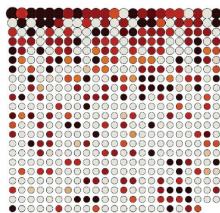
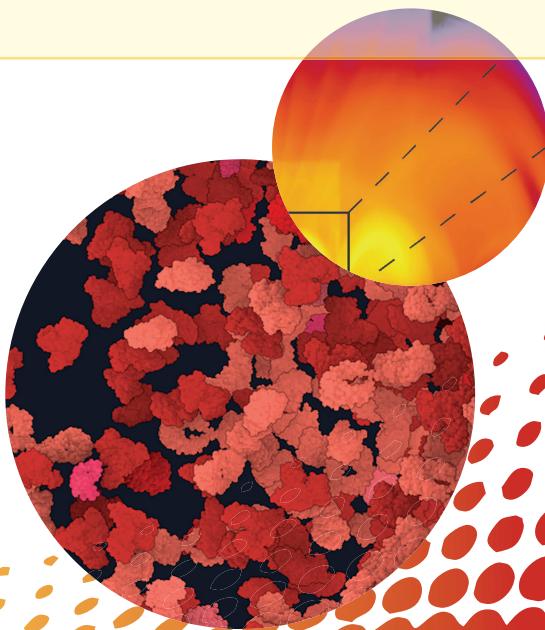


# VIS 2018

VAST  
INFOVIS  
SCIVIS

21–26 OCTOBER 2018  
BERLIN, GERMANY



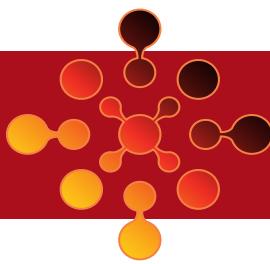
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Sponsored by the IEEE Computer Society  
Visualization and Graphics Technical Committee.

# WELCOME



## Welcome to IEEE VIS 2018!

For the second time, IEEE VIS comes to Europe! Berlin is one of the most vibrant and interesting cities in Europe. It offers many cultural highlights, historic sites, touristic sightseeing as well as plenty of restaurants and entertainment around.

The conference is held 21-26 October 2018 in the Estrel Hotel Berlin. It includes programs for students, academics, artists, industry and commercial practitioners, government researchers, and anyone with interests in visualization and data analytics.

The three main conferences IEEE Visual Analytics in Science and Technology (VAST), IEEE Information Visualization (InfoVis), and IEEE Scientific Visualization (SciVis), feature a record number of full paper presentations. In addition, we have a variety of tutorials, workshops, art programs, panels, demonstrations, posters and exhibitions. For the first time, VIS 2018 has an Inclusivity & Diversity Scholarship program.

We expect more than 1000 participants from dozens of countries. Enjoy a week full of discussions, insights, ideas, meetings, inspirations and solutions around all aspects of visualization. Enjoy Berlin!

**Holger Theisel, University of Magdeburg**  
VIS 2018 General Chair

## Berlin

Explore this unique city along with attending IEEE VIS! Despite being a hotspot, hotel and restaurant prices are still rather affordable in Berlin.

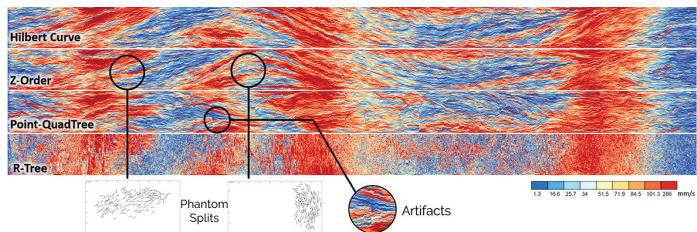
Berlin has a highly developed transportation infrastructure providing diverse modes of urban mobility. Long-distance rail lines connect Berlin with all major German cities and with many cities in neighboring European countries. Berlin's local public transport network consists of several integrated systems. These include the U-Bahn and S-Bahn urban rail systems, regional railway services, a tramway system, a bus network and a number of ferry services. There are a large number of common interchange stations between the different modes.

The conference hotel is located in the district Berlin-Neukölln. Neukölln is a part of Berlin with international flair. In the past few years, northern Neukölln has undergone a transformation and has seen a huge influx of students and artists as the area becomes increasingly popular. Close to the conference hotel, there are plenty of restaurants. All important tourist attractions in Berlin can be reached by public transportation within a few minutes.



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## How to Order Proceedings

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# ESTREL HOTEL & CONGRESS CENTER

## 1 Conference Registration

Located on ground floor: Foyer Estrel Hall  
Saturday 6:00 PM–8:00 PM  
Sunday & Tuesday 7:30 AM–5:00 PM  
Monday, Wednesday, Thursday 8:00 AM–5:00 PM  
Friday 8:00 AM–11:00 AM

## 2 Tutorials, Workshops, Pre-approved Events

Located on ground floor: Conv 1, Sec C / Conv 1, Sec D / Estrel Hall A / Estrel Hall B / Estrel Hall C / Room Paris  
Located on 1st floor: Room II / Room III  
Sunday–Monday 9:00 AM–6:00 PM

## 3 Conference Sessions

Located on ground floor: Conv 1, Sec C / Conv 1, Sec D / Estrel Hall A+B / Estrel Hall C  
Located on 2nd floor: Room IV  
Tuesday 8:30 AM–6:00 PM  
Wednesday–Thursday 9:00 AM–6:00 PM  
Friday 9:00 AM–12:30 PM

## 4 Posters

Located on ground floor: Foyer Estrel Hall / Foyer 1

## 5 Supporter Exhibition

Located on ground floor: Foyer 3  
Tuesday–Thursday 10:40 AM–6:00 PM

## 6 Arts Program

Located on ground floor: Room Paris  
Opening Tuesday 7:00 PM  
Exhibition Wednesday–Thursday 9:00 AM–6:00 PM

## 7 Speaker Preparation

Located on 2nd floor: Room 30241  
Sunday–Thursday 9:00 AM–6:00 PM

## 8 Meetup Rooms

Located on 3rd & 4th floor:  
Rooms 30310 / 30312 / 30341 / 30441  
Sunday–Friday, Schedule at Registration Desk

## 9 Interview Room

Located on 2nd floor: Room 30210  
Sunday–Friday, Schedule at Registration Desk

## 10 VISKids Room

Located on 2nd floor: Room 30212  
Sunday–Friday

All participants will have free W-LAN access:  
The W-Lan login is: VIS2018  
password: Berlin2018



# VIS KEYNOTE

## When Visualization Met Augmented Reality

Dieter Schmalstieg

*Institute of Computer Graphics and Vision at Graz University of Technology, Austria*

Tuesday, 23 October 2018, 11:20 AM–12:20 PM @ Convention Hall 1, Section C+D

### Abstract

In the past year, Augmented Reality (AR) has been introduced in several products of premier technology companies, addressing billions of mobile computing users. In particular, a new breed of AR games is engaging and visually appealing. In contrast, non-entertainment applications of AR generally tend to lack sophisticated content. This can be related to the fact that AR developers are only learning how to effectively use the new medium. But it also has to do with the lack of overlap in AR research and visualization research. While AR research has mostly been driven by computer vision with minimal consideration of the visual output, VIS is the field where the perceptual and cognitive foundations of visual information are studied. AR needs VIS! As AR matures, it will be vital to bring the two fields together. VIS needs to address the new medium AR, embracing its two key aspects: mobility and mixed real+virtual perception. AR poses new challenges for VIS, as the visual information needs to adapt to reality rather than shaping the entire visual domain. This talk will discuss fundamental properties of AR visualization and present examples of previous, current and future work.

### Bio

Dieter Schmalstieg is full professor and head of the Institute of Computer Graphics and Vision at Graz University of Technology, Austria. His current research interests are augmented reality, virtual reality, computer graphics, visualization and human-computer interaction. He received Dipl.-Ing. (1993), Dr. techn. (1997) and Habilitation (2001) degrees from Vienna University of Technology. He is author and co-author of over 300 peer-reviewed scientific publications with over 14,000 citations, with over twenty best paper awards and nominations. His recent textbook "Augmented Reality - Principles and Practice" (2016) is published by Addison-Wesley Professional. His organizational roles include associate editor in chief of IEEE Transactions on Visualization and Computer Graphics, member of the editorial advisory board of computers & graphics and of the Springer Virtual Reality journal, member of the steering committee of the IEEE International Symposium on Mixed and Augmented Reality, chair of the EUROGRAPHICS working group on Virtual Environments (1999-2010), key researcher of the K-Plus Competence Center for Virtual Reality and Visualization in Vienna and key researcher of the Know-Center in Graz. In 2002, he received the START career award presented by the Austrian Science Fund. In 2012, he received the IEEE Virtual Reality technical achievement award for seminal contributions to the field of Augmented Reality. He was elected as a senior member of IEEE, as a member of the Austrian Academy of Sciences and as a member of the Academia Europaea. In 2008, he founded the Christian Doppler Laboratory for Handheld Augmented Reality.



