪
3:40 PM BREAK										
4:15 PM										
5:55 PM										
7:00 PM	VIS Opening Reception *@ Key Blrm 7-12 + South Foyer*									
9:00 PM										

MONDAY, 24 OCTOBER

	Key 7–12	Holiday 1+2+3	Holiday 4+5	Key 3+4+6	Key 1+2+5	Johnson A+B	Holiday 6	Peale A+B+C	Ruth	Latrobe
8:30 AM	Posters	Art Program	BELIV: BEyond time and errors: novel evaluation methods for information visualization	VDS: Visualization in Data Science	VizSec: Visualization for Cybersecurity	Workshop: Visualization for the Digital Humanities	Workshop: Discovery Jam	Tutorial: Visual Analytics for High-Dimensional Data ✪	Tutorial: Applying Color Theory to VIS ✪	Tutorial: User-Centred Evaluation in Visualization
10:10 AM BREAK										
10:30 AM										
12:10 PM										
LUNCH										
2:00 PM							Workshop: Visualization in Practice ✪	Workshop: The Event Event: Temporal & Sequential Event Analysis	Tutorial: Tensor Decomposition Methods	Tutorial: Considering Qualitative Evaluations
3:40 PM BREAK										
4:15 PM										
5:55 PM										
7:00 PM										
9:00 PM										

✪ *Recommended for Practitioners*

TUESDAY, 25 OCTOBER

	VAST *Holiday 4+5*	INFOVIS *Key 3+4+6*	SCIVIS *Key 1+2+5*	VIS *Holiday 6*	VIS
8:00 AM	VIS Welcome				
8:30 AM	VIS Keynote (8:30–9:30 AM) *@ Key 1+2+5 and Key 3+4+6*				Posters @ *Key 7–12*
	VIS Fast Forward (Tues) (9:30–10:10 AM)				Art Program @ *Holiday 1+2+3*
10:10 AM					Exhibits @ *Key 7–12*
	BREAK				
10:30 AM	VAST Intro + Traffic and Urban Planning	Infovis Intro + Interaction	SciVis Intro + Bio, Molecular and Shape Visual-ization		
12:10 PM	LUNCH				
2:00 PM	Explora-tory Analysis	Immersive Analytics	Design Studies and Evaluation	Panel: Transition-ing Research	
3:40 PM	BREAK				
4:15 PM	Machine Learning	Geo-visualiza-tion	Topology-based Techniques	Supporters Presenta-tions	
5:00 PM					
6:00 PM	Fast Forward (Wed) *@ Key 3+4+6*				
6:30 PM					
7:00 PM	VIS Arts Program Opening Event *@ Holiday 1+2+3*				
9:00 PM					

WEDNESDAY, 26 OCTOBER

	VAST *Holiday 4+5*	INFOVIS *Key 3+4+6*	SCIVIS *Key 1+2+5*	VIS *Holiday 6*	VIS
8:30 AM	Textual Data	Applica-tions	Ensembles, Multi-variate and Compar-ative	VISAP Session 1	Posters @ *Key 7–12*
					Art Program @ *Holiday 1+2+3*
					Exhibits @ *Key 7–12*
	BREAK				
10:30 AM	Managing Visual Analytics Process	Evaluation	Panel: On the Death of Scientific Visualiza-tion	(CG&A) Visualiza-tion Systems & Applica-tions	
12:10 PM	LUNCH				
2:00 PM	Biomedical Visualiza-tion	Graphs	SciVis Contest	Panel: How data vis and regulation meet on the mod-ern web	
3:40 PM	BREAK				
4:15 PM	Fast Forward (Thu & Fri) (4:15–4:45 PM) *@ Key 3+4+6*				
5:00 PM	Posters + Networking (5:00–7:00 PM) *@ Key Blrm 7–12*				
7:00 PM	VIS Banquet Supported by Tableau Software *@ Key Blrm 1–6*				
9:00 PM					

THURSDAY, 27 OCTOBER

VAST *Holiday 4+5*	INFOVIS *Key 3+4+6*	SCIVIS *Key 1+2+5*	VIS *Holiday 6*	VIS
Social Media Data and Events	Story-telling / Presenta-tion ✪	Rendering ✪	VISAP Session 2	Posters @ *Key 7–12*
BREAK				Art Program @ *Holiday 1+2+3*
Comple-menting Visual and Algorithmic Analysis	Panel: How can we improve empirical research on under-standing visual infor-mation?	Presenta-tion, Production, and Dissemin-ation	(CG&A) Applied Visualiza-tion Techniques ✪	Exhibits @ *Key 7–12*
LUNCH				
Visual Knowledge Discovery and Sense-Making ✪	Time Series	Panel: Application Papers: What are they and how should they be evaluated?	VAST: User Behaviors	
BREAK				
Education and Games	Scalable Algorithms	Vectors and Tensors	Panel: Pathways for Theoretical Advances in Visualiza-tion	

FRIDAY, 28 OCTOBER

VAST *Holiday 4+5*	INFOVIS *Key 3+4+6*	SCIVIS *Key 1+2+5*	VIS *Holiday 6*
Time Series Data	Visualiza-tion Education	Biomedical Visualiza-tion ✪	Panel: Critical Visualiza-tion
BREAK			

VIS Capstone
(10:30–11:30 AM)

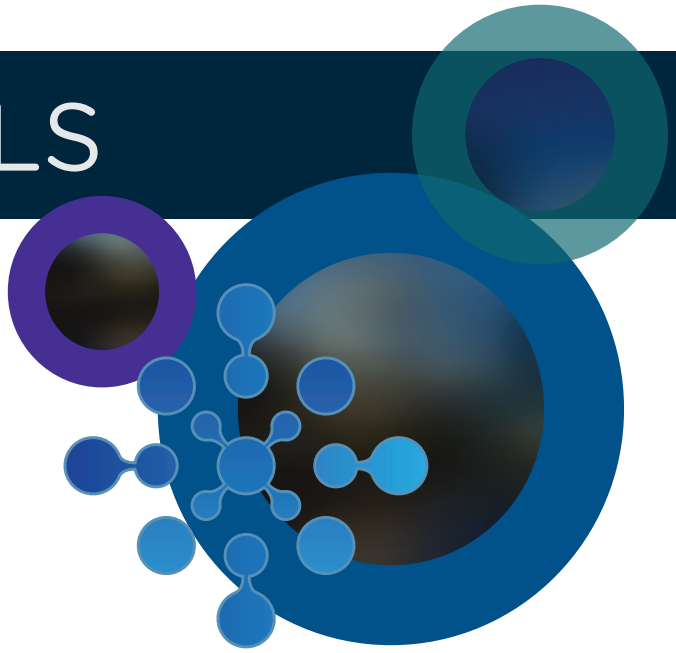
VIS Closing
(11:30 AM–12:00 PM)

@ Key 1+2+5 and Key 3+4+6

8:30 AM
10:10 AM
10:30 AM
12:10 PM
2:00 PM
3:40 PM
4:15 PM
5:55 PM

✪ *Recommended for Practitioners*

PROGRAM DETAILS



SUNDAY, 23 OCTOBER

Full Day

Holiday 4+5

VAST

VAST Challenge (8:30 AM–5:55 PM)

Contributors: Kristin Cook, Georges Grinstein, Mark Whiting

VAST Challenge 2016 posed realistic tasks in streaming visual analytics. Mini-Challenge 1 participants designed streaming data analysis tools for an operations center. Mini-Challenge 2 participants characterized patterns and anomalies in static building sensor data. Mini-Challenge 3 participants built streaming visual analytics solutions for building sensor data. These solutions are intended to help users rapidly orient to emerging events and reconsider past data as circumstances change. This workshop will include presentations from award winners and a streaming visual analytics design session. http://vacommunity.org/VAST+Challenge+2016.

Peale A+B+C

Workshop (8:30 AM–5:55 PM)

2nd Workshop on Eye Tracking and Visualization (ETVIS)

Contributors: Daniel Weiskopf, Michael Burch, Lewis Chuang, Andrew Duchowski

There is a growing interest in eye tracking as a research method in many communities because progress in hardware technology and the reduction of costs for eye tracking devices have made this analysis technique accessible to a large population of researchers. Nonetheless, standardized practices for technical implementations and data interpretation remain unresolved. With ETVIS, we intend to build a community of eye tracking researchers within the visualization community, covering information visualization, scientific visualization, and visual analytics. We also aim to establish connections to related fields, in particular, in human-computer interaction, cognitive science, and psychology.

Half Day

Holiday 6

Workshop (8:30 AM–12:10 PM)

Creation, Curation, Critique and Conditioning of Principles and Guidelines in Visualization (C4PGV)

Contributors: Rita Borgo, Nadia Boukhelifa, Kelly Gaither, Michael Sedlmair

C4PGV 2016 is a forum that provides an opportunity to discuss state-of-the-art and present novel contributions towards the development of a theoretical foundation for Visualization and Visual Analytics. There are three challenges that will be addressed in the workshop: (1) the lack of a centralized place for easy discovery of known or proposed principles and guidelines; (2) the lack of documentation about when and where a principle or guideline is applicable and when and where it is not, as well as examples for attesting either conditions; and (3) the lack of platforms (except formal publications) for supporting the evolution and improvement of principles and guidelines, and fostering early proposal of principles and guidelines.

Johnson A+B

Tutorial (8:30 AM–12:10 PM)

Information Theory in Visualization

Contributors: Min Chen, Mateu Sbert, Anton Bardera, Han-Wei Shen, Miquel Feixas, Ivan Viola

In this half-day tutorial (intermediate to advanced), we review a variety of applications of information theory in visualization. The holistic nature of information-theoretic reasoning has enabled many such applications, ranging from light placement to view selection, from feature highlighting to transfer function design, from data fusion to visual multiplexing, and so on. Perhaps a particularly exciting application is the potential for information theory to underpin the discipline of visualization, for example, mathematically confirming the benefit of visualization in data intelligence.

Ruth

Tutorial (8:30 AM–12:10 PM)

✪ **Recent Advancements of Feature-based Flow Visualization and Analysis**

Contributors: Jun Tao, Hanqi Guo, Bei Wang, Christoph Garth, Tino Weinkauf

Flow visualization has been a central topic in scientific visualization for many years with applications in scientific, engineering, medical researches. Contemporary numerical simulations produce large, time-varying and highly complex vector fields. Preserving the rich information in these and presenting concise visualizations for clarity are two desired, but often conflicting goals that need to be balanced. This requires a distinction of context and features, whose understanding and extraction is critical to obtain insight. In this tutorial, we review and discuss state-of-the-art techniques on different aspects of feature-based flow visualization and analysis: (a) interactive techniques for discovery; (b) spatio-temporal flow analysis; (c) feature extraction, tracking and simplification with robustness; d) parallel and in-situ techniques for large-scale time-varying data; and (f) theories and scalability issues in ensemble and uncertain flow.

✪ *Recommended for Practitioners*

Latrobe

Workshop (8:30 AM–12:10 PM)

LIVVIL: Logging Interactive Visualizations & Visualizing Interaction Logs

Contributors: Romain Vuillemot, Jeremy Boy, Aurélien Tabard, Charles Perin, Jean-Daniel Fekete

Logs recording and analysis is a very powerful mechanism to improve the usability of tools and enrich the user experience with history. This workshop aims at bringing the visualization community together to share their practice on all aspect of logging, ranging from reporting, analysis, to visualization and its underlying infrastructure. Expected benefits include raising awareness on the potentials of logging for visualization, providing shared tools and methods to instrument visualizations, show how logging can improve visualization and interaction techniques, and scale to large number of users and sessions.

Holiday 6

Tutorial (2:00–5:55 PM)

✪ Visualization Analysis and Design

Contributor: Tamara Munzner

This introductory tutorial will provide a broad foundation for thinking systematically about visualization systems, built around the idea that becoming familiar with analyzing existing systems is a good springboard for designing new ones. The major data types of concern in visual analytics, information visualization, and scientific visualization will all be covered: tables, networks, and sampled spatial data. This tutorial is focused on data and task abstractions, and the design choices for visual encoding and interaction; it will not cover algorithms. No background in computer science or visualization is assumed.

Johnson A+B

Workshop (2:00–5:55 PM)

Innovations in the Pedagogy of Data Visualization

Contributors: Eytan Adar, Sophie Engle, Marti Hearst, Alark Joshi, Daniel Keefe

The pedagogy of data visualization is becoming increasingly important as data visualization techniques and tools proliferate. In this workshop, we propose to create a community of practice that supports each other as they learn to be better teachers in their respective classrooms. Based on the well attended panels at IEEE Vis in 2010 and 2015, there is a strong interest in the data visualization community for exploring the pedagogy of data visualization. We propose the conduct a half-day interactive workshop that will include lightning talks followed by a discussion on strategies to further sustain the community of practice of data visualization educators.

Ruth

Tutorial (2:00–5:55 PM)

Human Vision, Cognition and Visualization

Contributor: Bernice E. Rogowitz

This course builds upon the foundation set by the IEEE Vis course "Human Vision and Cogniton for Emerging Technologyies," presented in 2012. The course involves a review of key principles outlined earlier, focusing on human spatial, luminance and color perception, interpreted for data visualization and visual analytics tasks, with many examples from real-world projects in a wide range of industries. The course includes many new topics, such as multisensory interactions, and provides fundamental insights into the design of experiments involving human observers

Latrobe

Tutorial (2:00–5:55 PM)

✪ Sketching Designs for Data-Visualization using the Five Design-Sheet Methodology

Contributors: Jonathan C. Roberts, Christopher Headleand, Panagiotis Ritsos

When developing visualization software, developers need to plan what they are going to build. They need to make plans of how the data can be visualized using a computer interface. Low fidelity methods, such as sketching, have been used before, however they are ad hoc. This tutorial leads the attendees through sketching designs, considering design alternatives using the Five Design-Sheet methodology.