# VIS CAPSTONE

## Can I Believe What I See? Information-Theoretic Algorithm Validation

Joachim M. Buhmann

*Department of Computer Science at ETH Zurich*

Friday, 26 October 2018, 11:00 AM–12:00 PM @ Convention Hall 1, Section C

### Abstract

Data Science promises us a methodology and algorithms to gain insights in ubiquitous Big Data. Sophisticated algorithmic techniques seek to identify and visualize non-accidental patterns that may be (causally) linked to mechanisms in the natural sciences, but also in the social sciences, medicine, technology, and governance. When we use machine learning algorithms to inspect the often high-dimensional, uncertain, and high-volume data to filter out and visualize relevant information, we aim to abstract from accidental factors in our experiments and thereby generalize over data fluctuations. Doing this, we often rely on highly nonlinear algorithms.

This talk presents arguments advocating an information-theoretic framework for algorithm analysis, where an algorithm is characterized as a computational evolution of a posterior distribution on the output space with a quantitative stopping criterion. The method allows us to investigate complex data analysis pipelines, such as those found in computational neuroscience, neurology, and molecular biology. I will demonstrate this concept for the validation of algorithms using the example of a statistical analysis of diffusion tensor imaging data. In addition, on the example of gene expression data, I will demonstrate how different spectral clustering methods can be validated by showing their robustness to data fluctuations and yet sufficient sensitivity to changes in the data. All in all, an information-theoretical method is presented for validating data analysis algorithms, offering the potential of more trustful results in Visual Analytics.

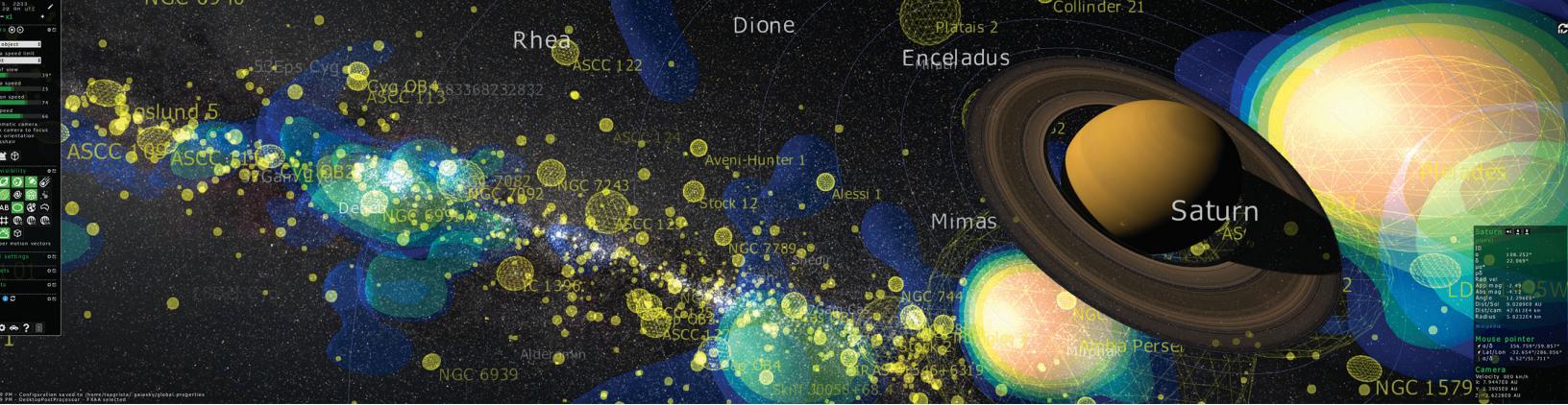
### Bio

Joachim M. Buhmann is full professor in the Department of Computer Science at ETH Zurich since 2003 representing the research area “Information Science and Engineering”. He studied physics at the Technical University of Munich and received a doctoral degree for his research work on artificial neural networks. After research appointments at the University of Southern California (1988-1991) and at the Lawrence Livermore National Laboratory (1991-1992) he served as a professor for applied computer science at the University of Bonn (1992-2003).

His research interests range from statistical learning theory to applications of machine learning and artificial intelligence. Research projects are focused on topics in neuroscience, biology and medical sciences, as well as signal processing and computer vision.

He headed the German Society for Pattern Recognition (DAGM e.V.) from 2009-15 and was elected as their honorary member in 2017. In 2014-17 he served as Vice-Rector for Study Programmes at ETH Zurich. The Swiss Academy of Technical Sciences SATW elected him as a regular member in 2017. He serves also as a research council member of the Swiss National Science Foundation.





## Diversity & Inclusivity

Promoting and fostering inclusion is important to IEEE VIS. The IEEE VIS community provides opportunities to underrepresented groups as well as education to the community on the benefits of a more inclusive culture and programming. Acknowledging the uniqueness of each individual, IEEE VIS seeks to cultivate an environment that encourages freedom of expression. As part of our efforts, we are proud to sponsor a variety of events and programs at VIS that are focused on inclusion and diversity including the Inclusivity & Diversity Scholarship program, VISKids Childcare grant program, and meetup events.

IEEE VIS is committed to providing an inclusive and harassment-free environment in all interactions regardless of gender, sexual orientation, disability, physical appearance, race, or religion. Our Code of Conduct is available at: [http://ieeewis.org/year/2018/info/inclusion-and-diversity/code-of-conduct](http://ieeveis.org/year/2018/info/inclusion-and-diversity/code-of-conduct)

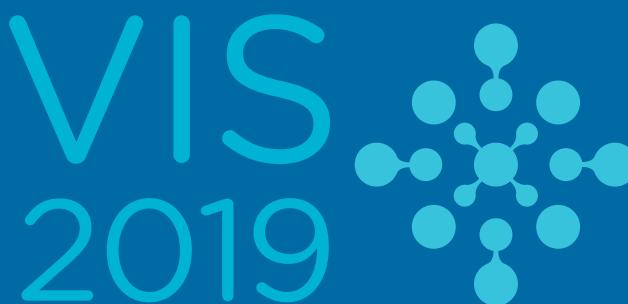
Please contact [ombuds@ieeewis.org](mailto:ombuds@ieeewis.org) if you experience, observe, or have knowledge of behavior in violation of the Code of Conduct.

Please contact [inclusivity@ieeewis.org](mailto:inclusivity@ieeewis.org) with any questions about the Code of Conduct and Inclusivity & Diversity at IEEE VIS.

## VisInPractice Practitioner Guide

Use this key to attend recommended sessions for Practitioners. See the full practitioner guide at <http://visinpractice.org>.

- AP** All Practitioners
- DS** Data Science and Machine Learning
- BA** Biomedical Applications
- DJ** Data Journalism & News Graphics
- UX** User Experience, Human Factors, and Interaction Design
- SS** Simulation Science



## Call for Participation 20-25 October 2019 Vancouver, BC, Canada

15th IEEE VAST Conference  
26th IEEE InfoVis Conference  
30th IEEE SciVis Conference

IEEE VIS 2019 will be the year's premier forum for advances in theory, methods, and applications of visualization and visual analytics. The conference will convene an international community of researchers and practitioners from universities, government, and industry to discuss findings and achievements in the design and use of visualization interfaces. We invite you to share your research, insights, experience, and enthusiasm at Visual Analytics Science and Technology (VAST), Information Visualization (InfoVis), Scientific Visualization (SciVis) and the other co-located events that we are planning. For 2019, IEEE VIS will take place in Vancouver, BC, Canada. One of Canada's most iconic tech cities, Vancouver is known for its scenic beauty, outdoor activities, and vibrant west-coast culture.

# www.ieeewis.org

Follow @ieeewis to keep up with conference activities and announcements.

Questions? Email [info@ieeewis.org](mailto:info@ieeewis.org)

VIS 2019 General Chair:

Brian Fisher, *Simon Fraser University*

Alex Endert, *Georgia Institute of Technology*

Wesley Willett, *University of Calgary*

# 2018 AT-A-GLANCE



SUNDAY, 21 OCTOBER

Room Paris	Workshop: Machine Learning from User Interaction for Visualization and Analytics	DS
Room III	Workshop: VISREG - Visual Summarization and Report Generation	
Room II	Workshop: VisGuides: 2nd Workshop on the Creation, Curation, Critique and Conditioning of Principles and Guidelines in Visualization	
Estrel C	Tutorial: Urban Trajectory Data Visualization	
Estrel B	BioVis Challenge	SS BA
Estrel A	VishnPractice	AP
Conv 1, Sec D	VDS: Visualization in Data Science	DS
Conv 1, Sec C	VizSec: Visualization for Cyber Security	
Room Paris	Workshop: Visualization for Communication (VisComm)	DJ
Room III	Workshop: Toward a Design Language for Data Physicalization	UX
Room II	Tutorial: Everything Except the Chart 2018	AP
Estrel C	Workshop: 3rd Workshop on Visualization for the Digital Humanities	
Estrel B	Tutorial: Introduction to IATK: An Immersive Visual Analytics Toolkit	UX
Estrel A	VASTChallenge	DS
Conv 1, Sec D	LDAV: Large Data Analysis and Visualization	SS
Conv 1, Sec C	BELIV: Evaluation and Beyond—Methodological Approaches for Visualization	