BioVis

Key 1+2+5

8:30–8:35 AM

Opening

Chair: G.Elisabeta Marai

8:35–9:35 AM

Keynote

Speaker: Sheelagh Carpendale, *Computer Science Professor, University of Calgary, Canada*

Visualization: The power of alternate representations

To visualize data one of the first steps is to develop a visual representation. This representation is a result of a mapping by which the data can be specified. Much has been said of about the power of these visual representations. Simon (1981) said that solving a problem is simply a matter of representing so as to make the solution transparent – implying that finding the right representation solves the problem. Card et al. (1998) said that interactive visual representations can amplify our cognition – can in effect make us smarter. In spite of this, the small box in the visualization creation pipeline that signifies the development of the visual representation remains one of the least unpacked. Through examples from my own work and others', I will discuss the power and potential of alternate visual representations.

9:35–10:10 AM

Primer Session

Chair: Eamonn Maguire

Primer: Statistical dances: why no statistical analysis is reliable and what to do about it, Pierre Dragicevic, *Inria*

10:10–10:30 AM

Coffee Break

10:30 AM–12:10 PM

Papers Session: Abstract Data and Pathway Visualization

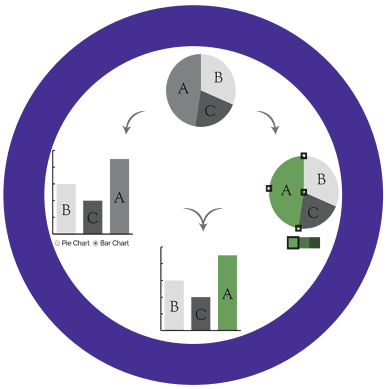
Chair: Michel Westenberg

Unboxing Cluster Heatmaps, Sophie Engle, Sean Whalen, Alark Joshi, Katherine Pollard

PRODIGEN: Visualizing the Probability Landscape of Stochastic Gene Regulatory Networks in State and Time Space, Chihua Ma, Timothy Luciani, Anna Terebus, Jie Liang, G.Elisabeta Marai

Generalized Box-Plot for Root Growth Ensembles, Viktor Vad, Douglas Cedrim,Wolfgang Busch, Peter Filzmoser, Ivan Viola

A Taxonomy of Visualization Tasks for the Analysis of Biological Pathway Data, Paul Murray, Fintan McGee, Angus Forbes



12:10–2:00 PM

Lunch Break

2:00–3:40 PM

Papers Session: Protein and Microscopy Data Visualization

Chair: Carsten Görg

Comparative Visualization of Protein Secondary Structures, Lucia Kocincova, Miroslava Jaresova, Jan Byska, Julius Parulek, Helwig Hauser, Barbora Kozlikova

Bio-physically Plausible Visualization of Highly Scattering Fluorescent Neocortical Models for in Silico Experimentation, Marwan Abdellah, Ahmet Bilgili, Stefan Eilemann, Julian Shillcock, Henry Markram, Felix Schürmann

Virtual Reality Assisted Microscopy Data Visualization and Colocalization Analysis, Rensu Theart, Ben Loos, Thomas Niesler

Interactive Exploration of Ligand Transportation through Protein Tunnels, Katarina Furmanova, Miroslava Jaresova, Jan Byska, Adam Jurcik, Julius Parulek, Helwig Hauser, Barbora Kozlikova

3:40–4:15 PM

Coffee Break

4:15–4:45 PM

Challenges Session

Chair: Eamonn Maguire

Challenge: An Introduction to Microbiome Data Visualization, Eric Franzosa, *Harvard School of Public Health*

4:45–5:15 PM

Design Contest Presentations

Chair: Eamonn Maguire

5:15–5:25 PM

Poster Fast Forward

Chair: Michel Westenberg

5:25–5:35 PM

BioVis Data Contest: DREAM Challenge

Speaker: Raghu Machiraju

5:35–5:55 PM

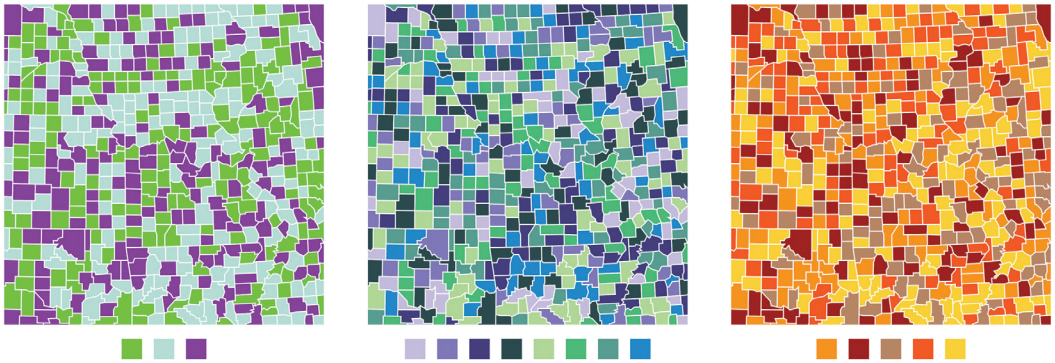
Awards & Closing

Chair: Jan Aerts

7:00–9:00 PM

Key Blrm 7-12 + South Foyer

Poster Reception @ VIS Opening Reception



LDAV

Key 3+4+6

8:30–8:55 AM

Opening & Fast Forward

8:55–10:10 AM

Papers Session: InfoVis and Visual Analytics

Embedded Domain-Specific Language and Runtime System for Progressive Spatiotemporal Data Analysis and Visualization, Cameron Christensen, Shusen Liu, Giorgio Scorzelli, Ji-Woo Lee, Peer-Timo Bremer, Valerio Pascucci

SeekAView: An intelligent Dimensionality Reduction Strategy for Navigating High-Dim Data Spaces, Josua Krause, Aritra Dasgupta, Jean-Daniel Fekete, Enrico Bertini

Quantitative Exploration of Large Medieval Manuscripts Data for the Codicological Research, Swati Chandna, Francesca Rindone, Carsten Cachsbacher, Rainer Stotzka

10:10–10:30 AM

Coffee Break

10:30–10:55 AM

Papers Session: Distributed and Parallel Computing

Block-Parallel Data Analysis with DIY, Dmitriy Morozov, Tom Peterka

10:55 AM–12:10 PM

Keynote

Speaker: Alex Szalay, *Bloomberg Distinguished Professor, Johns Hopkins University*

Exascale Numerical Laboratories

The talk will describe how science is changing as a result of the vast amounts of data we are collecting from gene sequencers to telescopes and supercomputers. This "Fourth Paradigm of Science", predicted by Jim Gray, is moving at full speed, and is transforming one scientific area after another. The talk will present various examples on the similarities of the emerging new challenges and how this vision is realized by the scientific community. Scientists are increasingly limited by their ability to analyze the large amounts of complex data available. These data sets are generated not only by instruments but also computational experiments; the sizes of the largest numerical simulations are on par with data collected by instruments, crossing the petabyte threshold. The importance of large synthetic data sets is increasingly important, as scientists compare their experiments to reference simulations. All disciplines need a new "instrument for data" that can deal not only with large data sets but the cross product of large and diverse data sets. There are several multi-faceted challenges related to this conversion, e.g. how to move, visualize, analyze and in general interact with Petabytes of data.

12:10–2:00 PM

Lunch Break

2:00–3:40 PM

Papers Session: Rendering and Probability Distribution

Optimizing Multi-Image Sort-Last Parallel Rendering, Matthew Larsen, Kenneth Moreland, Chris Johnson, Hank Childs

Parallel Distributed, GPU-Accelerated, Advanced Lighting Calculations for Large-Scale Volume Visualization, Min Shih, Silvio Rizzi, Joseph Insley, Thomas Uram, Venkatram Vishwanath, Mark Hereld, Michael E. Papka, Kwan-Liu Ma

Interactive Visual Exploration of a Trillion Particles, Karsten Schatz, Christoph Mueller, Michael Krone, Guido Reina, Jens Schneider, Thomas Ertl

In Situ Generated Probability Distribution Functions for Interactive Post Hoc Visualization and Analysis, Yucong Ye, Tyson Neuroth, Franz Sauer, Kwan-Liu Ma, Giulio Borghesi, Aditya Konduri, Hemanth Kolla, Jacqueline Chen

3:40–4:15 PM

Coffee Break

4:15–5:05 PM

Papers Session: Contour Trees

Parallel Peak Pruning for Scalable SMP Contour Tree Computation, Hamish Carr, Gunther Weber, Chris Sewell, James Ahrens

Contour Forests: Fast Multi-threaded Augmented Contour Trees, Charles Gueunet, Pierre Fortin, Julien Jomier, Julien Tierny

5:05–5:45 PM

Panel

5:45–5:55 PM

Awards & Closing

7:00–9:00 PM

Key Blrm 7-12 + South Foyer

Poster Reception @ VIS Opening Reception

MONDAY, 24 OCTOBER

Full Day

Johnson A+B

Workshop (8:30 AM–5:55 PM)

Visualization for the Digital Humanities

Contributors: Christopher Collins, Michael Correll, Mennatallah El-Assady, Stefan Jänicke, Daniel A. Keim

Despite the growing popularity of digital methods for research in the humanities, digital humanists are underserved by academics in visualization, and under-represented in visualization conferences. Addressing this deficit requires exposure to the specific data issues and epistemologies of humanities scholars, interdisciplinary collaboration, and steering of future research directions. The purpose of this workshop is to propose new research directions in visualization for the digital humanities, to familiarize the visualization research community with the problems faced by digital humanities researchers, and to foster future collaboration between visualization and digital humanities research.

Half Day

Holiday 6

Workshop (8:30 AM–12:10 PM)

Discovery Jam

Contributors: David Rogers, Daniel Keefe, Miriah Meyer, Francesca Samsel, Cecilia Aragon

Join us in the first Discovery Jam in a design sprint for scientific discovery. Think of it as a "Game Jam for Science". Guest scientists will present data-centric discovery challenge problems, then you'll collaborate in a small team (with a scientist) to brainstorm, design, and present pitches of your innovative ideas. Modern science requires a data-intensive approach melding expertise from many disciplines, but this is difficult to achieve. A new, perhaps even disruptive, approach is needed. This workshop will demonstrate the culture of collaboration that we believe will help scientists, technologists, designers and artists work together to innovate designs, methods, and tools for scientific discovery.

Peale A+B+C

Tutorial (8:30 AM–12:10 PM)

Visual Analytics for High-Dimensional Data

Contributors: Klaus Mueller, Shenghui Cheng

Analyzing high-dimensional data and finding hidden patterns in them is a difficult problem and has attracted numerous research efforts in the visualization community and beyond. Gaining insight into high dimensional data is at the core of big data analysis and data science. Automated methods can be useful to some extent but bringing the data analyst into the loop via interactive visual tools can help the discovery process tremendously. All of these visual tools use some kind of projection strategy to convey the high dimensional space within the confines of the two screen dimensions. Since this projection is an inherently ill-posed problem in all but the most trivial cases, all methods will bear certain trade-offs. Knowing the strengths and weaknesses of the various paradigms existing in the field can inform the design of the most appropriate visualization strategy for the task at hand. It can help practitioners in selecting the best among the many tools available, and it can help researchers in devising new tools to advance the state of the art. This tutorial aims to serve both of these factions of the visualization community.

Ruth

Tutorial (8:30 AM–12:10 PM)

Applying Color Theory to VIS

Contributors: Theresa-Marie Rhyne

We examine the foundations of color theory & how these methods apply to building effective visualizations. We define color harmony & demonstrate the application of color harmony to case studies. Case studies include ensemble scientific visualizations, historic & new infographics, correlation in biological data, rainbow color deficiency safe examples, & time series animations. The Pantone Matching System, Munsell Color System and other hue systems are reviewed. The features of ColorBrewer, Adobe's Capture CC app, & Josef Albers "Interaction of Color" app are examined. We also introduce "Gamut Mask" & "Color Proportions of an Image" analysis tools. Our tutorial concludes with a hands on session that teaches how to use online and mobile apps to successfully capture, analyze and store color schemes for future use in visual analytics. This includes evaluations for color deficiencies using Vizcheck & Coblis. These color suggestion tools are available online for your continued use in creating new visualizations. Please bring small JPEG examples of your visualizations for performing color analyses during the hands on session.

Latrobe

Tutorial (8:30 AM–12:10 PM)

User-Centred Evaluation in Visualization

Contributors: Camilla Forsell, Matthew Cooper

User-centred evaluation has repeatedly been identified as an aspect of development in visualization that is both vitally important and frequently quite poorly carried out within the field. The objective of this half-day introductory tutorial is to introduce the topic, provide knowledge and clear guidelines about what is important to consider and what resources are available to support further study in this area. Participants will also learn to better judge the relevance and quality of a publication presenting an evaluation when reviewing such work since similar rules apply.

Holiday 6

Workshop (2:00–5:55 PM)

Visualization in Practice: Open Source Visualization and Visual Analytics Software

Contributors: Bernd Hentschel, T. Alan Keahey, Daniela Oelke, Justin Talbot

The 2016 Workshop on Visualization in Practice is an opportunity for visualization practitioners and researchers to meet and share experiences, insights, and ideas in applying the latest visualization and visual analytics research to real world problems. The focus of this year's workshop will be the design, development, distribution, and application of open source visualization and visual analytics software. The workshop will include an invited keynote, a session of talks, and a poster session in which live demonstrations of open source tools will be given.

Peale A+B+C

Workshop (2:00–5:55 PM)

The Event Event: Workshop on Temporal & Sequential Event Analysis

Contributors: Adam Perer, Steven Drucker, Danyel Fisher, David Gotz, Megan Monroe, Ben Shneiderman, Catherine Plaisant

An ongoing visualization challenge is often to leverage the voluminous data that is being captured to drive decision making and insights. Common to such data are temporal events, data points with both a timestamp and event type, so understanding patterns

of temporal event sequences is an important problem to many domains. Recently, there has been an increasing amount of visualization research focusing on temporal events. The main question behind the proposed workshop is: How can we unify and advance the role of visualization in temporal event analysis? The workshop will gather visualization researchers together to discuss the interesting opportunities and challenges visualization may face with temporal events.

Ruth

Tutorial (2:00–5:55 PM)

Tensor Decomposition Methods

Contributors: Rafael Ballester-Ripoll, Renato Pajarola

Initially proposed as an extension of the concept of matrix decomposition for three and more dimensions, tensor decompositions have found numerous applications in visualization and visual computing. They constitute a powerful mathematical framework for compactly representing and manipulating dense data fields, especially in many dimensions. This course will introduce the most popular decomposition models and showcase emerging tensor methods for compression, interactive visualization, texture synthesis, denoising, and multidimensional inpainting. Multidimensional visual data types of interest include image and geometry ensembles, hyperspectral images, volumes and corresponding time-varying data.

Latrobe

Tutorial (2:00–5:55 PM)

Considering Qualitative Evaluations

Contributors: Sheelagh Carpendale, Uta Hinrichs, Trevor Hogan, Alice Thudt, Melanie Tory, Jo Vermeulen, Jagoda Walny

Evaluation is increasingly recognized as an essential component of visualization research. However, evaluation itself is a changing area of research. New methods to extend and validate our research continue to emerge. This 1/2-day tutorial is designed for beginning to intermediate audiences. We will focus on qualitative research methods using a mixture of talks and hands-on activities. After completing this tutorial, people will have a richer understanding of the benefits and challenges of qualitative empirical research.

BELIV

Holiday 4+5

8:30–8:50 AM

Opening

8:50–9:50 AM

Keynote

Speaker: Enrico Bertini, *Assistant Professor at New York University, Tandon School of Engineering*

We Should Never Stop BELIVing: Reflections on 10 Years of Workshops on the Esoteric Art of Evaluating Information Visualization

Wow! It has been 10 years since when Catherine, Giuseppe and I started BELIV in 2006! Back then, I was just a fledgling PhD student, with little understanding of what I was doing, but excited by the idea of being able to contribute something new to our community. Not only was visualization a niche topic back then, but its evaluation did not seem to be a major worry in people's mind. Today, I have way more gray hair and I am even more excited about doing something good for the community. Visualization is now a thriving discipline, sought after and practiced by many, and nobody would ever question the value and need for good and thoughtful evaluation. In this talk, I will try to retrace the path of BELIV: starting from its humble beginnings at AVI in Rome, up to its current glorious status of established and respected academic event people look forward to attend. I will use this opportunity to reflect on how the role and practice of evaluation has changed during the last 10 years: how it was back then, what we have achieved so far, and how it could be in 10 years from now. My talk will include recollections and anecdotes from the past; statistics showing the progress we have made; highlights on BELIV papers that have had a particularly significant impact; and my personal reflections on what we may be able to achieve in the future. Despite the many intricacies and struggles research and evaluation put in front of us, I think our future can be bright. Very bright. But it is up to us to make it happen. We all need to BELIV in it!

9:50–10:10 AM

BELIV 2016 Impact Award

Strategies for Evaluating Information Visualization Tools: Multi-dimensional In-depth Long-term Case Studies, Ben Shneiderman, Catherine Plaisant *(published in BELIV 2006)*

10:10–10:30 AM

Coffee Break

10:30–11:10 AM

Papers Session: Heuristics and Metrics

Chair: Michael Sedlmair

Information Visualization Heuristics in Practical Expert Evaluation, Heli Väätäjä, Jari Varsaluoma, Tomi Heimonen, Katariina Tiitinen, Jaakko Hakulinen, Markku Turunen, Harri Nieminen

Evaluating Visualization Sets: Trade-offs Between Local Effectiveness and Global Consistency, Zening Qu, Jessica Hullman

Entropy Measures for Visual Analytics: The Silver Ticket?, Laura McNamara, Travis Bauer, Laura Matzen, Michael Haass

A Survey on Interaction Log Analysis for Evaluating Exploratory Visualizations, Omar ElTayeby, Wenwen Dou

11:10–11:45 AM

Papers Session: Models

Chair: Michael Sedlmair

Cognitive Stages in Visual Data Exploration, Adil Yalcin, Niklas Elmqvist, Ben Bederson

Looking at the Representations in our Mind: Measuring Mental Models of Information Visualizations, Eva Mayr, Günther Schreder, Michael Smuc, Florian Windhager

A Nested Workflow Model for Visual Analytics Design and Validation, Paolo Federico, Albert Amor-Amoros, Silvia Miksch

11:45 AM–12:10 PM

Papers Session: Eye Tracking

Chair: Michael Sedlmair

Supporting Exploration of Eye Tracking Data: Identifying Changing Behavior Over Long Durations, Prithiviraj Muthumanickam, Camilla Forsell, Katerina Vrotsou, Jimmy Johansson, Matthew Cooper

Measuring Cognitive Load using Eye Tracking Technology in Visual Computing, Johannes Zagermann, Ulrike Pfeil, Harald Reiterer

12:10–2:00 PM

Lunch Break

2:00–2:40 PM

Papers Session: Evaluation in the Development Cycle

Chair: Petra Isenberg

On Regulatory and Organizational Constraints in Visualization Design and Evaluation, Anamaria Crisan, Jennifer Gardy, Tamara Munzner

Action Design Research and Visualization Design, Nina McCurdy, Jason Dykes, Miriah Meyer

Evaluation of Visualization by Critiques, Richard Brath, Ebad Banissi

Using Concrete and Realistic Data in Evaluating Initial Visualization Designs, Soren Knudsen, Jeppe Gerner Pedersen, Thor Herdal, Jakob Eg Larsen

2:40–3:10 PM

Papers Session: Reflections

Chair: Petra Isenberg

Why Evaluating Uncertainty Visualization is Error Prone, Jessica Hullman

Design Study Contributions Come in Different Guises: Seven Guiding Scenarios, Michael Sedlmair

An Empire Built On Sand: Reexamining What We Think We Know About Visualization, Robert Kosara

3:10–3:40 PM

Papers Session: New Directions in Evaluation

Chair: Petra Isenberg

Generative Data Models for Validation and Evaluation of Visualization Techniques, Christoph Schulz, Arlind Nocaj, Mennatallah El-Assady, Steffen Frey, Marcel Hlawatsch, Michael Hund, Grzegorz Karch, Rudolf Netzel, Christin Schätzle, Miriam Butt, Daniel A. Keim, Thomas Ertl, Ulrik Brandes, Daniel Weiskopf

Evaluating Information Visualization on Mobile Devices: Gaps and Challenges in the Empirical Evaluation Design Space, Kerstin Blumenstein, Christina Niederer, Markus Wagner, Grischa Schmiedl, Alexander Rind, Wolfgang Aigner

Beyond Usability and Performance: A Review of User Experienced-focused Evaluations in Visualization, Bahador Saket, Alex Endert, John Stasko

3:40–4:15 PM

Coffee Break

4:15–5:30 PM

Panel

On the Future of Evaluation and BELIV

5:30–5:50 PM

Closing

VDS

Key 3+4+6

8:30–10:10 AM

Opening

Speakers: Alexander Lex, Marc Streit

Session 1

Chair: Marc Streit

Big Data For A Public Good, Sarah Williams

What Shakespeare Taught Us About (Visual) Data Science, Michael Gleicher

Explanatory Visual Analytics for Enhancing Human Interpretability of Machine Learning Models, Josua Krause

10:10–10:30 AM

Coffee Break

10:30 AM–12:10 PM

Session 2

Chair: Daniel A. Keim

Teaching Data Visualization to 4 Million Data Scientists - Lessons from Evidence Based Data Analysis, Jeff Leek

The Role of Visualization in Prediction, Adam Perer

Visual Analysis of Hidden State Dynamics in Recurrent Neural Networks, Hendrik Strobelt

12:10–2:00 PM

Lunch Break

2:00–3:40 PM

Session 3

Chair: Hanspeter Pfister

Teaching Data Science and Visualization: What works, what doesn't?, Jeff Leek, Patrick Lucey, Sarah Williams

Advancing Additive Manufacturing Through Visual Data Science, Chad Steed

Clusterix: A Visual Analytics Approach to Clustering, Eamonn Maguire

3:40–4:15 PM

Coffee Break

4:15–5:40 PM

Session 4

Chair: Alexander Lex

Interactive Sports Analytics: Going Beyond Spreadsheets, Patrick Lucey

Coupled Interactive Visualization and Machine Learning for Accelerated Model Development: Applications to Electronic Healthcare Record Data, Charles Fisher

Data Shading: Building Data Models from Visualizations, Joseph Cottam

Causal Inference in Time Series Data Using Autoencoder, Kozen Umezawa

Closing

Speakers: Alexander Lex, Marc Streit

VizSec

The VizSec 2017 Proceedings have not been included on the VIS USB this year. You will find the full VizSec Proceedings online at http://vizsec.org/preprint2016, password "2016vizsec".

Key 1+2+5

8:30–8:40 AM

Opening

8:40–9:40 AM

Keynote

Speaker: Jay Jacobs, *Sr. Data Scientist, BitSight*

The State of (Viz) Security

The information security industry is changing rapidly (like always). It's worthwhile to take a moment to stop and look around to figure out if we are still on a good path. Join Jay Jacobs as he takes looks back over his career along with 12 years of VizSec and takes stock of where we are and some areas we should be moving towards.

Jay Jacobs is a Sr. Data Scientist at BitSight, before that, he spent four years as the Lead Data Analyst on the Verizon Data Breach Investigations Report (DBIR). Jacobs is the Co-Author of Data Driven Security, a book covering data analysis and visualizations for information security, and hosts the Data-Driven Security podcast. Jacobs is also a Co-Founder of the Society of Information Risk Analysts (SIRA) and serves as President on their Board of Directors.

9:40–10:10 AM

Papers Session: Methodology

Mixed Method Approach to Identify Analytic Questions to be Visualized for Military Cyber Incident Handlers, Laurin Buchanan, Anita D'Amico, Drew Kirkpatrick

10:10–10:30 AM

Coffee Break

10:30–11:10 AM

Papers Session: Code Security

J-Viz: Finding Algorithmic Complexity Attacks via Graph Visualization of Java Bytecode, Md. Jawaherul Alam, Michael Goodrich, Timothy Johnson

Visual representation of source code vulnerabilities, Hala Assal, Sonia Chiasson, Robert Biddle Cesar

11:10 AM–12:10 PM

Papers Session: Case Studies

CyberPetri at CDX 2016: Real-time Network Situation Awareness, Dustin Arendt, Dan Best, Russ Burtner, Celeste Lyn Paul

Visualizing a Malware Distribution Network, Sebastian Peryt, Jose Andre Morales, William Casey, Aaron Volkmann, Yang Cai

Visually guided Flow Tracking in Software-defined Networking, Tobias Post, Thomas Wischgoll, Adam R. Bryant, Bernd Hamann, Paul Müller, Hans Hagen

12:10–2:00 PM

Lunch Break

2:00–3:00 PM

Panel: Use of Visualizations in DoD Cyberspace Operations

Moderators: LTC Stoney Trent, Anita D'Amico

Panelists: Capt Lorenzo Ireland, CPT Sarah Smith, MAJ Danielle Gonzalez, CPT Robert Frost, CWO3 Robert Couey

While information visualization researchers and designers continue to develop new cybersecurity visualizations, little attention has been paid to how currently-fielded visualizations are actually used in cyberspace operations. Lathrop and Trent (2016) introduce the differences between traditional cybersecurity roles and expertise and emerging roles and technology requirements in cybersecurity operations. Cyber technologies and cyberspace operations organizations are co-evolving, so it is critical for researchers to understand practitioner perspectives. U.S. Cyber Command has established a research activity, the Cyber Immersion Lab, that is supporting such understanding. This panel, facilitated by the Cyber Immersion Lab, will provide an overview of the Cyber Mission Force and roles that perform cyberspace operations. Cyber Mission Force members will share insights into how visualizations are currently being used as well as perspectives on how currently-fielded visualizations fail to support real cyber work. Additional time will be reserved for questions and answers.