MONDAY, 22 OCTOBER

9:00 AM	Workshop: Visualization for AI Explainability (ViSxAI)	DS
10:40 AM	Workshop: Storyboards for Science: Combining the Visual and Verbal to Create Engaging Communication	DJ
11:00 AM	Workshop: CityVis – Urban Data Visualization	
12:40 PM	Tutorial: Cost-benefit Analysis in Visualization: Theory and Practice	
1:00 PM	LUNCH	
2:20 PM	Workshop: Topological Data Analysis Made Easy with the Topology Toolkit (TTK)	SS BA
3:00 PM	Workshop: DSIA: Data Systems for Interactive Analysis	DS
4:00 PM	Tutorial: Recent Feature Tracking Techniques	SS
4:20 PM	Tutorial: Comparative Visualization: Interactive Designs and Algorithms Depending on Data and Tasks	AP
6:00 PM	Fast Forward (Tue & Wed Sessions) (6:15–7:15 PM) @ Conv 1, Sec C	
7:00 PM		
9:00 PM		

VIS Opening Reception (7:00–9:00 PM)  
@ Foyers

# TUESDAY, 23 OCTOBER

8:30 AM  
9:00 AM

VAST Conv 1, Sec C	INFOVIS Conv 1, Sec D	SCIVIS Estrel A+B	VIS Estrel C
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VIS Welcome (8:30–8:45 AM)  
VGTC Technical Awards (8:45–9:00 AM)  
Test of Time Awards (9:00–10:00 AM)  
VIS Best Papers (10:00–11:00 AM)  
*@ Conv 1, Sec C+D*

**AP**

10:40 AM  
BREAK  
11:00 AM

**BREAK (11:00–11:20 AM)**

**VIS Keynote (11:20 AM–12:20 PM)**  
*When Visualization Met Augmented Reality*  
Dieter Schmalstieg, Graz University of Technology  
*@Conv 1, Sec C+D*

**AP**

12:40 PM

**LUNCH**  
(12:20–2:05 PM)

LUNCH

2:05 PM  
2:20 PM

VAST Opening	InfoVis Opening	SciVis Opening	
Evaluation and Theory	Multiple Dimensions	Flow Features	Panel: Succeeding by Failing: The Iceberg in VIS Careers

4:00 PM  
BREAK

4:20 PM

Spatio-Temporal Data	Evaluation & Applications	Biological Applications	Supporters Presentations
	<b>AP</b>	<b>BA</b>	<b>AP</b>

6:00 PM

Celebration of Life:  
Georges Grinstein  
(6:15–7:15 PM)  
*@ Estrel C*

VIS Arts Program Opening Event  
*@ Room Paris + Foyer*

9:00 PM

# WEDNESDAY, 24 OCTOBER

VAST Conv 1, Sec C	INFOVIS Conv 1, Sec D	SCIVIS Estrel A+B	VIS Estrel C	VIS Room IV
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Ensemble and Provenance <b>DS</b>	Time	Biomedical Visualization <b>BA</b>	VAST: Text <b>DS BA</b>	VisAP Session 1
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**BREAK**

Applications <b>AP</b>	Graphs & Trees	Volume Visualization	InfoVis: Devices: Small & Large <b>UX</b>	CG&A Session 1
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Restructuring IEEE VIS  
for the Future  
(1:00–2:20 PM) *@ Conv 1, Sec C*

LUNCH

High Dimensional Data <b>DS</b>	Text & Communication <b>AP</b>	Space and Physics <b>SS</b>	SciVis Contest <b>SS</b>	Panel: Perspectives in Color Research for Scientific Visualization
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**BREAK**

Fast Forward (Thu & Fri Sessions) (4:20–5:20 PM) <i>@ Estrel A+B</i> <b>AP</b>
Posters + Networking + Hiring events (5:20–7:00 PM) <i>@ Foyers</i> <b>AP</b>

Celebration of Life: Georges Grinstein (6:15–7:15 PM) <i>@ Estrel C</i>	VIS Dinner Banquet (7:00–9:00 PM) <i>@ Conv 1, Sec C+D</i>
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# THURSDAY, 25 OCTOBER

VAST Conv 1, Sec C	INFOVIS Conv 1, Sec D	SCIVIS Estrel A+B	VIS Estrel C	VIS Room IV
Security, Privacy, and Anomaly	Immersive Analytics <b>UX</b>	Tensors	VAST: Interactive Analytics and Design <b>DS</b>	VisAP Session 2
BREAK				
Deep Learning <b>DS</b>	Design & Storytelling <b>DJ</b>	Scalable Techniques <b>SS</b>	InfoVis: Interaction <b>UX</b>	CG&A Session 2 <b>SS BA</b>
LUNCH				
Graph and Image	Perception & Cognition 1	Topology, Geometry, and Precision	SciVis Short: Visual Abstractions, Perceptual Study and Immersive Visualization <b>SS UX</b>	Panel: Meet the Founders: How to Start and Sustain a Business in the Visualization Space <b>AP</b>
BREAK				
Explainable ML <b>DS</b>	Perception & Cognition 2	Interaction and Multivariate Data <b>UX</b>	SciVis Short: Flow, Astrophysics, and Computationally Intensive Data Visualization	

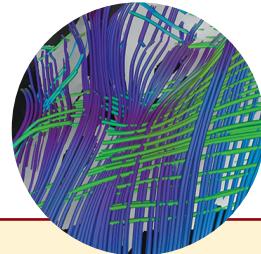
## Open Discussion Session: Restructuring IEEE VIS for the Future

Wednesday, 1:00–2:20 PM @ Conv 1, Sec C

IEEE VIS is at a crossroads: for many years it has been subdivided into the SciVis, InfoVis, and Visual Analytics conferences. There is now considerable appetite to consider alternate structures, such as a more unified conference, that may better enhance vibrancy and growth. Our goals are to preserve intellectual diversity while promoting organizational consistency. The organizers of this open discussion have been charged by the VIS Executive Committee (VEC) to guide this decision-making process, which started in 2016. The goal of this session is to provide a broad cross-section of the community a voice into the set of options under consideration. Your participation will shape the future of our flagship venue and thus the field of visualization for the coming decades.

# FRIDAY, 26 OCTOBER

VAST Conv 1, Sec C	INFOVIS Conv 1, Sec D	SCIVIS Estrel C
Event, Sequence, and ML <b>DS</b>	Uncertainty & Error	Time-varying Data <b>SS</b>
BREAK		
<b>AP</b> VIS Capstone (11:00 AM–12:00 PM) Can I Believe What I See?—Information-Theoretic Algorithm Validation Joachim M. Buhmann, ETH Zurich		
<b>AP</b> VIS Closing (12:00–12:30 PM) @ Conv 1, Sec C		



<b>Posters</b> Located in Foyer 1 & Foyer Estrel Hall Sunday—Thursday, 9:00 AM–6:00 PM
<b>Exhibitions</b> Located in Foyer 3 Tuesday—Thursday, 10:40 AM–6:00 PM
<b>VIS Arts Program</b> Located in Room Paris Opening, Tuesday 7:00 PM Exhibition, Wednesday—Thursday, 9:00 AM–6:00 PM
6:00 PM 7:00 PM 9:00 PM

# PROGRAM DETAILS

SUNDAY, 21 OCTOBER

12:50–1:20 PM

Room II

## Meetups: VIS Newcomers

Organizers: Anastasia Bezerianos, Jonathan Woodring, Weiwei Cui  
Attending VIS for the first time can be overwhelming, especially if you don't know any other attendees, it's your first conference, or if you are new to visualization. The VIS Newcomers Meetup is a conference orientation and informal lunch intended for first-time VIS attendees, regardless of experience, from students to practitioners. This allows participants to meet other conference goers and learn various tips for attending VIS. The meetup will start with a short presentation containing conference tips. Following the presentation, meetup attendees will split into small groups led by experienced VIS attendees to continue discussions over lunch and get to know each other. Contact: [community@ieevis.org](mailto:community@ieevis.org)

## Workshops and Tutorials

Full Day

Estrel Hall A

### Workshop (9:00 AM–6:00 PM)

#### VAST Challenge

Contributors: Kristin Cook, Jordan Crouser, Georges Grinstein, Mark Whiting

The Visual Analytics Science and Technology (VAST) Challenge is an annual contest with the goal of advancing the field of visual analytics through competition. The VAST Challenge is designed to help researchers understand how their software would be used in a novel analytic task and determine if their data transformations, visualizations, and interactions would be beneficial for particular analytic tasks. VAST Challenge problems provide researchers with realistic tasks and data sets for evaluating their software, as well as an opportunity to advance the field by solving more complex problems.

Estrel Hall C

### Workshop (9:00 AM–6:00 PM)

#### Visualization for the Digital Humanities

Contributors: Mennatallah El-Assady, Stefan Jänicke, David Joseph Wrisley, Eric Alexander, Adam James Bradley, Min Chen, Uta Hinrichs  
We are witnessing a growth in collaborations and interdisciplinary research between the humanities and computing.

In this year's workshop, we hope to feature some of this innovation in the realm of applied visualization, as well as to explore new avenues for interdisciplinary and collaborative research between visualization and the humanities.

We will explore different vocabularies and conceptual frameworks to think about how to engage differences as potentially rich opportunities rather than seeing them as barriers.

Half Day

Room III

### Workshop (9:00 AM–12:40 PM)

#### UX Toward a Design Language for Data Physicalization

Contributors: Trevor Hogan, Uta Hinrichs, Jason Alexander, Samuel Huron, Sheelagh Carpendale, Eva Hornecker

The aim of this workshop is to draw together practitioners and researchers in order to discuss different approaches toward a design language for data physicalization. Through a series of invited talks alternating with hands-on discussions of existing physicalization examples, the workshop will start to consolidate different efforts of characterizing and evaluating the core properties or "variables" that drive data physicalization, and to define a research agenda in this area.