3:00–3:40 PM

Papers Session: Security Policy and Passwords

Detecting Malicious Logins in Enterprise Networks Using Visualization, Hossein Siadati, Bahador Saket, Nasir Memon

V3SPA: A Visual Analysis, Exploration, and Diffing Tool for SELinux and SEAndroid Security Policies, Robert Gove

3:40–4:15 PM

Coffee Break

4:15–5:35 PM

Papers Session: Visualizing Large Scale Threats

Uncovering Periodic Network Signals of Cyber Attacks, Ngoc Anh Huynh, Wee Keong Ng, Alex Ulmer, Jörn Kohlhammer

Bigfoot: A Geo-based Visualization Methodology for Detecting BGP Threats, Meenakshi Syamkumar, Ramakrishnan Durairajan, Paul Barford

Visualisation of Actionable Knowledge to Mitigate DRDoS Attacks, Michael Marie Aupetit, Yury Zhauniarovich, Giorgos Vasiliadis, Marc Dacier, Yazan Boshmaf

Understanding the Context of Network Traffic Alerts, Bram Cappers, Jarke J. van Wijk

5:35–5:55 PM

Posters Hosted Viewing

TUESDAY, 25 OCTOBER

8:00–9:30 AM

Key 1+2+5 and Key 3+4+6

VIS Opening

VIS Keynote

Speaker: Ricardo Hausmann, *Director at the Center for International Development & Professor of the Practice of Economic Development, Kennedy School of Government, Harvard University*

Visualizing knowhow, technological diffusion and the wealth of nations

9:30–10:10 AM

Key 1+2+5 and Key 3+4+6

VIS Fast Forward (Tues)

10:10–10:30 AM

Coffee Break

10:30 AM–12:10 PM

Holiday 4+5

VAST Opening

VAST Papers

Traffic and Urban Planning

Chair: Tatiana von Landesberger

[J] SmartAdP: Visual Analytics of Large-scale Taxi Trajectories for Selecting Billboard Locations, Dongyu Liu, Di Weng, Yuhong Li, Jie Bao, Yu Zheng, Huamin Qu, Yingcai Wu

[J] SemanticTraj: A New Approach to Interacting with Massive Taxi Trajectories, Shamal AL-Dohuki, Farah Kamw, Ye Zhao, Chao Ma, Yingyu Wu, Jing Yang, Xinyue Ye, Fei Wang, Xin Li, Wei Chen

[T] Embedding Spatio-temporal Information into Maps by Route-Zooming, Guodao Sun, Ronghua Liang, Huamin Qu, Yingcai Wu

[T] Vis-A-Ware: Integrating Spatial and Non-Spatial Visualization for Visibility-Aware Urban Planning, Thomas Ortner, Johannes Sorger, Harald Steinlechner, Gerd Hesina, Harald Piringer, Eduard Gröller

Key 3+4+6

InfoVis Opening

InfoVis Papers

Interaction

Chair: Anastazia Bezerianos

[J] Visualization by Demonstration: An Interaction Paradigm for Visual Data Exploration, Bahador Saket, Hannah Kim, Eli T. Brown, Alex Endert

[J] [Best Paper Award] Vega-Lite: A Grammar of Interactive Graphics, Arvind Satyanarayan, Dominik Moritz, Kanit Wongsuphasawat, Jeffrey Heer

[J] HindSight: Encouraging Exploration through Direct Encoding of Personal Interaction History, Mi Feng, Cheng Deng, Evan M. Peck, Lane Harrison

[J] PowerSet: A Comprehensive Visualization of Set Intersections, Bilal Alsallakh, Liu Ren

Key 1+2+5

SciVis Opening

SciVis Papers

Biological, Molecular and Shape Visualization

Chair: Christoph Heinzl

[J] Molecular Surface Maps, Michael Krone, Florian Frieß, Katrin Scharnowski, Guido Reina, Silvia Fademrecht, Tobias Kulschewski, Jürgen Pleiss, Thomas Ertl

[J] Synteny Explorer: An Interactive Visualization Application for Teaching Genome Evolution, Chris Bryan, Gregory Guterman, Kwan-Liu Ma, Harris Lewin, Denis Larkin, Jaebum Kim, Jian Ma, Marta Farré

[J] Visualizing Shape Deformations with Variation of Geometric Spectrum, Jiaxi Hu, Hajar Hamidian, Zichun Zhong, Jing Hua

[J] Physics-based Visual Characterization of Molecular Interaction Forces, Pedro Hermosilla, Jorge Estrada, Victor Guallar, Timo Ropinski, Àlvar Vinacua, Pere-Pau Vázquez

12:10–2:00 PM

Lunch Break

2:00–3:40 PM

Holiday 6

VIS Panel

Transitioning Research into Re-useable Open Source or Commercial Software

Organizer: T. Alan Keahey

Panelists: Graham Wills, Jock MacKinlay, John Stasko, Jeffrey Heer, Jeff Baumes

What are the key factors that determine whether results from the visualization research community will attain significance in practical usage? This panel will explore success stories in transitioning visualization research into more widely used systems. The panelists represent a cross section of visualization specializations (infovis, visual analytics, media and scivis).

Holiday 4+5

VAST Papers

Exploratory Analysis

Chair: Remco Chang

[J] Visualizing Dimension Coverage to Support Exploratory Analysis, Ali Sarvghad, Melanie Tory, Narges Mahyar

[J] Magnostics: Image-based Search of Interesting Matrix Views for Guided Network Exploration, Michael Behrisch, Benjamin Bach, Michael Hund, Michael Delz, Laura von Rüden, Jean-Daniel Fekete, Tobias Schreck

[J] A Grammar-based Approach for Modeling User Interactions and Generating Suggestions During the Data Exploration Process, Filip Dabek, Jesus J. Caban

[J] [Honorable Mention] A Visual Analytics Approach for Categorical Joint Distribution Reconstruction from Marginal Projections, Cong Xie, Wen Zhong, Klaus Mueller

[C] Supporting Visual Exploration for Multiple Users in Large Display Environments, Sriram Karthik Badam, Fereshteh Amini, Niklas Elmqvist, Pourang Irani

Key 3+4+6

InfoVis Papers

Immersive Analytics

Chair: Christopher Collins

[J] Immersive Collaborative Analysis of Network Connectivity: CAVE-style or Head-Mounted Display?, Maxime Cordeil, Tim Dwyer, Karsten Klein, Bireswar Laha, Kim Marriott, Bruce H. Thomas

[J] Investigating the Use of a Dynamic Physical Bar Chart for Data Exploration and Presentation, Faisal Taher, Yvonne Jansen, Jonathan Woodruff, John Hardy, Kasper Hornbæk, Jason Alexander

[J] Embedded Data Representations, Wesley Willett, Yvonne Jansen, Pierre Dragicevic

[T] A Study of Layout, Rendering, and Interaction Methods for Immersive Graph Visualization, Oh-Hyun Kwon, Chris Muelder, Kyungwon Lee, Kwan-Liu Ma

[J] [Honorable Mention] The Attraction Effect in Information Visualization, Evanthia Dimara, Anastasia Bezerianos, Pierre Dragicevic

Key 1+2+5

SciVis Papers

Design Studies and Evaluation

Chair: Helwig Hauser

[J] Visualization as Seen Through its Research Paper Keywords, Petra Isenberg, Tobias Isenberg, Michael Sedlmair, Jian Chen, Torsten Möller

[J] Comparing Cross-Sections and 3D Renderings for Surface Matching Tasks using Physical Ground Truths, Andreas J. Lind, Stefan Bruckner

[J] Urban Pulse: Capturing the Rhythm of Cities, Fabio Miranda, Harish Doraiswamy, Marcos Lage, Kai Zhao, Bruno Gonçalves, Luc Wilson, Mondrian Hsieh, Cláudio T. Silva

[J] Visualization and Extraction of Carvings for Heritage Conservation, Kai Lawonn, Erik Trostmann, Bernhard Preim, Klaus Hildebrandt

[J] [Honorable Mention] In Situ Distribution Guided Analysis and Visualization of Transonic Jet Engine Simulations, Soumya Dutta, Chun-Ming Chen, Gregory Heinlein, Han-Wei Shen, Jen-Ping Chen

3:40–4:15 PM

Coffee Break

4:15–5:55 PM

Holiday 6

Supporters Presentations

IBM, T. Alan Keahey, *Senior Data Visualization Scientist*

NVIDIA Corporation, Thomas Fogal, *Software developer*

Intel Corporation, Jim Jeffers, *Principal Engineer, Manager, Software-Defined Visualization Engineering*

Tableau Software, Jock Mackinlay, *Vice President, Research and Design*

Holiday 4+5

VAST Papers

Machine Learning

Chair: Torsten Möller

[J] Squares: Supporting Interactive Performance Analysis for Multiclass Classifiers, Donghao Ren, Saleema Amershi, Bongshin Lee, Jina Suh, Jason D. Williams

[J] [Best Paper Award] An Analysis of Machine- and Human-Analytics in Classification, Gary K. L. Tam, Vivek Kothari, Min Chen

[J] Multi-Resolution Climate Ensemble Parameter Analysis with Nested Parallel Coordinates Plots, Junpeng Wang, Xiaotong Liu, Han-Wei Shen, Guang Lin

[J] Towards Better Analysis of Deep Convolutional Neural Networks, Mengchen Liu, Jiaxin Shi, Zhen Li, Chongxuan Li, Jun Zhu, Shixia Liu

[J] Visualizing the Hidden Activity of Artificial Neural Networks, Paulo E. Rauber, Samuel G. Fadel, Alexandre X. Falcão, Alexandru C. Telea

Key 3+4+6

InfoVis Papers

Geovisualization

Chair: Gennady Andrienko

[J] Quantifying the Visual Impact of Classification Boundaries in Choropleth Maps,Yifan Zhang, Ross Maciejewski

[J] Small Multiples with Gaps, Wouter Meulemans, Jason Dykes, Aidan Slingsby, Cagatay Turkay, Jo Wood

[J] [Honorable Mention] Map LineUps: effects of spatial structure on graphical inference, Roger Beecham, Jason Dykes, Wouter Meulemans, Aidan Slingsby, Cagatay Turkay, Jo Wood

[T] Visual Encoding of Dissimilarity Data via Topology-Preserving Map Deformation, Quirijn W. Bouts, Tim Dwyer, Jason Dykes, Bettina Speckmann, Sarah Goodwin, Nathalie Henry Riche, Sheelagh Carpendale, Ariel Liebman

Key 1+2+5

SciVis Papers

Topology-based Techniques

Chair: Bei Wang

[J] Topological Analysis of Inertial Dynamics, Antoni Sagristà Sellés, Stefan Jordan, Andreas Just, Fábio Dias, Gustavo Nonato, Filip Sadlo

[J] [Best Paper Award] Jacobi Fiber Surfaces for Bivariate Reeb Space Computation, Julien Tierny, Hamish Carr

[J] Backward Finite-Time Lyapunov Exponents in Inertial Flows, Tobias Günther, Holger Theisel

[T] Fast and Exact Fiber Surfaces for Tetrahedral Meshes, Pavol Klacansky, Julien Tierny, Hamish Carr, Zhao Geng

6:00–6:30 PM

Key 3+4+6

VIS Fast Forward (Wed)

7:00–9:00 PM

Holiday 1+2+3

VIS Arts Program Opening Event

The installations, performances, and demonstrations featured in the IEEE VIS 2016 Arts Program exhibition explore the relationships between visualization research and arts and/or design practice, and present creative visual techniques that emphasize transformative aspects of scientific or cultural exploration. The featured installations include work by both established and emerging media artists from across the globe, including Gavin Baily, Maxwell Carlson, Duncan Clark, Tom Corby, Esteban Garcia Bravo, Mitch Goodwin, Benedikt Groß, Yoon Chung Han, Paul Heinicker, François-Joseph Lapointe, Dietmar Offenhuber, Raphael Reimann, Mike Richison, Weili Shi, Adam Trowbridge, Jessica Parris Westbrook, and others. Additionally, creative visualization projects will be demonstrated on the opening night of the exhibition. See http://visap.uic.edu for more details about the artists and the projects showcased in VISAP'16.

WEDNESDAY, 26 OCTOBER

8:30–10:10 AM

Holiday 4

VISAP Papers: Track 1
Chair: Angus Forbes

California Drought Impact: Multimodal Data Representation to Predict the Water Cycle, Yoon Chung Han, Shankar Tiwari

All Roads to Rome: Visualizing Mobility at Scale, Raphael Reimann, Benedikt Groß, Philipp Schmitt

Altering our Perception of Smartphones through Noise: Introducing the Affection Research Lab, Salvador Orara

Shan Shui in the World: A Generative Approach to Traditional Chinese Landscape Painting, Weili Shi

Artist Talks: Please join us in welcoming a select group of artists from around the globe!

Holiday 4+5

VAST Papers

Textual Data
Chair: Christopher Andrews

[J] NameClarifier: A Visual Analytics System for Author Name Disambiguation, Qiaomu Shen, Tongshuang Wu, Haiyan Yang, Yanhong Wu, Huamin Qu, Weiwei Cui

[J] TopicLens: Efficient Multi-Level Visual Topic Exploration of Large-Scale Document Collections, Minjeong Kim, Kyeongpil Kang, Deokgun Park, Jaegul Choo, Niklas Elmqvist

[J] TextTile: An Interactive Visualization Tool for Seamless Exploratory Analysis of Structured Data and Unstructured Text, Cristian Felix, Anshul Vikram Pandey, Enrico Bertini

[C] DocuCompass: Effective Exploration of Document Landscapes, Florian Heimerl, Markus John, Qi Han, Steffen Koch, Thomas Ertl

[T] Online Visual Analytics of Text Streams, Shixia Liu, Jialun Yin, Xiting Wang, Weiwei Cui, Kelei Cao, Jian Pei

Key 3+4+6

InfoVis Papers

Applications
Chair: Jinwook Seo

[J] Screenit: Visual Analysis of Cellular Screens, Kasper Dinkla, Hendrik Strobelt, Bryan Genest, Stephan Reiling, Mark Borowsky, Hanspeter Pfister

[J] PROACT: Iterative Design of a Patient-Centered Visualization for Effective Prostate Cancer Health Risk Communication, Anzu Hakone, Lane Harrison, Alvitta Ottley, Nathan Winters, Caitlin Gutheil, Paul K. J. Han, Remco Chang

[J] WeightLifter: Visual Weight Space Exploration for Multi-Criteria Decision Making, Stephan Pajer, Marc Streit, Thomas Torsney-Weir, Florian Spechtenhauser, Torsten Möller, Harald Piringer

[J] Visualizing Social Media Content with SentenTree, Mengdie Hu, Krist Wongsuphasawat, John Stasko

[J] Optimizing Hierarchical Visualizations with the Minimum Description Length Principle, Rafael Veras, Christopher Collins

Key 1+2+5

SciVis Papers

Ensembles, Multivariate and Comparative
Chair: Kristi Potter

[J] Decal-maps: Real-Time Layering of Decals on Surfaces for Multivariate Visualization, Allan Rocha, Usman Alim, Julio Daniel Silva, Mario Costa Sousa

[J] Time-hierarchical Clustering and Visualization of Weather Forecast Ensembles, Florian Ferstl, Mathias Kanzler, Marc Rautenhaus, Rüdiger Westermann

[J] Visualization of Time-Varying Weather Ensembles Across Multiple Resolutions, Ayan Biswas, Guang Lin, Xiaotong Liu, Han-Wei Shen

[J] A Fractional Cartesian Composition Model for Semi-spatial Comparative Visualization Design, Ivan Kolesár, Stefan Bruckner, Ivan Viola, Helwig Hauser

[T] Visual Analysis of Multi-run Spatio-temporal Simulations Using Isocontour Similarity for Projected Views, Alexey Fofonov, Vladimir Molchanov, Lars Linsen

10:10–10:30 AM

Coffee Break

10:30 AM–12:10 PM

Holiday 4+5

CG&A

Visualization Systems & Applications
Chair: Theresa-Marie Rhyne

Key-Node-Separated Graph Clustering and Layouts for Human Relationship Graph Visualization, Takayuchi Itoh, Karsten Klein

ENTVis: A Visual Analytic Tool for Entropy-Based Network Traffic Anomaly Detection, Fangfang Zhou, Wei Huang, Ying Zhao, Yang Shi, Xing Liang, Xiaoping Fan

Visualizing Rank Time Series of Wikipedia Top Viewed Pages, Jing Xia, Yumeng Hou, Victor Chen, Cheryl Qian, David Ebert, Wei Chen

WarpIV: In Situ Visualization and Analysis of Ion Accelerator Simulations, Oliver Rübel, Burlen Loring, Jean-Luc Vay, David P. Grote, Remi Lehe, Stepan Bulanov, Henri Vincenti, E. Wes Bethel

A Decision Support System for Planning Sustainable Water Distribution Systems, Alina Freund, Nazli Yonca Aydin, Dirk Zeckzer, Hans Hagen

Key 1+2+5

VIS Panel

On the Death of Scientific Visualization
Moderator: Bob Laramee

Panelists: Mike Kirby, David Laidlaw, Klaus Mueller, Han-Wei Shen, Anders Ynnerman

While InfoVis and VAST have been expanding for the last decade, SciVis seems to be, in general, contracting. This apparent contraction coincides roughly with Bill Lorenson's famous paper on the Death of Visualization. This panel discusses what appears to be a trend of the SciVis track of the conference contracting. This panel addresses some very challenging, core, fundamental questions.

Holiday 4+5

VAST Papers

Managing Visual Analytic Process

Chair: Brian Fisher

[J] Characterizing Guidance in Visual Analytics, Davide Ceneda, Theresia Gschwandtner, Thorsten May, Silvia Miksch, Hans-Jörg Schulz, Marc Streit, Christian Tominski

[J] Toward Theoretical Techniques for Measuring the Use of Human Effort in Visual Analytic Systems, R. Jordan Crouser, Lyndsey Franklin, Alex Endert, Kris Cook

[J] Designing Progressive and Interactive Analytics Processes for High-Dimensional Data Analysis, Cagatay Turkay, Erdem Kaya, Selim Balcisoy, Helwig Hauser

[C] What May Visualization Processes Optimize?, Min Chen, Amos Golan

[C] Approximated and User Steerable tSNE for Progressive Visual Analytics, Nicola Pezzotti, Boudewijn P.F. Lelieveldt, Laurens van der Maaten, Thomas Höllt, Elmar Eisemann, Anna Vilanova

Key 3+4+6

InfoVis Papers

Evaluation

Chair: Catherine Plaisant

[J] Evaluation of Graph Sampling: A Visualization Perspective, Yanhong Wu, Nan Cao, Daniel Archambault, Qiaomu Shen, Huamin Qu, Weiwei Cui

[J] [Honorable Mention] Many-to-Many Geographically-Embedded Flow Visualisation: An Evaluation, Yalong Yang, Tim Dwyer, Sarah Goodwin, Kim Marriott

[J] An Evaluation of Visual Search Support in Maps, Rudolf Netzel, Marcel Hlawatsch, Michael Burch, Sanjeev Balakrishnan, Hansjörg Schmauder, Daniel Weiskopf

[J] Evaluating the Impact of Binning 2D Scalar Fields, Lace Padilla, P. Samuel Quinan, Miriah Meyer, Sarah H. Creem-Regehr

[T] The Elicitation Interview Technique: Capturing People's Experiences of Data Representations, Trevor Hogan, Uta Hinrichs, Eva Hornecker

12:10–2:00 PM

Lunch Break

2:00–3:40 PM

Holiday 6

VIS Panel

How data visualization and regulation meet on the modern web

Moderator: Georges Grinstein

Panelists: Robert Baker, Betsy Beaumon, Karl Groves, Mike Paciello, Joss Stubblefield

Individuals with accessibility issues are not able to access much of our work in visualization and we, as a community, have not paid a great deal of attention to that community. This panel will address the misconceptions, the law, and the steps that need to be taken to resolve this.

Holiday 4+5

VAST Papers

Biomedical Visualization

Chair: David Gotz

[J] AnaFe: Visual Analytics of Image-derived Temporal Features – Focusing on the Spleen, Ievgeniia Gutenko, Konstantin Dmitriev, Arie E. Kaufman, Matthew A. Barish

[J] Blockwise Human Brain Network Visual Comparison Using NodeTrix Representation, Xinsong Yang, Lei Shi, Madelaine Daianu, Hanghang Tong, Qingsong Liu, Paul Thompson

[J] PhenoStacks: Cross-Sectional Cohort Phenotype Comparison Visualizations, Michael Glueck, Alina Gvozdik, Fanny Chevalier, Azam Khan, Michael Brudno, Daniel Wigdor

[C] C2A: Crowd Consensus Analytics for Virtual Colonoscopy, Ji Hwan Park, Saad Nadeem, Seyedkoosha Mirhosseini, Arie Kaufman

[C] The DataSpace for HIV Vaccine Studies, David McColgin, Paul Hoover, Mark Igra

Key 3+4+6

InfoVis Papers

Graphs

Chair: Stephen North

[J] Probabilistic Graph Layout for Uncertain Network Visualization, Christoph Schulz, Arlind Nocaj, Jochen Goertler, Oliver Deussen, Ulrik Brandes, Daniel Weiskopf

[J] Towards Unambiguous Edge Bundling: Investigating Confluent Drawings for Network Visualization, Benjamin Bach, Nathalie Henry Riche, Christophe Hurter, Kim Marriott, Tim Dwyer

[T] CUBu: Universal real-time bundling for large graphs, Matthew van der Zwan, Valeriu Codreanu, Alexandru Telea

[T] Visualizing Dynamic Hierarchies in Graph Sequences, Corinna Vehlow, Fabian Beck, Daniel Weiskopf

Key 1+2+5

SciVis Contest

Chairs: Christoph Garth and Berk Geveci

Each year, the VisContest presents researchers from the vis community an opportunity to transfer the latest developments in visual data analysis to a challenging application scenario.

3:40–4:15 PM

Coffee Break

4:15–4:45 PM

Key 3+4+6

VIS Papers Fast Forward (Thurs & Fri)

5:00–7:00 PM

Key Blrm 7-12

Posters & Networking

7:00–9:00 PM

Key Blrm 1-6

VIS Banquet

Supported by Tableau Software

THURSDAY, 27 OCTOBER

8:30–10:10 AM

Holiday 4

VISAP Papers - Track 2

Chair: Fanny Chevalier

Glitch style visualization of disrupted neuronal connectivity in Parkinson's disease, Tim McGraw

Glitches as a Generative Design Process, Romain Vuillemot, Samuel Huron

Staged Analysis: From Evocative to Comparative Visualizations of Urban Mobility, Till Nagel, Christopher Pietsch, Marian Dörk

Artist Talks: Please join us in welcoming a select group of artists from around the globe!

Holiday 4+5

VAST Papers

Social Media Data and Events

Chair: Andreas Kerren

[C] D-Map: Visual Analysis of Ego-centric Information Diffusion Patterns in Social Media, Siming Chen, Shuai Chen, Zhenhuang Wang, Jie Liang, Xiaoru Yuan, Nan Cao, Yadong Wu

[C] How Ideas Flow across Multiple Social Groups, Xiting Wang, Shixia Liu, Yang Chen, Tai-Quan Peng, Jing Su, Jing Yang, Baining Guo

[C] EventAction: Visual Analytics for Temporal Event Sequence Recommendation, Fan Du, Catherine Plaisant, Neil Spring, Ben Shneiderman

[C] SocialBrands: Visual Analysis of Public Perceptions of Brands on Social Media, Xiaotong Liu, Anbang Xu, Liang Gou, Haibin Liu, Rama Akkiraju, Han-Wei Shen

[T] Coping with Volume and Variety in Temporal Event Sequences: Strategies for Sharpening Analytic Focus, Fan Du, Ben Shneiderman, Catherine Plaisant, Sana Malik, Adam Perer

Key 3+4+6

InfoVis Papers

Storytelling / Presentation

Chair: Jessica Hullman

[J] Iterating Between Tools to Create and Edit Visualizations, Alex Bigelow, Steven Drucker, Danyel Fisher, Miriah Meyer

[J] Data-Driven Guides: Supporting Expressive Design for Information Graphics, Nam Wook Kim, Eston Schweickart, Zhicheng Liu, Mira Dontcheva, Wilmot Li, Jovan Popovic, and Hanspeter Pfister

[J] Authoring Data-Driven Videos with DataClips, Fereshteh Amini, Nathalie Henry Riche, Bongshin Lee, Andres Monroy-Hernandez, Pourang Irani

[J] Temporal Summary Images: An Approach to Narrative Visualization via Interactive Annotation Generation and Placement, Chris Bryan, Kwan-Liu Ma, Jonathan Woodring

[J] Colorgorical: Creating discriminable and preferable color palettes for information visualization, Connor C. Gramazio, David H. Laidlaw, Karen B. Schloss

Key 1+2+5

SciVis Papers

Rendering

Chair: Jens Kruger

[J] [Honorable Mention] Correlated Photon Mapping for Interactive Global Illumination of Time-Varying Volumetric Data, Daniel Jönsson, Anders Ynnerman

[J] A Versatile and Efficient GPU Data Structure for Spatial Indexing, Jens Schneider, Peter Rautek

[J] Progressive Direct Volume-to-Volume Transformation, Steffen Frey, Thomas Ertl

[J] OSPRay – A CPU Ray Tracing Framework for Scientific Visualization, I Wald, GP Johnson, J Amstutz, C Brownlee, A Knoll, J Jeffers, J Günther, P Navratil

[J] Direct Multifield Volume Ray Casting of Fiber Surfaces, Kui Wu, Aaron Knoll, Benjamin J Isaac, Hamish Carr, Valerio Pascucci

10:10–10:30 AM

Coffee Break

10:30 AM–12:10 PM

Holiday 6

CG&A Papers

Applied Visualization Techniques

Chair: Melanie Tory

Episogram: Visual Summarization of Egocentric Social Interactions, Nan Cao, Yuru Lin, Fan Du

VTK-m: Accelerating the Visualization Toolkit for Massively Threaded Architectures, Kenneth Moreland, Christopher Sewell, William Usher, Li-ta Lo, Jeremy Meredith, David Pugmire, James Kress, Hendrik Schroots, Kwan-Liu Ma, Hank Childs, Matthew Larsen, Chun-Ming Chen, Robert Maynard, Berk Geveci

Evaluating Shape Alignment via Ensemble Visualization, Mukund Raj, Mahsa Mirzargar, J. Samuel Preston, Robert M. Kirby, Ross T. Whitaker

Spatial Analytic Interfaces: Spatial User Interfaces for In-Situ Visual Analytics, Barret Ens, Pourang Irani

Visualizing Evaluation Structures using Layered Graph Drawings, Yosuke Onoue, Nobuyuki Kukimoto, Naohisa Sakamoto, Kazuo Misue, Koji Koyamada

Key 3+4+6

VIS Panel

How can we improve empirical research on understanding visual information?

Moderator: Steve Haroz

Panelists: Pierre Dragicevic, Ronald Rensink, Jessica Hullman, Matthew Kay

Empirical scientific research comprises many stages, including choosing research questions, designing experiments, analyzing data, drawing conclusions, and effectively communicating the entire process. This panel will discuss various approaches to these stages and debate how empirical research in visualization can improve.

Holiday 4+5

VAST Papers

Complementing Visual and Algorithmic Analysis

Chair: Ross Maciejewski

[J] AxiSketcher: Interactive Nonlinear Axis Mapping of Visualizations through User Drawings, Bum Chul Kwon, Hannah Kim, Emily Wall, Jaegul Choo, Haesun Park, Alex Endert

[J] VisMatchmaker: Cooperation of the User and the Computer in Centralized Matching Adjustment, Po-Ming Law, Wenchao Wu, Yixian Zheng, Huamin Qu

[J] Visual Interaction with Dimensionality Reduction: A Structured Literature Analysis, Dominik Sacha, Leishi Zhang, Michael Sedlmair, John A. Lee, Jaakko Peltonen, Daniel Weiskopf, Stephen C. North, Daniel A. Keim

[J] VisFlow - Web-based Visualization Framework for Tabular Data with a Subset Flow Model, Bowen Yu, Cláudio T. Silva

[C] DimScanner: A Relation-based Visual Exploration Approach Towards Data Dimension Inspection, Jing Xia, Wei Chen, Yumeng Hou, Wanqi Hu, Xinxin Huang, David Ebert

Key 1+2+5

SciVis Papers

Presentation, Production, and Dissemination

Chair: Daniel Keefe

[J] Vol2velle: Printable Interactive Volume Visualization, Sergej Stoppel, Stefan Bruckner

[J] Categorical Colormap Optimization with Visualization Case Studies, H. Fang, S. Walton, E. Delahaye, J. Harris, D. A. Storchak, M. Chen

[J] Hybrid Tactile/Tangible Interaction for 3D Data Exploration, Lonni Besançon, Paul Issartel, Mehdi Ammi, Tobias Isenberg

[J] GlyphLens: View-dependent Occlusion Management in the Interactive Glyph Visualization, Xin Tong, Cheng Li, Han-Wei Shen

[T] Lightness Constancy in Surface Visualization, Danielle Albers Szafir, Alper Sarikaya, Michael Gleicher

12:10–2:00 PM

Lunch Break

2:00–3:40 PM

Key 1+2+5

VIS Panel

Application Papers: What are they and how should they be evaluated?