Room Paris

### Workshop (9:00 AM–12:40 PM)

#### DJ Visualization for Communication (VisComm)

Contributors: Robert Kosara, Benjamin Watson

While visualization research is still largely focused on data analysis, most people's experience with visualization is in the form of communication and presentation, as seen now in publications such as the New York Times and from an independent community of visualization practitioners and bloggers. The VisComm workshop will bring together both practitioners and researchers from a broad range of disciplines to address the questions raised by visualization's new communicative role. We encourage participation from journalists, designers and others that do not typically attend IEEE VIS and write academic manuscripts. Accordingly, we seek not only short papers but also visual case studies: one-page abstracts with video walkthroughs of communicative visualizations.

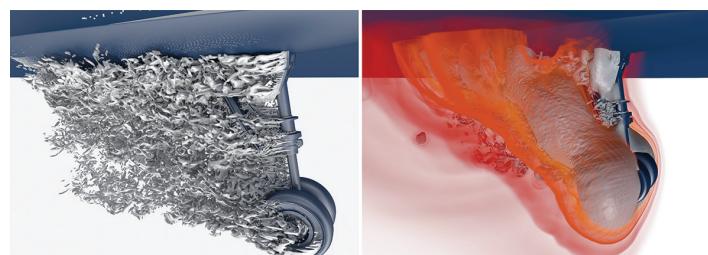
Estrel Hall B

### Tutorial (9:00 AM–12:40 PM)

#### UX Introduction to IATK: An Immersive Visual Analytics Toolkit

Contributors: Maxime Cordeil, Andrew Cunningham, Tim Dwyer, Kim Marriott, Bruce H. Thomas

Immersive Analytics Toolkit is an open source visualization toolkit for the Unity game engine that fills this gap. Specifically, IATK supports an infovis pipeline for virtual and augmented reality environments, visualizes large (up to 1 million) data points at an optimal framerate for immersive applications, and provides a technology-agnostic model for user interactions with immersive visualizations. This tutorial will introduce the Unity game engine and teach practical skills for implementing immersive data visualizations using IATK.



*Room II***Tutorial (9:00 AM–12:40 PM)****AP Everything Except the Chart 2018**

Contributors: Dominikus Baur, Moritz Stefaner

This half-day tutorial is an updated version of the very popular “Everything except the chart” tutorial at IEEE VIS 2014. With several years of experience as freelance visualization developers and on the basis of their successful projects, the tutorial organizers will not only help researchers and practitioners with intermediate experience in web-based visualizations, but also provide an entry point for novices to this topic, to learn the proper environment before diving into creating the actual content.

*Room III***Workshop (2:20–6:00 PM)****DS DSIA: Data Systems for Interactive Analysis**

Contributors: Dominik Moritz, Joseph Cottam, Leilani Battle, Marianne Procopio

The goal of the DSIA workshop is to bring together researchers from the database and machine learning community to participate in VIS. The premise of the workshop is that the development of back-end data systems is of increasing importance for visualization tools due to the growing size and complexity of data and the increased demand for interactivity. However, tackling the issue of data systems cannot be addressed by VIS researchers alone. Collaboration with other communities is essential to ensure integration between the front-end visualization and back-end storage and computation.

*Estrel Hall B***Tutorial (2:20–6:00 PM)****AP Comparative Visualization: Interactive Designs and Algorithms Depending on Data and Tasks**

Contributors: Tatiana von Landesberger, Kathrin Ballweg, Hans-Jörg Schulz, Natalie Kerracher, Margit Pohl

This tutorial presents how differences in data and task influence visual-analytical solution designs for the three main cases of 1-to-1, 1-to-many, and many-to-many comparisons. We first characterize the comparison problem for each of these cases. We then show how the specifics of these cases influence the algorithmic and visual

solution design both in theory and in real world examples. In combination, this tutorial provides the means for a systematic analysis and perceptually grounded solution design for visual comparison scenarios.

*Room II***Tutorial (2:20–6:00 PM)****SS Recent Feature Tracking Techniques**

Contributors: Hanqi Guo, Harsh Bhatia, Tino Weinkauf, Gunther H. Weber, Han-Wei Shen

The purpose of this tutorial is to review feature tracking, a traditional but still core research topic in scientific visualization. The tutorial has two main sessions: the first session will review general techniques including statistics, topology, and combinatorial based feature tracking algorithms; the second session will then present specific feature tracking algorithms for complex-valued scalar fields and flow fields. The tutorial will also organize a short panel discussion on future research directions on feature tracking.

*Room Paris***Tutorial (2:20–6:00 PM)****SS BA Topological Data Analysis Made Easy with the Topology ToolKit (TTK)**

Contributors: Guillaume Favelier, Charles Gueunet, Attila Gyulassy, Julien Jomier, Joshua A. Levine, Jonas Lukasczyk, Daisuke Sakurai, Maxime Soler, Julien Tierny, Will Usher, Qi Wu

This tutorial presents the Topology ToolKit (TTK), a recently released open-source library for topological data analysis. Instead of focusing on theoretical aspects and algorithmic details, this tutorial focuses on how topological methods can be useful in practice for concrete data analysis tasks such as segmentation, feature extraction or tracking. This tutorial mostly targets students, practitioners and researchers who are not experts in topological methods but who are interested in using them in their daily tasks.

**7:00–9:00 PM***Foyers***VIS Opening Reception**

# DOCTORAL COLLOQUIUM 2019

## Call for Participation

VIS 2019 will host a Doctoral Colloquium to support the next generation of visualization researchers. 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. While all students are invited to apply, priority will be given to those who will gain the most from the experience. Typically, this means students who will be preparing or completing their dissertation proposals near the time of the Colloquium.

Questions? Email [doctoral\\_coll@ieeveis.org](mailto:doctoral_coll@ieeveis.org)

# BELIV: Evaluation and Beyond

Convention Hall 1, Section C

9:00-10:40 AM

## Session 1

### Welcome + Keynote + Replication Mini-Tutorials

Chair: Petra Isenberg

#### Keynote Presentation

##### Reproducibility: Or, How I Learned to Stop Worrying and Love Open Science

Jon Tennant

You can barely go anywhere within research these days without hearing the term 'reproducibility crisis'. It is becoming more and more common for meta-analyses of research to fail to reproduce key discoveries within the scholarly literature. At the same time, researchers are under increasing pressure to 'publish or perish', embellish their research findings, and prioritise impact/prestige of publication venue over research rigour. This is clearly not how science is supposed to work. One of the key aspects of the global Open Science 'movement' is to help to solve these issues to do with incentives, questionable research practices, and a lack of reproducibility or repeatability across different research disciplines.

During this talk, you will hear about the wave of new practices and services to help increase the reproducibility of research across different research fields, from open notebook science, pre-registrations, through to mandatory code and data sharing. This is still very much a new and ongoing evolution that is helping to transform the way research is conducted, but is already having a huge impact in helping to improve the reliability of modern science. Researchers who are adopting and supporting these practices are already becoming leaders in their respective fields and helping to drive real change.

#### Mini-tutorials based on these papers:

Towards Designing Unbiased Replication Studies in Information Visualization, Poorna Talkad Sukumar, Ronald Metoyer

Skipping the Replication Crisis in Visualization: Threats to Study Validity and How to Address Them, Robert Kosara, Steve Haroz

10:40-11:00 AM

Coffee Break

11:00 AM-12:40 PM

## Session 2

### Panel—A Roadmap For Replication in Visualization

Chair: Michael Sedlmair

#### Author panelists

Open Practices in Visualization Research, Steve Haroz

Requirements for Reproducibility of Research in Situational and Spatio-Temporal Visualization, André Calero Valdez, Anne Kathrin Schaar, Julian Romeo Hildebrandt, Martina Ziefle

#### Invited panelists

Jason Dykes, Nils Gehlenborg, Paul Rosenthal, Danielle Albers Szafir

12:40-2:20 PM

Lunch Break

2:20-4:00 PM

## Session 3

### Paper Presentations + Break-out Sessions

Chair: Miriah Meyer

Towards Characterizing Domain Experts as a User Group, Yuet Ling Wong, Krishna Madhavan, Niklas Elmquist

A Micro-Phenomenological Lens for Evaluating Narrative Visualization, Stanislaw Nowak, Lyn Bartram, Thecla Schiphorst

From Taxonomy to Requirements: A Task Space Partitioning Approach, Mai Elshehaly, Natasha Alvarado, Lynn McVey, Rebecca Randell, Mamas Mamas, Roy A. Ruddle

How to Evaluate an Evaluation Study? Comparing and Contrasting Practices in Vis with Those of Other Disciplines, Anamaria Crisan, Madison Elliott

The Garden of Forking Paths in Visualization: A Design Space for Reliable Exploratory Visual Analytics, Xiaoying Pu, Matthew Kay

Improving Accessibility, Replicability, and Reproducibility through Open Practices, Steve Haroz, Andre Calero-Valdez