Moderator: Gunther Weber

Panelists: Sheelagh Carpendale, David Ebert, Brian Fisher, Hans Hagen, Ben Shneiderman, Anders Ynnerman

This panel will start a discussion in the community about what goals an application paper ought to have, what its main contributions to the state of art of visualization should be, and how it ought to be evaluated by reviewers. How do we as a community generate clear evaluation criteria for this type of paper?

Holiday 6

VAST Papers

User Behaviors

Chair: Jonathan Roberts

[J] Visual Analytics for Mobile Eye Tracking, Kuno Kurzhals, Marcel Hlawatsch, Christof Seeger, Daniel Weiskopf

[J] GazeDx: Interactive Visual Analytics Framework for Comparative Gaze Analysis with Volumetric Medical Images, Hyunjoo Song, Jeongjin Lee, Tae Jung Kim, Kyoung Ho Lee, Bohyoung Kim, Jinwook Seo

[J] Patterns and Sequences: Interactive Exploration of Clickstreams to Understand Common Visitor Paths, Zhicheng Liu, Yang Wang, Mira Dontcheva, Matthew Hoffman, Seth Walker, Alan Wilson

[T] Analyzing Eye-Tracking Information in Visualization and Data Space: from Where on the Screen to What on the Screen, Sayeed Safayet Alam, Radu Jianu

Holiday 4+5

VAST Papers

Visual Knowledge Discovery and Sense-Making

Chair: Hans-Jörg Schulz

[J] Annotation Graphs: A Graph-Based Visualization for Meta-Analysis of Data based on User-Authored Annotations, Jian Zhao, Michael Glueck, Simon Breslav, Fanny Chevalier, Azam Khan

[J] Familiarity Vs Trust: A Comparative Study of Domain Scientists' Trust in Visual Analytics and Conventional Analysis Methods, Aritra Dasgupta, Joon-Yong Lee, Ryan Wilson, Robert A. Lafrance, Nick Cramer, Kristin Cook, Samuel Payne

[J] What do Constraint Programming Users Want to See? Exploring the role of Visualisation in Profiling of Models and Search, Sarah Goodwin, Christopher Mears, Tim Dwyer, Maria Garcia de la Banda, Guido Tack, Mark Wallace

[C] SenseMap: Supporting Browser-based Online Sensemaking through Analytic Provenance, Phong Nguyen, Kai Xu, Andy Bardill, Betul Salman, Kate Herd, William Wong

[C] PorosityAnalyzer: Visual Analysis and Evaluation of Segmentation Pipelines to Determine the Porosity in Fiber-Reinforced Polymers, Johannes Weissenböck, Artem Amirkhanov, Eduard Gröller, Johann Kastner, Christoph Heinzl

Key 3+4+6

InfoVis Papers

Time Series

Chair: Adam Perer

[J] Visplause: Visual Data Quality Assessment of Many Time Series Using Plausibility Checks, Clemens Arbesser, Florian Spechtenhauser, Thomas Mühlbacher, Harald Piringer

[J] Surprise! Bayesian Weighting for De-Biasing Thematic Maps, Michael Correll, Jeffrey Heer

[J] Multi-Granular Trend Detection for Time-Series Analysis, Arthur van Goethem, Frank Staals, Maarten Löffler, Jason Dykes, Bettina Speckmann

[T] ThermalPlot: Visualizing Multi-Attribute Time-Series Data Using a Thermal Metaphor, Holger Stitz, Samuel Gratz, Wolfang Aigner, Marc Streit

[T] The Connected Scatterplot for Presenting Paired Time Series, Steve Haroz, Robert Kosara, Steven L. Franconeri

3:40–4:15 PM

Coffee Break

4:15–5:55 PM

Holiday 6

VIS Panel

Pathways for Theoretical Advances in Visualization

Moderator: Min Chen

Panelists: Georges Grinstein, Chris Johnson, Jessie Kennedy, Tamara Munzner, Melanie Tory

This panel focuses on the question "How can we build a theoretic foundation for visualization collectively as a community?" The panellists will envision the pathways in four different aspects of a theoretic foundation, namely (i) taxonomies and ontologies, (ii) principles and guidelines, (iii) conceptual models and theoretic frameworks, and (iv) quantitative laws and theoretic systems.

Holiday 4+5

VAST Papers

Education and Games

Chair: Michael Sedlmair

[J] Visual Analysis of MOOC Forums with iForum, Siwei Fu, Jian Zhao, Weiwei Cui, Huamin Qu

[J] A Visual Analytics Approach for Understanding Reasons behind Snowballing and Comeback in MOBA Games, Quan Li, Peng Xu, Yeuk Yin Chan, Yun Wang, Zhipeng Wang, Huamin Qu, Xiaojuan Ma

[C] DropoutSeer: Visualizing Learning Patterns in Massive Open Online Courses for Dropout Reasoning and Prediction, Yuanzhe Chen, Qing Chen, Mingqian Zhao, Sebastien Boyer, Kalyan Veeramachaneni, Huamin Qu

[T] PeakVizor: Visual Analytics of Peaks in Video Clickstreams from Massive Open Online Courses, Qing Chen, Yuanzhe Chen, Dongyu Liu, Conglei Shi, Yingcai Wu, Huamin Qu

Key 3+4+6

InfoVis Papers

Scalable Algorithms

Chair: Zhicheng Liu

[J] Hashedcubes: Simple, Low Memory, Real-Time Visual Exploration of Big Data, Cícero A. L. Pahins, Sean A. Stephens, Carlos Scheidegger, João L. D. Comba

[J] Gaussian Cubes: Real-Time Modeling for Visual Exploration of Large Multidimensional Datasets, Zhe Wang, Nivan Ferreira, Youhao Wei, Aarthy Sankari Bhaskar, Carlos Scheidegger

[T] An Enhanced Visualization Process Model for Incremental Visualization, Hans-Jörg Schulz, Marco Angelini, Giuseppe Santucci, Heidrun Schumann

[T] Dealing with Multiple Requirements in Geometric Arrangements, Erick Gomez-Nieto, Wallace Casaca, Danilo Motta, Ivar Hartmann, Gabriel Taubin, Luis Gustavo Nonato

[J] cite2vec: Citation-Driven Document Exploration via Word Embeddings, Matthew Berger, Katherine McDonough, Lee M. Seversky

Key 1+2+5

SciVis Papers

Vectors and Tensors

Chair: David Laidlaw

[J] Glyphs for General Second-Order 2D and 3D Tensors, Tim Gerrits, Christian Rössl, Holger Theisel

[J] Hairy Slices: Evaluating the Perceptual Effectiveness of Cutting Plane Glyphs for 3D Vector Fields, Andrew H. Stevens, Thomas Butkiewicz, Colin Ware

[T] Validation of SplitVectors Encoding for Quantitative Visualization of Large-Magnitude-Range Vector Fields, Henan Zhao, Garnett W. Bryant, Wesley Griffin, Judith E. Terrill, Jian Chen

[T] Feature Surfaces in Symmetric Tensor Fields Based on Eigenvalue Manifold, Jonathan Palacios, Harry Yeh, Wenping Wang, Yue Zhang, Robert S Laramee, Ritesh Sharma, Thomas Schultz, Eugene Zhang

DOCTORAL COLLOQUIUM 2017
Call for Participation

VIS 2017 will host a Doctoral Colloquium to support the next generation of visualization researchers. Ph.D. students at any stage of their research are invited to apply to participate in the colloquium. Students who will be completing their proposal defense near the time of the colloquium are particularly encouraged to apply. It will incorporate contributions from the scientific visualization, information visualization, and visual analytics student communities.

Colloquium participation will offer students insight and support for the framing of their research and will help them create important relationships. Financial support may be available to participants to assist in traveling to the conference. The colloquium will be run as a single day invitation-only event at the beginning of IEEE VIS.

Questions? Email info@ieeevis.org

8:30–10:10 AM

Holiday 6

VIS Panel

Critical Visualization

Moderator: Angus Forbes

Panelists: Marian Dörk, Jessica Hullman, Dietmar Offenhuber, Adam Trowbridge, Jessica Westbrook

How could a critical approach to visualization promote disclosure, plurality, contingency, and empowerment? What opportunities are there for incorporating human-centered inquiry into visualization research? Does articulating value, bias, and ideology have a place in scientific discourse? The Critical Visualization panel will introduce the diverse work of the five panelists and provide a forum for discussing critical approaches to visualization.

Holiday 4+5

VAST Papers

Time-Series Data

Chair: Jessie Kennedy

[J] [Honorable Mention] ViDX: Visual Diagnostics of Assembly Line Performance in Smart Factories, Panpan Xu, Honghui Mei, Liu Ren, Wei Chen

[C] Shape Grammar Extraction for Efficient Query-by-Sketch Pattern Matching in Long Time Series, Prithiviraj Muthumanickam, Katerina Vrotsou, Matthew Cooper, Jimmy Johansson

[C] The Semantics of Sketch: A Visual Query System for Time Series Data, Michael Correll, Michael Gleicher

[C] Visual Analysis and Coding of Data-Rich User Behavior, Tanja Blascheck, Fabian Beck, Sebastian Baltes, Thomas Ertl, Daniel Weiskopf

Key 3+4+6

InfoVis Papers

Visualization Education

Chair: Nathalie Riche

[J] VLAT: Development of a Visualization Literacy Assessment Test, Sukwon Lee, Sung-Hee Kim, Bum Chul Kwon

[J] VIZITCARDS: A Card-Based Toolkit for Infovis Design Education, Shiqing He, Eytan Adar

[J] booc.io: An Education System with Hierarchical Concept Maps and Dynamic Non-linear Learning Plans, Michail Schwab, Hendrik Strobelt, James Tompkin, Colin Fredericks, Connor Huff, Dana Higgins, Anton Strezhnev, Mayya Komisarchik, Gary King, Hanspeter Pfister

[J] Exploring the Possibilities of Embedding Heterogeneous Data Attributes in Familiar Visualizations, Mona Hosseinkhani Loorak, Charles Perin, Christopher Collins, Sheelagh Carpendale

Key 1+2+5

SciVis Papers

Biomedical Visualization

Chair: Ivan Viola

[J] PelVis: Atlas-based Surgical Planning for Oncological Pelvic Surgery, Noeska Smit, Kai Lawonn, Annelot Kraima, Marco DeRuiter, Hessam Sokooti, Stefan Bruckner, Elmar Eisemann, Anna Vilanova

[J] Corresponding Supine and Prone Colon Visualization Using Eigenfunction Analysis and Fold Modeling, Saad Nadeem, Joseph Marino, Xianfeng Gu, Arie Kaufman

[J] Combined Visualization of Vessel Deformation and Hemodynamics in Cerebral Aneurysms, Monique Meuschke, Samuel Voss, Oliver Beuing, Bernhard Preim, Kai Lawonn

[T] Comparative Local Quality Assessment of 3D Medical Image Segmentations with Focus on Statistical Shape Model-based Algorithms, Tatiana von Landesberger, Dennis Basgier, Meike Becker

10:10–10:30 AM

Coffee Break

10:30–11:30 AM

Key 1+2+5 and Key 3+4+6

VIS Capstone

Speaker: Jean-luc Doumont, *Principiae*

The three laws of communication

11:30 AM–12:00 PM

Key 1+2+5 and Key 3+4+6

VIS Closing

Chair: Terry Yoo, *National Institutes of Health*

VIS 2017 General Chair: James Ahrens, *Los Alamos National Laboratory*

[J] TVCG journal special issue papers *[C] Conference papers* *[T] TVCG journal previously published papers*

POSTERS & CONTESTS

VIS Posters

On the Performance of Stereoscopic Versus Monoscopic 3D Parallel Coordinates, Kahin Akram Hassan, Niklas Rönnberg, Camilla Forsell, Jimmy Johansson

[InfoVis Honorable Mention] **The Biasing Effect of Word Length in Font Size Encodings,** Eric Alexander, Chih-Ching Chang, Mariana Shimabukuro, Steven Franconeri, Christopher Collins, Michael Gleicher

Visually-supported graph traversals for exploratory analysis, Albert Amor-Amorós, Paolo Federico, Silvia Miksch

[VAST Best Poster] **Exploring Pressure in Football,** Gennady Andrienko, Natalia Andrienko, Guido Budzjak, Tatiana von Landesberger, Hendrik Weber

[InfoVis Honorable Mention] **Fireflies: Biomimicry-Inspired InfoVis for Exploring Public Opinion about an Infectious Disease,** Bon Adriel Aseniero, Charles Perin, Marjan Eggermont, Sheelagh Carpendale

ClassSPLOM - A Scatterplot Matrix to Visualize Separation of Multiclass Multidimensional Data, Michael Aupetit, Ahmed Ali

Articulate2: Toward a Conversational Interface for Visual Data Exploration, Jillian Aurisano, Abhinav Kumar, Alberto Gonzalez, Jason Leigh, Barbara DiEugenio, Andrew Johnson

Integrating Visual Exploration into Traditional Scientific Research Methodology, Evan Barba, Yifang Wei, Janet Mann, Lisa Singh

[SciVis Best Poster] **Case Study on Visualizing Gulf Stream Eddies from ROMS,** Karen Bemis, Li Liu, Deborah Silver, Dujuan Kang, Enrique Curchitser

Fluid Treemap Interactions, Seth Borges, David Koop

[VAST Honorable Mention] **Eliciting Strategies and Tasks in Uncertainty-Aware Data Analytics,** Nadia Boukhelifa, Marc-Emmanuel Perrin, Samuel Huron, James Eagan

Immersive Analytics with WebVR and Google Cardboard, Peter Butcher, Jonathan Roberts, Panagiotis Ritsos

Guiding the Visualization of Time-Oriented Data, Davide Ceneda, Wolfgang Aigner, Markus Bögl, Theresia Gschwandtner, Silvia Miksch

Multi-Granularity Visualizations of Geographic Mobility, Bishal Chamling, Adam M. Terwilliger, Jonathan P. Leidig, Greg Wolffe

A Semiotics Approach to Characterize Diffusion Tensor Imaging Visualization, Jian Chen

Adaptive Mobility Transition Graph: A Visual Exploration Approach for Citywide Crowd Mobility, Wei Chen, Minfeng Zhu, Feiran Wu, Zhaosong Huang, Wanqi Hu, Tao Wang, Lingfei Zhao, Xumeng Wang, Fan Zhang, Ross Maciejewski

StreamExplorer: A Multi-Stage System for Visually Exploring Events in Social Stream, Zhutian Chen, Guodao Sun, Nan Cao, Huamin Qu, Yingcai Wu

[SciVis Honorable Mention] **Extending Scatterplots to Scalar Fields,** Shenghui Cheng, Pengcheng Cui, Klaus Mueller

A Data-Driven Approach for Mapping Multivariate Data to Color, Shenghui Cheng, Wei Xu, Wen Zhong, Klaus Mueller

Tile-Based Spatio-Temporal Visual Analytics via Topic Modeling on Social Media, Minsuk Choi, Jaeseong Yoo, Ashley S. Beavers, Scott Langevin, Chris Bethune, Sean McIntyre, Drake Barry, Jaegul Choo, Park Haesun

NaturalMotion: Exploring Gesture Controls for Visualizing Time-Evolving Graphs, Samuel Clarke, Nathan Dass, Duen Horng Chau

Analyzing Hillary Clinton's Emails, Vasundhara Dehiya, Klaus Mueller

GIS and Cartographic Techniques Using Multi-Temporal Raster Datasets to Illustrate Crop Migration and Change, Lee Ebinger, Avery Sandborn

Towards an Algebra for the Visual Analytics Design Process, Ulrich Engelke, Eser Kandogan

A Hierarchical Interaction Design for Multi-dimensional Flow Datasets, Ruimin Gao, Mingran Li, Xinghe Hu, Yingjie Victor Chen

Information-Theoretic Visual Exploration of Multivariate Sensor Time-series with A Time-Correlation Partitioning Tree, Fangzhou Guo, Junhua Lu, Feiran Wu, Tianye Zhang, Wei Chen, Lei Shi, Huaming Qu

SpannerFinder: Interactive Visualization of Temporal Ensemble Rankings to Explore Structural Holes in Dynamic Networks, Fangzhou Guo, Yingcai Wu, chenyang ji, Bingzhang Dai, Tianye Zhang, Huihua Guan, Wei Chen, Tim Dwyer

Supporting Sensemaking Transitions in Research Proposal Writing through Topic Modeling and Embedded Visualizations, Hua Guo, David Laidlaw

A Visualization System for Clustering Dementia Patients based on Automated Similarity Analysis, Hyoji Ha, Hyunwoo Han, Sungyun Bae, Jihye Lee, Sunjoo Bang, Sangjoon Son, Changhyung Hong, Hyunjung Shin, Kyungwon Lee

Characterizing Visual Exploration Techniques for Temporal Data, Rafael Henkin, Aidan Slingsby, Jason Dykes

Analyzing influenza incidence and policy data at different temporal and spatial scales, Julia Hocket, Shweta Bansal, Han-Hsi Liu, Lisa Singh

Adding Semantic Information into Data Models by Learning Domain Expertise from User Interaction, Nathan Hodas, Alex Endert

Visualizing Dynamics of Complex Familial Structures, John R. Hott, Worthy N. Martin, Kathleen Flake

Visual Analysis of Rugby Matches: Pixel-oriented Visualization and Evaluation Indices, Yusuke Ishikawa, Issei Fujishiro

SwiftTuna: Incrementally Exploring Large-scale Multidimensional Data, Jaemin Jo, Wonjae Kim, Seunghoon Yoo, Bohyoung Kim, Jinwook Seo

GPU-Assisted Visual Analysis and Categorization of Ensemble Conflict, Donald Johnson, TJ Jankun-Kelly

Investigation of Scalar Field Metrics and Respective Visualization Techniques, Christopher Paul Kappe, Michael Böttinger, Heike Leitte

TransUccess: Investigating Social Equity in Accessing Public Transportation through Visual Analytics, Shaked Kaufmann, Peter Bak, Noam Tractinsky

Multiscale Display of 1D, 2D, and 3D Genomic Information, Peter Kerpedjiev, Kasper Dinkla, Hendrik Strobelt, Hanspeter Pfister, Peter Park, Nils Gehlenborg

Supporting Graph Exploration Tasks on Display Walls Using Spatially-Aware Mobile Devices, Ulrike Kister, Konstantin Klamka, Raimund Dachselt

Schedulater: Supporting Plant Operators in Scheduling Tasks by Visualizing Streaming Process Data and Model Predictions, Søren Knudsen, Mikkel Rønne Jakobsen

ParaSAGE: Scalable Web-based Scientific Visualization for Ultra Resolution Display Environment, Dylan Kobayashi, Simon Su, Luis Bravo, Jason Leigh, Dale Shires

Visualizing Cancer Genomics Data with MEXPRESS, Alexander Koch, Tim De Meyer, Jana Jeschke, Wim Van Criekinge

The Effects of Latency on 3D Interactive Data Visualizations, Allen Korenevsky, Zoe Wood

Exploring High Dimensional Data Through Locally Enhanced Projections, Chufan Lai, Ying Zhao, Xiaoru Yuan

BeXplorer: Visual Analytics of Multiplex Behaviors in MMORPGs, Ji Lan, Xiao Xie, Junhua Lu, Tai-Quan Peng, Wei Chen, Yingcai Wu

[InfoVis Honorable Mention] **Towards Combining Mobile Devices for Visual Data Exploration,** Ricardo Langner, Tom Horak, Raimund Dachselt

SATORI: A System for Ontology-Guided Visual Exploration of Biomedical Data Repositories, Fritz Lekschas, Nils Gehlenborg

Flowstory: Storytelling for Improving Memorability and Comprehension, Johannes Liem, Jo Wood, Greg Slabaugh

JobViz: Interactive Visualization of Majors & Jobs, Li Liu, Deborah Silver, Karen Bemis

Filter+: Interaction Argument for Web-based Visualization, Min Lu, Jie Liang, Zongru Li, Siming Chen, Xiaoru Yuan

Visual Analysis of Mixed Numerical and Categorical Data in Cohort Studies, José Matute, Lars Linsen

2.5D Edge Bundling, Quan Nguyen, Seokhee Hong, Peter Eades

China's Property Market Visual Report: An Interactive Web-based Narrative Visualization for Data Journalism, Yining Nie, Siming Chen, Xiaoru Yuan, Zhimin Huang, Ka Wai Chan

Redundant Coding Can Speed Up Segmentation in Multiclass Displays, Christine Nothelfer, Michael Gleicher, Steven Franconeri

Visualization of Crowd movements at Large-scale Events, Maya Okawa, Aki Hayashi, Kim Hideaki, Takuya Nishimura, Hiroyuki Toda

Two Novel Participatory Solutions for Visual Interfaces Supporting Decision Making Processes, Tomasz Opach, Jan Ketil Rød

WorldVis: A Visualization Tool for World Data, Juliette Pardue, Mridul Sen, Christos Tsolakis, Reid Rankin, Ayush Khandelwal, Michele Weigle

[InfoVis Best Poster] **Affective Colour Palettes in Visualization,** Abhisekh Patra, Lyn Bartram, Maureen Stone

Cartoglyphs: Reducing the World to a Glyph for Quick Exploration and Comparison of Spatio-Temporal Change, Vanessa Peña-Araya, Jorge Bahamonde, Barbara Poblete, Benjamin Bustos

Making Sense of Graph Query Results: Interactive Summarization and Exploration, Robert Pienta, Alex Endert, Shamkant Navathe, Duen Horng Chau

Supporting the Comprehension of Interactive Visualizations, Thomas Plank, Markus Helfert, Peter Hofer

SDCurve.js: A JavaScript Library for Interactive Subdivision Curves, Richard Pusch, Charles Perin, Sheelagh Carpendale

Probabilistic Volume Rendering using Data-driven High-dimensional Features, Tran Minh Quan, JunYoung Choi, Won-Ki Jeong

Pattern-based progressive analytics on interaction traces, Vincent Raveneau, Julien Blanchard, Yannick Prié

Capturing and Visualizing Uncertainty in Liver Ablation, Gordan Ristovski, Nicole Garbers, Horst K. Hahn, Tobias Preusser, Lars Linsen

Creating Explanatory Visualizations of Algorithms for Active Learning, Jonathan Roberts, James Jackson, Christopher Headleand, Panagiotis Ritsos

VASE (Visualized Atmosphere Sounding Exploration), Lisa Rogers

Sonification Support for Information Visualization Dense Data Displays, Niklas Rönnberg, Gustav Hallström, Tobias Erlandsson, Jimmy Johansson

Tasks to Tease Apart Scatterplot Design Decisions, Alper Sarikaya, Michael Gleicher

Determining and Visualising E-mail Subsets to Support E-discovery, Mithileysh Sathiyanarayanan, Cagatay Turkay

Tangible Brush: Performing 3D Selection with Portable and Position-aware Devices, Mickael Sereno, Mehdi Ammi, Tobias Isenberg, Lonni Besançon

Sense.me - Open Source Framework for the Exploration and Visualization of Eye Tracking Data, Nelson Silva, Lin Shao, Tobias Schreck, Eva Eggeling, Dieter Fellner

NL4DV: Toolkit for Natural Language Driven Data Visualization, Arjun Srinivasan, John Stasko

Visual Evaluation of Cloud Infrastructure Performance Predictions, Holger Stitz, Samuel Gratzl, Harald Rogner, Marc Streit

Optimized Displacement and Selection in Scale-Aware Map Editing, Shigeo Takahashi, Hsiang-Yun Wu, Masatoshi Arikawa, Sheung-Hung Poon

HistoryMan: a Generic History Visualization Framework in the Loop, Tomomi Takashina, Yuji Kokumai

Promoting and Gamifying Energy Sustainability through Visualization, Soon Tang, Jonathan Leidig

SocialFlow: Visual Analysis of Spatio-temporal Diffusion of Information on Social Media, Tan Tang, Guodao Sun, Tai-Quan Peng, Ronghua Liang, Hong Zhou, Yingcai Wu

Semantic Flow Graph: A Framework to Explore 3D Flow Fields, Jun Tao, Chaoli Wang, Nitesh Chawla, Lei Shi

Understanding Data-Driven Visual Encodings through Deconstruction, John R Thompson, John Stasko

Maritime Trajectory Visualization, Rishu Vaid, David Koop

A Visualization Method for Understanding Forensic Statements, Jing Wang, Yufang Ho, Zhijie Xu, Dan McIntyre, Jane Lugea

Quality Metrics for Tile Grid Maps, Krist Wongsuphasawat

Consistent placement of labels with different scale ranges, Hsiang-Yun Wu, Shigeo Takahashi, Masatoshi Arikawa, Sheung-Hung Poon

Visualizing Publication Data, Kui Wu, Duong Hoang, Alexander Lex

Google Glass for Personalized Augmentations of Data Visualizations, Dan Zhang, Darius Coelho, Klaus Mueller

Visualizing Ensemble Data in Scale Space, Fangyan Zhang, Song Zhang, Andrew Mercer

Empirical Guidance on Integral and Separable Marker Substrate for Large-Magnitude-Range Vector Field Visualization, Henan Zhao, Jian Chen

Doctoral Colloquium

Session 1

Understanding Sensemaking Strategies in Criminal Intelligence Analysis Looking at User Interaction, Johanna Haider, *Vienna University of Technology, Austria*

Analyzing Creative Processes: Qualitative Methods Meets Visual Analytics, Rhema Linder, *Texas A&M University, USA*

Drawing Small Beautiful Diagrams, Vahan Yoghourdjian, *Monash University, UK*

On the Scalability of Large Graph Visualization, Yanhong Wu, *Hong Kong University of Science and Technology, PRC*

Visual Exploration Techniques for Urban Planning, Fabio Miranda, *New York University, USA*

Proofreading of Automatic Segmentations in Connectomics, Daniel Haehn, *Harvard University, USA*

Session 2

Scalable Visual Analytics for Advanced Manufacturing, Dominik Herr, *University of Stuttgart, Germany*

Effective Visualization of The Uncertainty in Hurricane Forecasts, Le Liu, *Clemson University, USA*

Spatial-Nonspatial Visual Integration of Dynamic, Multi-Scale and Comparative Biological Networks, Chihua Ma, *University of Illinois at Chicago, USA*

Session 3

Integrating Predictive Analytics and Social Media, Yafeng Lu, *Arizona State University, USA*

Spatio-Temporal Historical Event Visual Exploration Through Social Media-Based Models, Vanessa Peña-Araya, *University of Chile, Chile*

Implementation and Evaluation of Cartogram Generation Algorithms, Sabrina Nusrat, *University of Arizona, USA*

Targeting Designs of Scalable Exploratory Visual Summaries, Alper Sarikaya, *University of Wisconsin-Madison, USA*

Compiling Differential Tensor Calculus, Charisee Chiw, *University of Chicago, USA*

Flow Visualization and Analysis: From Geometry to Physics, Lei Zhang, *University of Houston, USA*