4:00-4:20 PM

Coffee Break

4:20-6:00 PM

## Session 4

### Paper Presentations + Break-out Sessions

Chair: Tobias Isenberg

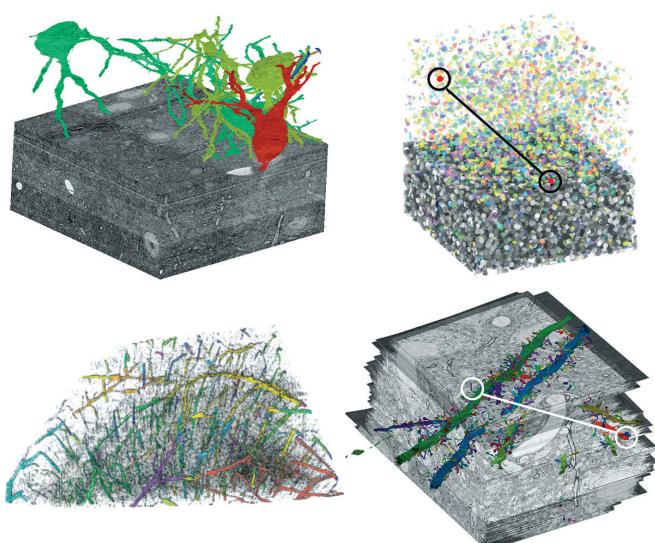
Lowering the Barrier for Successful Replication and Evaluation, Hendrik Lücke-Tieke, Marcel Beuth, Philipp Schader, Thorsten May, Jürgen Bernard

A Case for Cognitive Models in Visualization Research, Lace M. Padilla

Heuristic Evaluation in Visualization: An Empirical Study, Beatriz Sousa Santos, Samuel Silva, Paulo Dias

Reflecting on the Evaluation of Visualization Authoring Systems, Donghao Ren, Bongshin Lee, Matthew Brehmer, Nathalie Henry Riche

Replication of Qualitative Research in Visualization, Poorna Talkad Sukumar, Robert Kosara



# ss LDAV: Large Data Analysis and Visualization

Convention Hall 1, Section D

9:00-9:10 AM

Opening Remarks

9:10-10:15 AM

Keynote Presentation

**Large Data Analysis and Visualization—New Approaches for Dynamic Volumes and Particle Data Sets**

Thomas Ertl, University of Stuttgart

As data set sizes and complexity continue to grow, more elaborate techniques for their interactive analysis and visualization are being developed in our community. This talk presents some of the recent contributions of the VISUS group at the University of Stuttgart focusing on dynamic volumes and particle data sets. For volumes we exploit similarity between time steps to select the most important characteristic temporal features, while still allowing exploration, and we develop intermediate view dependent representations for hybrid in situ approaches. New adaptive volume rendering algorithms allow for maintaining interactive frame rates by balancing quality and sampling errors. For large particle data sets, we present multi-GPU techniques for static astrophysical datasets of more than trillions of particles; and for dynamic molecular trajectories we elaborate on the OSPRay integration into our Megamol framework. We conclude with our first attempts to learn interesting features in volumetric time series and performance characteristics of visual computing systems.

10:15-10:40 AM

Uncertain Data

Chair: Hanqi Guo

**Visual Analysis of Simulation Uncertainty Using Cost-Effective Sampling**, Annie Preston, Yiran Li, Franz Sauer, Kwan-Liu Ma

10:40-11:00 AM

Coffee Break

11:00-11:50 AM

Data Reduction

Chair: Peer-Timo Bremer

**VOIDGA: A View-Approximation Oriented Image Database Generation Approach**, Jonas Lukasczyk, Eric Kinner, James Ahrens, Heike Leitte, Christoph Garth

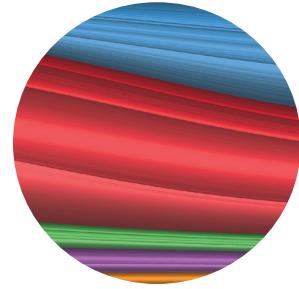
**Lifted Wasserstein Matcher for Fast and Robust Topology Tracking**, Maxime Soler, Mélanie Plainchault, Bruno Conche, Julien Tierny

11:50 AM-12:40 PM

Panel

**Progressive Visualization and Visual Analytics**

Progressive visualization, also known as Online Aggregation, consists of splitting long and expensive computations into a series of approximate results improving with time; in this process, partial or approximate results are then rapidly returned to the user and can be interacted with in a fluent and iterative fashion. With the increasing growth in data, such progressive data analysis approaches will become one of the leading paradigms for data exploration systems, but it also will require major changes in the algorithms,



data structures, and visualization tools used today. In early October 2018, a Dagstuhl Seminar explored progressive visualization; in this panel, speakers from that seminar will share outcomes from that conversation, and explore ways the LDAV community can adapt these approaches.

12:40-2:20 PM

Lunch Break

2:20-4:00 PM

Parallelism & Approximation

Chair: Steffen Frey

**DPP-PMRF: Rethinking Optimization for a Probabilistic Graphical Model Using Data-Parallel Primitives**, Brenton Lessley, Talita Perciano, Colleen Heinemann, David Camp, Hank Childs, E. Wes Bethel

**Parallel Partial Reduction for Large-Scale Data Analysis and Visualization**, Wenbin He, Hanqui Guo, Tom Peterka, Sheng Di, Franck Cappello, Han-Wei Shen

**Comparing Binary-Swap Algorithms for Odd Factors of Processes**, Kenneth Moreland

**Foundations of Multivariate Functional Approximation for Scientific Data**, Tom Peterka, Youssef S. G. Nashed, Iulian Grindeanu, Vijay S. Mahadevan, Raine Yeh, Xavier Tricoche

4:00-4:20 PM

Coffee Break

4:20-5:35 PM

Fidelity & Interactivity

Chair: Tom Peterka

**Galaxy: Asynchronous Ray Tracing for Large High-Fidelity Visualization**, Greg Abram, Paul Navrátil, Pascal Grossett, David Rogers, James Ahrens

**SpRay: Speculative Ray Scheduling for Large Data Visualization**, Hyungman Park, Donald Fussell, Paul Navrátil

**Adaptive Encoder Settings for Interactive Remote Visualization on High-Resolution Displays**, Florian Frieß, Mathias Landwehr, Valentin Bruder, Steffen Frey, Thomas Ertl

5:35-5:45 PM

Best Paper Awards & Closing Remarks

5:45-6:05 PM

Poster Presentations

Please see page 31 for the list of accepted posters.

7:00-9:00 PM

Vis Opening Reception (includes LDAV Poster Session)

SUNDAY

# MONDAY, 22 OCTOBER

4:00–4:30 PM

Room 30212

## Meetups: VISKids Hello

Organizers: Michelle A. Borkin, R. Jordan Crouser, Kelly Gaither

Come to this gathering to learn more about the VISKids grants and conference activities, connect with other parents and families at the conference, and provide feedback and ideas for this and future years. The Inclusivity & Diversity Committee members will answer all your questions. Everyone is welcome to attend, including VISKids/families.

VISKids has provided child care grants to VIS conference attendees since 2015. As part of Inclusivity and Diversity at IEEE VIS, VISKids also organizes activities at the conference, and has a meeting room on-site. The activities and the room are open to everyone, not just awardees of the child care grant program.

## Workshops and Tutorials

Full Day

Room II

### Workshop (9:00 AM–6:00 PM)

#### VisGuides: 2nd Workshop on the Creation, Curation, Critique and Conditioning of Principles and Guidelines in Visualization

Contributors: Alexandra Diehl, Benjamin Bach, Alfie Abdul-Rahman

The ever-increasing global awareness, practice, and teaching of information and data visualization include a growing audience of consumers and creators. We, as a scientific community must put careful emphasis on the collection and curation of knowledge in the area. The goal of this workshop is to discuss and consolidate guidelines, best practices, controversies, and success stories in the field of information visualization.

Half Day

Room III

### Workshop (9:00 AM–12:40 PM)

#### VISREG - Visual Summarization and Report Generation: Beyond Scatter-Plots and Bar-Charts

Contributors: Johanna Schmidt, Gabriel Mistelbauer

This workshop investigates visual summarizations of data and meaningful representations for static reports. Visual summaries have/should/aim to combine different data aspects into a concise overview in order to communicate findings to external collaborators. The workshop consists of paper presentations that introduce new techniques for visual summarization. Based on these talks, common strategies, open research questions and potential future research directions will be identified.

Room Paris

### Workshop (9:00 AM–12:40 PM)

#### DS Machine Learning from User Interaction for Visualization and Analytics

Contributors: John Wenskovitch, Michelle Dowling, Chris North, Remco Chang, Alex Endert, David Rogers

This workshop will bring together researchers from across the VIS community to share their knowledge and build collaborations at the intersection of the Machine Learning and Visualization fields,

with a focus on learning from user interaction. We plan to generate open discussion about how we currently learn from user interaction and where we can go with future research in this area. We hope to foster discussion regarding systems, interaction models, and interaction techniques.

Estrel Hall C

### Tutorial (9:00 AM–12:40 PM)

#### Urban Trajectory Data Visualization

Contributors: Ye Zhao, Jing Yang, Wei Chen, Shamal AL-Dohuki

This tutorial aims to help visualization researchers and practitioners in the development of visualization systems of big trajectory datasets. Our tutorial contents will focus on important and practical topics people usually face when developing a visualization system of urban trajectories including: trajectory data representation, processing, indexing, and data queries; trajectory data visualization tasks, challenges, and techniques; developing web-based interactive visualization system; case studies of urban visual analytics with shared source codes and examples.

Estrel Hall B

### Workshop (2:20–6:00 PM)

#### CityVis – Urban Data Visualization

Contributors: Sebastian Meier, Nina Hälker, Sarah Goodwin

Visualization helps us unravel the complex urban fabrics that form our cities. But, there is a crucial need to bridge the gap between the increasing flood of urban data and the capacity to integrate this into effective and informed decisions. Focusing on an explicitly “human-centric” perspective the CityVis workshop asks how data and visualization can be used to serve and better understand or organize urban processes.

Room Paris

### Workshop (2:20–6:00 PM)

#### DS Visualization for AI Explainability (VISxAI)

Contributors: Mennatallah El-Assady, Duen Horng Chau, Adam Perer, Hendrik Strobelt, Fernanda Viegas

The goal of this workshop is to initiate a call for “explainables” that explain how AI techniques work using visualizations. We believe the VIS community can leverage their expertise in creating visual narratives to bring new insight into the often obfuscated complexity of AI systems.

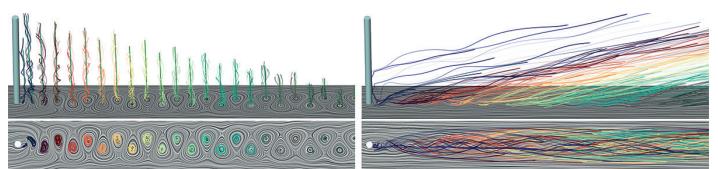
Estrel Hall C

### Tutorial (2:20–6:00 PM)

#### Cost-benefit Analysis in Visualization: Theory and Practice

Contributor: Min Chen

In this tutorial, we will focus on the topic of analyzing the cost-benefit of visualization and visual analytics systems. The delivery of the tutorial will be structured in the order of “from practice to theory and then to practice again”. One objective of this tutorial is to help remove the barrier for visualization researchers to enter the arena of “information theory to visualization”, while examining the broad scope of future directions of research.



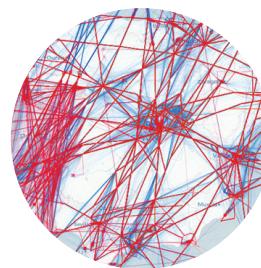
**Tutorial (2:20–6:00 PM)****DJ Storyboards for Science: Combining the Visual and Verbal to Create Engaging Communication**

Contributors: David Rogers, Francesca Samsel, Sean Cunningham, Benjamin Bach

Drawing on the experience of writers, artists, and videographers with decades of experience in science communication, we present hands-on, example-based approach to developing narratives through storyboarding - a visual method of developing the structure, imagery and narrative of engaging stories. Participants gain experience in the skills and processes needed to develop engaging stories about their science. This includes not just building a narrative but also the visualizations and supporting visual elements that help connect with an audience.

6:15–7:15 PM

Convention Hall 1, Section C

**VIS Fast Forward (Tue & Wed Sessions)****VizSec: Visualization for Cyber Security**

Convention Hall 1, Section C

**9:00–9:15 AM****Opening Remarks**

Chair: Diane Staheli

**9:15–10:15 AM****Keynote Presentation**

Speaker: Dr. Sandro Gaycken, Senior Researcher and Director of the Digital Society Institute, ESMT Berlin

**10:15–10:40 AM****VizSec Poster and Demo Fast Forward**

Chair: Jörn Kohlhammer

Please see p. 31 for the list of accepted posters.

**10:40–11:00 AM****Coffee Break****11:00 AM–12:40 PM****Paper Session: Networks and Privacy**

Chair: Sophie Engle

**Visual-Interactive Identification of Anomalous IP-Block Behavior Using Geo-IP Data**, Alex Ulmer, Marija Schufrin, David Sessler, Jörn Kohlhammer

**Looking for a Black Cat in a Dark Room: Security Visualization for Cyber-Physical System Design and Analysis**, Georgios Bakirtzis, Brandon James Simon, Cody H Fleming, Carl R. Elks

**Visual Analytics for Root DNS Data**, Eric Krokos, Alexander R Rowden, Kirsten Whitley, Amitabh Varshney

**An Empirical Study on Perceptually Masking Privacy in Graph Visualizations**, Jia-Kai Chou, Chris Bryan, Jing Li, Kwan-Liu Ma

**12:40–2:20 PM****Lunch Break****2:20–3:35 PM****Paper Session: Analytics**

Chair: John Goodall

**Building a Machine Learning Model for the SOC, by the Input from the SOC, and Analyzing it for the SOC**, Awalin, Sopan, Matthew Berninger, Murali Kiran Mulakaluri, Raj Katakam

**Visualizing Automatically Detected Periodic Network Activity**, Robert Gove, Lauren Deason

**Crush your data with ViC<sup>2</sup>ES then CHISSL away**, Dustin L Arendt, Lyndsey Franklin, Fumeng Yang, Brooke Brisbois, Ryan LaMothe

**3:45–4:00 PM****Demos****4:00–4:20 PM****Coffee Break****4:20–5:10 PM****Papers Session: Malware Analysis**

Chair: Jörn Kohlhammer

**[Best Paper] ROPMate: Visually Assisting the Creation of ROP-based Exploits**, Marco Angelini, Graziano Blasilli, Pietro Borrello Borrello, Emilio Coppa, Daniele Cono D'Elia, Serena Ferracci, Simone Lenti, Giuseppe Santucci

**Eventpad: Rapid Malware Analysis and Reverse Engineering using Visual Analytics**, Bram Cappers, Paulus N. Meessen, Sandro Etalle, Jarke van Wijk

**5:10–5:50 PM****Papers Session: Short Papers**

Chair: Robert Gove

**User Behavior Map: Visual Exploration for Cyber Security Session Data**, Siming Chen, Shuai Chen, Natalia Andrienko, Gennady Andrienko, Phong H. Nguyen, Cagatay Turkay, Olivier Thonnard, Xiaoru Yuan

**TAPESTRY: Visualizing Interwoven Identities for Trust Provenance**, Yifan Yang, John Collomosse, Arthi Kanchana Manohar, Jo Briggs, Jamie Steane

**5:50–6:00 PM****Closing**

Chair: Diane Staheli

**DS VDS: Visualization in Data Science**

Convention Hall 1, Section D

**9:00-9:10 AM****Opening Address**

General Chairs: Torsten Möller, Shixia Liu

**9:10-10:10 AM****Keynote Presentation****Automating Analysis?**Pat M. Hanrahan, *Stanford University*

There have been great advances in machine learning lately, in particular, deep learning. The result has been even more intelligent systems, such as image recognition, AlphaGo and self-driving cars. The technologies of machine learning are similar in many ways to those used in statistical data analysis. So, a natural question is —can AI be applied to analysis? That is, can people doing analysis be replaced by automated systems? In this talk, I will explore this question.

**10:10-10:40 AM****Session 1: Interactive ML**

**BEAMES: Interactive Multi-Model Steering and Inspection for Regression Tasks**, Subhajit Das, Dylan Cashman, Remco Chang, Alex Endert

**Homology-Preserving Dimensionality Reduction via Manifold Landmarking and Tearing**, Lin Yan, Yaodong Zhao, Paul Rosen, Carlos Scheidegger, Bei Wang

**10:40-11:00 AM**

Coffee Break

**11:00 AM-12:00 PM****Keynote Presentation****Analytics Illustrated - How Visualization Is Changing Sports Forever**Kirk Goldsberry, *San Antonio Spurs*

Since Michael Lewis published “Moneyball” in 2003, sports discourse has become increasingly more analytical and data driven. However, only recently is it becoming properly visual. The intersection of visualization and sports analytics is a truly exciting place in 2018, and this presentation describes how and why visualization is uniquely equipped to reform and reshape sports discourse forever.

The presentation includes two sections. First, we investigate how visualization has helped shaped new analytical awakenings in professional basketball this decade and how those awakenings are reshaping the entire aesthetic of the sport. Second, we examine the relatively slow adoption of visual analytics in the sports world.

**12:00-12:40 PM****Session 2: Deep Learning**

**DeepCompare: Visual and Interactive Comparison of Deep Learning Model Performance**, Sugeerth Murugesan, Sana Malik, Fan Du, Eunyee Koh, Tuan Manh Lai

**Visualization-Assisted Development of Deep Learning Models in Offline Handwriting Recognition**, Martin Schall, Dominik Sacha, Manuel Stein, Matthias Franz, Daniel Keim

**Data2Vis: Automatic Generation of Data Visualizations Using Sequence to Sequence Recurrent Neural Networks**, Victor C. Dibia, Çağatay Demiralp

**12:40-2:20 PM**

Lunch Break

**2:20-3:20 PM****Keynote Presentation****Humans and AI: From Love-Hate Relationship to Dream Team?**Daniela Oelke, *Siemens AG*

Artificial Intelligence (AI) is on the rise all around us. On the one hand, we love it, because it enables services and features that would not be possible without it. On the other hand, we fear it because of the lack of transparency that these systems often entail despite the huge impact they can have.

In my talk, I am going to give you an introduction to the field of Explainable Artificial Intelligence (XAI) which aims at providing transparency for AI systems. I will also share my experiences with employing Explainable AI in an industrial setting. Besides, I am going to exemplify the value of visualization for Explainable AI and highlight what role we as a visualization community can play in shaping the future of applied Artificial Intelligence.