Session 4

Visual Analytics for Temporal Event Sequence Recommendation, Fan Du, *University of Maryland, USA*

Using Data Visualization to Bridge the Gaps in Tuberculosis Research, Anamaria Crisan, *The University of British Columbia, Canada*

Using Virtual Reality effectively: An Evaluation of Visual Fidelity Components in Immersive VR Environments, Johannes Novotny, *Brown University, USA*

VAST Challenge

VAST Challenge 2016: Streaming Visual Analytics, R. Jordan Crouser, Kristin Cook, John Fallon, Georges Grinstein, Kristen Liggett, Danko Nebesh, Diane Staheli, Mark A. Whiting, Kirsten Whitley

[Mini-Challenge 1 Award: Notable Support for Streaming Analysis]
Dynamite Dynamic Monitoring Interface for Task Ensembles, Wolfgang Jentner, Mennatallah El-Assady, Dominik Sacha, Dominik Jäckle, Florian Stoffel

[Mini-Challenge 1 Honorable Mention Compelling Vision]
Collaborative Observation and Response Environment, Jordan Riley Benson, Shaun Kurian, Karl Prewo, Rajiv Ramarajan

[Mini-Challenge 1 Honorable Mention Excellent Storyboard]
Fusing Events, Tasks and Spatial Awareness in an Ambient-Enabled Work Environment, Juri Buchmüller, Manuel Stein, Alexander Jger, Sabrina Schmidt, Hansi Senaratne, Halldór Janetzko

[Mini-Challenge 2 Award: Robust Support for Visual Anomaly Detection] **Visual Anomaly Detection in Spatio-Temporal Data using Element-Specific References,** Daniel Alcaide, Jansi Thiyagarajan, Houda Lamqaddam, Jaume Nualart Vilaplana, Jan Aerts

[Mini-Challenge 2 Award: Outstanding Presentation of Patterns in Context] **Visual Analytic Design for Contextualising Sensor Data,** Jo Wood

[Mini-Challenge 2 Honorable Mention Clear Analysis Strategy Haztrailz] **Exploratory Analysis of Trajectory and Sensor Data,** Sriram Karthik Badam, Christoph Kinkeldey, Petra Isenberg

[Mini-Challenge 2 Honorable Mention: User-Friendly Anomaly Detection] **VISTA: Visual Interactive Spatio-Temporal Data Analysis,** Kaushal Paneri, Gunjan Sehgal, Aditeya Pandey, Bindu Gupta, Siddharth Verma, Karamjit Singh, Geetika Sharma, Gautam Shroff

[Mini-Challenge 2 Honorable Mention: Effective Support for Building Management] **Divide and Conquer Approach to the Analysis of Complex Spatio-Temporal Sensory Data,** Rainer Splechtna, Michael Beham, Denis Gračanin, Alexandra Diehl, Claudio Delrieux, Krešimir Matković

[Mini-Challenge 2 Honorable Mention: Quality Aesthetics] **MetaCurve: A Method for Discovering Patterns, Identifying Anomalies, and Summarizing of Periodical Time Series Datasets,** Hui Tang, Zheng Zhou, Shuang Wei, Mingran Li, Siyan Liu, Hsin-man Wu, Xinghe Hu, Yuankun Song, Yingjie Chen, Zhenyu Qian

[Mini-Challenge 2 + Mini-Challenge 3 combined Award: Outstanding Comprehensive Solution] **STAD-HD: Spatial Temporal Anomaly Detection for Heterogeneous Data through Visual Analytics,** Yu Zhang, Guozheng Li, Chufan Lai, Qiangqiang Liu, Shuai Chen, Lu Feng, Tangzhi Ye, Siming Chen, Ren Zuo, Zhuo Zhang, Zhanyi Wang, Xin Huang, Fengchao Xu, Li Yu, Shunlong Zhang, Qiusheng Li, Xiaoru Yuan

Middguard at GASTech, Christopher Andrews, Lily Taub, Shannon Ovitt

Analyzing Trajectory Data Using Power BI, Dawoon Choi, Pablo Martinez, Ivo Rusconi

An interactive graph-based pipeline approach to the analysis of VAST 2016 Mini-Challenge 2 dataset, Guilherme S. M. Carneiro, Victor M. de Oliveira, Aaron Quigley, Hugo A. D. do Nascimento

Visual Analytics for Proximity and HVAC Sensor Data: VAST 2016 Mini-Challenge 2, Karthic Madanagopal, Paul Koola, John Freeze, Kalyan Vadakkeveedu

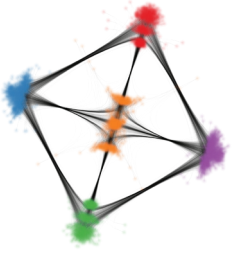
Dynamic Employee and Sensor Visualization: VAST 2016 Mini Challenge #2, Matthew Sinda, Ian Turk, Jun Tao, Qi Liao, Chaoli Wang, Lei Shi

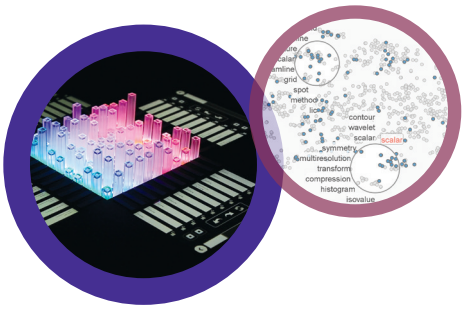
VAST 2016 Mini-Challenge 2, Pablo Andreoni, Adriana Romero, Alvaro Velez, Jhonny Rodriquez, Daniel Ojeda

Addressing VAST 2016 Mini Challenge 2 with POLAR Kermode, Classifier, Excel on a Power Wall and Data Timelines, Simon Attfield, Daniel Hewitt, Kai Xu, Peter Passmore, Adrian Wagstaff, Graham Phillips, David Windridge, Greg Dash, Richard Chapman, Lee Mason

A Novel Display Design for the Trajectory and the Environment Data Under Surveillance, Wang Junwei, Li Juncai, Zeng yuan, Li Lin, He Qi, Wang Xiangqian, Zhao Ying, Zhou Fangfang

Pororoca: Efficient Crowd Motion Monitoring and Instant Situation Awareness, Yuankun Song, Hsin-Man Wu, Xinghe Hu, Siyan Liu, Hui Tang, Zheng Zhou, Shuang Wei, Zhenyu (Cheryl) Qian, Yingjie (Victor) Chen





SciVis Contest

Viscous Fingers: A Topological Visual Analytic Approach, Garrett Aldrich, Jonas Lukasczyk, Michael Steptoe, Ross Maciejewski, Heike Leitte, Bernd Hamann

Interactive Topological Exploration of Particle Ensembles, Harsh Bhatia, Pavol Klacansky, Shusen Liu, Wathsala Widanagamaachchi, Attila Gyulassy, Valerio Pascucci, Peer-Timo Bremer

Visual and Structural Analysis of Point-based Simulation Ensembles, Sebastian Grottel, Patrick Gralka, Joachim Staib, Karsten Schatz, Grzegorz K. Karch, Manuel Hirschler, Michael Krone, Guido Reina, Stefan Gumhold, Thomas Ertl

Visualising Viscous Fingers, Martin Ender, Sebastian Weiß, Florian Ferstl, Johannes Kehrer, Rüdiger Westermann

Interactive Exploration and Tracking of Ensemble Viscous Fingers, Andrew Burks, Cassiano Sugiyama, Timothy Luciani, Jonathan Komperda, G. Elisabeta Marai

Visualizing Ensembles of Viscous Fingers, Guillaume Favelier, Charles Gueunet, Julien Tierny

VIS-In-Practice

new/s/leak – A Tool for Visual Exploration of Large Text Document Collections in the Journalistic Domain, Kathrin Ballweg, Florian Zouhar, Patrick Wilhelmi-Dworski, Tatiana von Landesberger, Uli Fahrer, Alexander Panchenko, Seid Muhie Yimam Chris Biemann, Michaela Regneri, Heiner Ulrich

Resonant Laboratory and Candela: Spreading Your Visualization Ideas to the Masses, Alex Bigelow, Roni Choudhury, Jeffrey Baumes

A Java alternative to open source visualization - VisNow, Bartosz A. Borucki, Krzysztof S. Nowiński

iDotter - an interactive dot plot viewer, Daniel Gerighausen, Alrik Hausdorf, Sebastian Zänker, Dirk Zeckzer

Uncertainty-Awareness in Open Source Visualization Solutions, Christina Gillmann, Thomas Wischgoll, Hans Hagen

MegaMol---for Fun and Profit, Sebastian Grottel, Guido Reina, Michael Krone, Christoph Müller, Thomas Ertl

Lessons learned from designing and implementing Network Explorer, a real world network visual analytics tool using open source software, John Alexis Guerra-Gomez

STRAD Wheel: Web-based Library for the Visualization of Temporal Data, Carol Naranjo-Valero, Diana Fernández-Prieto, José Tiberio Hernández, Hans Hagen

OpenThinning: Fast 3D Thinning based on Local Neighborhood Lookups, Tobias Post, Christina Gillmann, Thomas Wischgoll, Hans Hagen

Application of Visual Analytics to Maritime Domain Analysis, Margaret Varga, Valérie Lavigne

On Expressiveness and Conciseness of Data Graphics Templates, Romain Vuillemot

Java Scientific Containers - an open source generic large data library for visualization applications, Piotr Wendykier, Bartosz A. Borucki, Krzysztof S. Nowiński

Keshif: Out-of-the-Box Visual and Interactive Data Exploration Environment, Mehmet Adil Yalçın, Niklas Elmqvist, Benjamin B. Bederson

TrajAnalytics: A Web-Based Visual Analytics Software of Urban Trajectory Data, Ye Zhao, Shamal Al-Dohuki, Thomas Eynon, Farah Kamw, David Sheets, Chao Ma, Yueqi Hu, Xinyue Ye, Jing Yang

BioVis Posters

Visualizing the Trajectories and Contexts of Facial Branchiomotor Neuron Pioneers, Tri Huynh, Anastasia Beiriger, Victoria Prince, Gordon Kindlmann

Co-visualisation of Close Genetic Relatedness of Mycobacterium tuberculosis Isolates with Complex Meta-data, Trien V. Do, Oriol Mazariegos Canellas, Derrick Crook, Tim Peto, David Wyllie

A Story of Reanimating an Embryonic Mouse Limb, Yong Wan, A. Kelsey Lewis, Gabrielle Kardon, Charles Hansen

FluoRender: An Interactive Visualization System for 3D and 4D Confocal Microscopy Data in Neurobiology Research, Yong Wan, Hideo Otsuna, Chi-Bin Chien, Charles Hansen

MetroNome: Visual Data Exploration for a Genomic Data Repository, Christian Stolte, Dorian Leary, Dimitrije Jeremovic, Kevin Shi, Sudeep Mehrotra, Nina Lapchyk, Avinash Abhyankar, Ann-Katrin Emde, Shailu Gareya, Toby Bloom

Visual Analysis System for Clustering Dementia Patients Based on Similarity of Dementia Phase Changing Pattern, Mubashar Karim Raja, Youngbeom Choi, Wooseok Song, Kyungwon Lee

The JAX Synteny Browser for Mouse-Human Comparative Genomics, Mei Xiao, Keith Sheppard, Paul Hale, Govindarajan Kunde-Ramamoorthy, Joel Richardson, Carol Bult

LDAV Posters

Topology-aware Image Compositing using NVLink, Cameron Christensen, Thomas Fogal, Nathan Luehr, Cliff Woolley

Scalable Rendering of Large SPH Simulations Using an RK-Enhanced Interpolation Scheme on Constrained Datasets, Kevin Griffin, Kevin Griffin, Cody Raskin

Segmented Time Series Visualization Tool for Additive Manufacturing, William Halsey, Chad Steed, Ryan Dehoff, Vincent Paquit, Sean Yoder

A Lightweight H.264-based Hardware Accelerated Image Compression Library, Jie Jiang, Thomas Fogal, Cliff Woolley, Peter Messmer, Thomas Fogal

Statistical Projections for Multi-dimensional Visual Data Exploration, Hoa Nguyen, Daithi Stone, E. Wes Bethel

Formal Evaluation Strategies for Feature Tracking, Andrea Schnorr, Sebastian Freitag, Dirk Helmrich, Torsten W. Kuhlen, Bernd Hentschel

Correlating Sub-Phenomena in Performance Data in the Frequency Domain, Tom Vierjahn, Marc-André Hermanns, Bernd Mohr, Matthias S. Müller, Torsten W. Kuhlen, Bernd Hentschel

A Study of Scientific Visualization on Heterogeneous Processors Using Legion, Lina Yu, Hongfeng Yu

VizSec Posters

Visualizing DNS Datasets for Alert-driven Threat Analysis, Rosa Romero Gomez, Yacin Nadji, Panagiotis Kintis, Manos Antonakakis

A Framework for Context-Aware Visualization in Cyber Defense, Adam Fouse, Ryan Mullins, Caroline Ziemkiewicz

DirViz: Interactively Scale Treemaps for File Permission Visualization, Jared Chandler, Lane Harrison

Network Security Visualization Using Virtual Reality, Brandon Laughlin

Applying Data Transformation to Derive Insights for Network Intrusion Detection, Dong Hyun Jeong, Soo-Yeon Ji

Big Data, Bigger Audience: A Meta-algorithm for Making Machine Learning Actionable for Analysts, Dylan Cashman, Stephen Kelley, Diane Staheli, Cody Fulcher, Marianne Procopio, Remco Chang

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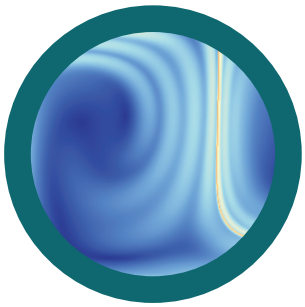

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