**3:20-4:00 PM****Session 3: Data Science in Domains**

**Tackling Similarity Search for Soccer Match Analysis: Multimodal Distance Measure and Interactive Query Definition**, Manuel Stein, Halldor Janetzko, Tobias Schreck, Daniel Keim

**Visual Analytics of Volunteered Geographic Information: Detection and Investigation of Urban Heat Islands**, Daniel Seebacher, Matthias Miller, Tom Polk, Johannes Fuchs, Daniel Keim

**Uncertainty-Aware Visualization for Analyzing Heterogeneous Wildfire Detections**, Annie Preston, Maksim Gomov, Kwan-Liu Ma

**4:00-4:20 PM**

Coffee Break

**4:20-4:50 PM**

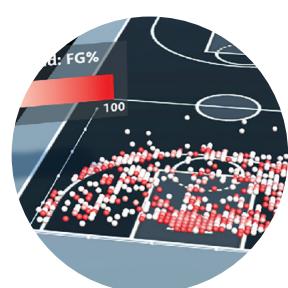
**Guided Visual Exploration of Cyclical Patterns in Time-series**, Davide Ceneda, Theresia Gschwandtner, Silvia Miksch, Christian Tominski

**Progressive Sequential Pattern Mining: Steerable Visual Exploration of Patterns with PPMT**, Vincent Raveneau, Pr Yannick Prié, Julien Blanchard

**4:50-5:50 PM****Panel****The Future of Visualization in Data Science**

Facilitator: Hanspeter Pfister

Panelists: Kirk Goldsberry, Pat M. Hanrahan, Daniela Oelke

**5:50-6:00 PM****Closing**

9:00-10:40 AM

## VisInPractice Invited Talks I

Chair: Daniela Oelke

**Glue-ing Together the Universe**, Alyssa Goodman**Siemens Power Generation – Big Data Analysis: Old World vs. New World**, Ayhan Inceoglu and Luke Mc Govern**Visualizing Large-Scale Geolocation Data with kepler.gl**, Shan He

10:40-11:00 AM

Coffee Break

11:00 AM-12:40 PM

## VisInPractice Invited Talks II

Chair: Matthew Brehmer

**Xenographics: Why We Should All Be William Playfairs**, Maarten Lambrechts**Transparent Machine Learning with Visual Analytics: How Interactive Visualization can Support Practitioners in the Machine Learning Process**, Jürgen Bernard**What I Learned Creating a 3D Visualization with 60K+ Datapoints in the Browser**, Jan Willem Tulp

12:40-2:20 PM

Lunch Break

2:20-4:00 PM

## VisInPractice: Tools of the Trade

Chair: Matthew Brehmer

**Data Vis Tools, Revisited**, Lisa Charlotte Rost**State-Of-The-Art of Commercial Visual Analytics Systems**, Michael Behrisch**Open Discussion of Visualization Tools**

4:00-4:20 PM

Coffee Break

4:20-6:00 PM

## Mini-Symposium on the Practice of Visualizing Uncertainty

Chair: Bernd Hentschel

## Primer Talk

**Uncertainty Visualization: From Metrics to Imagery**, Kristi Potter

## Lightning Talks

**Visualizing Uncertainties in Conflict Event Data**, Andrea Brennen**Visualising Climate Forecasts, Managing Uncertainty and Accuracy at Seasonal and Sub-Seasonal Scales**, Fernando Cucchietti**Hypothetical Outcome Plots: Communicating Uncertainty Through Animated Sampling**, Alex Kale**Line Density Plots**, Stefan Hagen Weber**Quantifying Uncertainty in Time Series Data Processing**, Christian Bors

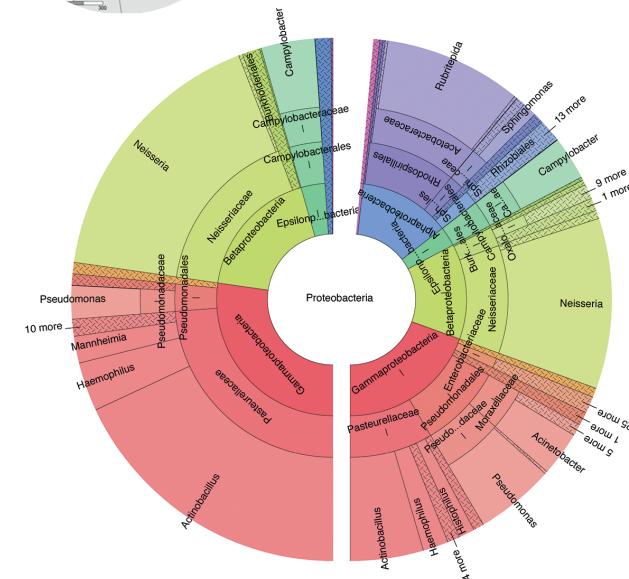
9:00 AM-12:40 PM

Contributors: Cagatay Turkay, Nils Gehlenborg

The number of individuals in studies that are collecting clinical, genomic, and other biomedical data has been growing rapidly in recent years. For example, the UK Biobank currently makes data for 500,000 individuals available and the National Institutes of Health All of Us Program aims to collect data on a million individuals over the next few years. Similar data collection and organization efforts are also taking place at hospitals and private companies in the pharma and healthcare sectors. The breadth of these collections is also growing significantly with the increasing availability of different data channels and personal sensors, adding new layers of richness and valuable information.

In this workshop, we will discuss what unique data visualization challenges visualization of data from such studies are posing and how the visualization community can contribute to the success of those studies. This will include questions focused on visual design and interaction, but also technical and legal challenges related to data access, for a broad range of data types and driving biomedical questions.

The event will be kicked-off with short talks from experts where a series of challenges are presented, and followed by hands-on activity on these challenges by groups of visualization researchers and domain scientists. The output of the workshop will be a list of well-characterized visualization challenges within the problem domain. The organizers, together with the participants, will externalize these challenges in the form of a report or publication following the event.



# TUESDAY, 23 OCTOBER

8:30–11:00 AM

Convention Hall 1, Section C+D

**AP VIS Welcome (8:30–8:45 AM)**

**AP VGTC Technical Awards (8:45–9:00 AM)**

Chair: Cláudio T. Silva

**2018 VGTC Visualization Career Award**, Sheelagh Carpendale

**2018 VGTC Visualization Technical Achievement Award**, Anders Ynnerman

**AP Test of Time Awards (9:00–10:00 AM)**

Chair: Silvia Miksch

**[VAST 2008: 10 Year Test of Time Award]** Spatio-temporal Aggregation for Visual Analysis of Movements, Gennady Andrienko, Natalia Andrienko

**[InfoVis 1998: 20 Year Test of Time Award]** An Operator Interaction Framework For Visualization Systems, Ed Huai-hsin Chi, John Riedl

**[InfoVis 2008: 10 Year Test of Time Award]** Effectiveness of Animation in Trend Visualization, George G. Robertson, Roland Fernandez, Danyel Fisher, Bongshin Lee, John T. Stasko

**[SciVis 1993: 25 Year Test of Time Award]** Texture Splat for 3D Scalar and Vector Field Visualization, Roger Crawfis, Nelson L. Max

**[SciVis 2003: 15 Year Test of Time Award]** Acceleration Techniques for GPU-based Volume Rendering, Jens H. Krüger, Rüdiger Westermann

**AP VIS Best Paper Awards and Talks (10:00–11:00AM)**

Chair: Chris North, Niklas Elmquist, David Laidlaw

**[J] [VAST Best Paper Award]** TPFlow: Progressive Partition and Multidimensional Pattern Extraction for Large-Scale Spatio-Temporal Data Analysis, Dongyu Liu, Panpan Xu, Liu Ren

**[J] [InfoVis Best Paper Award]** Formalizing Visualization Design Knowledge as Constraints: Actionable and Extensible Models in Draco, Dominik Moritz, Chenglong Wang, Greg L. Nelson, Halden Lin, Adam M. Smith, Bill Howe, Jeffrey Heer

**[J] [SciVis Best Paper Award]** Deadeye: A Novel Preattentive Visualization Technique Based on Dichoptic Presentation, Andrey Krekhov, Jens Krüger

11:00–11:20 AM

Coffee Break

11:20 AM–12:20 PM

Convention Hall 1, Section C+D

**AP VIS Keynote**

Speaker: Dieter Schmalstieg, Graz University of Technology

**When Visualization Met Augmented Reality**

Please see p. 4 for Keynote details.

12:30–2:00 PM

Room 30312

**Meetups: VISParents**

Organizer: Michelle A. Borkin, R. Jordan Crouser, Kelly Gaither

Whether you are a new parent, expectant parent, experienced wise parent, or considering some day to be a parent, come attend the first VISParents meet-up to discuss work-life balance topics at VIS. In this open roundtable conversation topics will include work-life balance in general, going into academia versus industry, balancing time with your VISKid, going on paternity leave, being a VISParent while completing your dissertation as a student, and being a VISParent while trying to achieve tenure as a professor. Please come share your wisdom and experiences. VISKids are also welcome to attend.

Room 30310

**Meetups: VisLies!**

Organizer: Kenneth Moreland, Bernice Rogowitz

This fun and engaging evening session showcases examples of egregious perceptual, cognitive, and conceptual errors in visualization, presented by members of the Vis community. Examples from our own work, from published papers, and from the internet highlight the many ways of visually misrepresenting phenomena underlying the data. This is a great opportunity for amusement and for learning, and every year we walk away with a smile on our faces and a deeper sense of responsibility that may one day impact the world. Make VisLies more fun for yourself and everyone else by sharing your favorite or most deplorable ways to misrepresent data. If you have examples to present, please visit <http://vislies.org>.

2:05–4:00 PM

Convention Hall 1, Section C

**VAST Opening (2:05–2:20 PM)**

**VAST Papers (2:20–4:00 PM)**

**AP Evaluation and Theory**

Chair: Alvitta Ottley

**[J] Evaluating Multi-Dimensional Visualizations for Understanding Fuzzy Clusters**, Ying Zhao, Feng Luo, Minghui Chen, Yingchao Wang, Jiazhi Xia, Fangfang Zhou, Yunhai Wang, Yi Chen, Wei Chen

**[C] The Effect of Proximity in Social Data Charts on Perceived Unity**, Marlen Promann, Sabine Brunswicker

**[J] Futzing and Moseying: Interviews with Professional Data Analysts on Exploration Practices**, Sara Alspaugh, Nava Zokaei, Andrea Liu, Cindy Jin, Marti Hearst

**[C] The Effect of Semantic Interaction on Foraging in Text Analysis**, John Wenskovitch, Lauren Bradel, Michelle Dowling, Leanna House, Chris North

**[J] Cost-benefit Analysis of Visualization in Virtual Environments**, Min Chen, Kelly Gaither, Nigel John, Brian McCann

Convention Hall 1, Section D

**InfoVis Opening (2:05–2:20 PM)**

**InfoVis Papers (2:20–4:00 PM)**

**Multiple Dimensions**

Chair: Arvind Satyanarayanan

**[J] Shape-preserving Star Coordinates**, Vladimir Molchanov, Lars Linsen

**[T] Using Dashboard Networks to Visualize Multiple Patient Histories: A Design Study on Post-operative Prostate Cancer**, Jürgen Bernard, David Sessler, Jörn Kohlhammer, Roy A. Ruddle

**[J] Towards Better Spatial Integration in Ranking Visualization**, Di Weng, Ran Chen, Zikun Deng, Feiran Wu, Jingmin Chen, Yingcai Wu

**InfoVis Papers****AP Evaluation & Applications**

Chair: Evanthia Dimara

[J] **A Declarative Rendering Model for Multiclass Density Maps**, Jaemin Jo, Frédéric Vernier, Pierre Dragicevic, Jean-Daniel Fekete

[J] **DimReader: Axis lines that explain non-linear projections**, Rebecca Faust, David Glickenstein, Carlos Scheidegger

Estrel Hall A+B

**SciVis Opening (2:05-2:20 PM)****SciVis Papers (2:20-4:00 PM)****Flow Features**

Chair: Roxana Bujak

[J] **Recirculation Surfaces for Flow Visualization**, Thomas Wilde, Christian Rössl, Holger Theisel

[J] **Objective Vortex Corelines of Finite-sized Objects in Fluid Flows**, Tobias Günther, Holger Theisel

[T] **Towards High-quality Visualization of Superfluid Vortices**, Yulong Guo, Xiaopei Liu, Chi Xiong, Xuemiao Xu, Chi-Wing Fu

[T] **Semantic Flow Graph: A Framework for Discovering Object Relationships in Flow Fields**, Jun Tao, Chaoli Wang, Nitesh Chawla, Lei Shi, Seung Hyun Kim

Estrel Hall C

**VIS Panel****Succeeding by Failing: The Iceberg in VIS Careers**

Panelists: Luana Micallef, Tatiana von Landesberger, Carla C. Schubert, Sheelagh Carpendale, John Stasko, Niklas Elmquist, G. Elisabeta Marai, Helwig Hauser, Daniel Archambault

The academic competitive environment and its 'acceptance & rejection' culture lead to high pressure and stress for researchers at all career stages. We will discuss such threats, coping mechanisms and ways how our community can help. Example topics include: work-life balance, dealing with rejections, providing supportive reviews, funding pressures, career prospects in times of uncertainty, and many more topics depending on the audience. Our panelists include: visualization professors with diverse expertise and seniority levels, and a psychologist/psychotherapist who also conducts research and treats academics with related psychological problems. Voice your first-hand experiences, questions and comments anonymously at <http://www.luanamicallef.com/succeedingbyfailing> and participate in our follow-up meetup!

**4:00-4:20 PM****Coffee Break****4:20-6:00 PM**

Convention Hall 1, Section C

**VAST Papers****Spatio-Temporal Data**

Chair: Hans-Jörg Schulz

[J] **Visual Abstraction of the Large Scale Geospatial Origin-Destination Movement Data**, Zhiguang Zhou, Linhao Meng, Cheng Tang, Ying Zhao, Zhiyong Guo, Miaoxin Hu, Wei Chen

[J] **Analysis of Flight Variability: a Systematic Approach**, Natalia Andrienko, Gennady Andrienko, Jose Manuel Cordero Garcia, David Scarlatti

[J] **ForVizor: Visualizing Spatio-Temporal Team Formations in Soccer**, Yingcai Wu, Xiao Xie, Jiachen Wang, Dazhen Deng, Hongye Liang, Hui Zhang, Shoubin Cheng, Wei Chen

[J] **MotionRugs: Visualizing Collective Trends in Space and Time**, Juri Buchmuller, Dominik Jackle, Eren Cakmak, Ulrik Brandes, Daniel Keim

[J] **Identification of Temporally Varying Areas of Interest in Long Duration Eye Tracking Data Sets**, Prithviraj Kaliappa Gounder Muthumanickam, Katerina Vrotsou, Aida Nordman, Jimmy Johansson, Matthew Cooper

Estrel Hall A+B

**SciVis Papers****BA Biological Applications**

Chair: G. Elisabeta Marai

[J] **Interactive Visualization of RNA and DNA Structures**, Norbert Lindow, Daniel Baum, Morgan Leborgne, Hans-Christian Hege

**[Honorable Mention]** [J] **Labels on Levels: Labeling of Multi-Scale Multi-Instance and Crowded 3D Biological Environments**, David Kouřil, Ladislav Čmolík, Barbora Kozlíková, Hsiang-Yun Wu, Graham Johnson, David S. Goodsell, Arthur Olson, Eduard Gröller, Ivan Viola

[J] **Visualization of Large Molecular Trajectories**, David Duran Rosich, Pedro Hermosilla Casajus, Timo Ropinski, Barbora Kozlíková, Álvar Vinacua, Pere-Pau Vázquez

[T] **Robust Tracing and Visualization of Heterogeneous Microvascular Networks**, Pavel Goyadinov, Tasha Womack, Jason L. Eriksen, Guoning Chen, David Mayerich

Estrel Hall C

**AP VIS Supporters Presentations**

Chair: Jörn Kohlhammer

**Tableau Research – An Industry Perspective**, Maureen Stone, *Tableau Innovation, Impact, Insights: The Bosch Approach to Visual Analytics Research*, Liu Ren, *Bosch*

**Automatic Slide Layout**, Arno Schödl, *think-cell*

**The Role of Visualization in Decision Making**, Julian Heinrich, *Bayer Visual Computing in Research and Practice*, Jörn Kohlhammer, *Fraunhofer IGD*

**The Intel® Rendering Framework: Open Source, High Fidelity, Interactive, Large Data Visualization**, Jim Jeffers, *Intel Corporation*

Room 30312

**Meetups: Follow-up meetup to the panel 'Succeeding by Failing: The Iceberg in VIS Careers'**

Organizers: Luana Micallef, Tatiana von Landesberger

We will continue discussing the challenges we encounter in VIS careers and ways how our community can help. This is your chance to share your experiences with peers and to contribute to the suggestions we will put forward to the VIS steering committees to help them make informed decisions during the restructuring process of our community. Everyone (students, postdocs, professors, researchers from academia or industry) is welcome to join! This will help us initiate a support network whereby we can help each other with the various challenges and pressures we encounter at different stages of our careers. If you cannot attend, you can still post your questions and comments anonymously at <http://www.luanamicallef.com/succeedingbyfailing>

6:00-8:00 PM

Estrel Hall A+B

**Meetups: Junior Faculty, Researchers, and Practitioners Happy Hour**

Organizers: Kristi Potter, Remco Chang

The goal of this meetup is to provide a safe environment for junior VIS researchers to gather and discuss challenges faced in and out of the work environment. The VIS community has always been very supportive of its junior members, however, one missing link among this wide range of programs is support for the junior professors, early career researchers and practitioners. Junior researchers face significant amount of pressure and are often overwhelmed by the drastic change from being a student (or a postdoc). Many junior researchers have little training in project management, grant-writing, mentoring, teaching, and establishing a research agenda. As a result, they struggle maintaining a work-life balance and have few (if no) outlet in seeking help, advice, or support. Attendees will have the opportunity to meet fellow early career researchers, participate in peer mentoring, and as a result build a social network (or a cohort) that will continue to support beyond the VIS conference.

6:15-7:15 PM

Estrel Hall C

**Celebration of Life—Georges Grinstein**

7:00-9:00 PM

Room Paris

**VISAP: Arts Program****Data and Identities Exhibition Opening**

**Installations by:** Kim F. Albrecht, Pedro Cruz, John Wihbey, Avni Ghosh, Felipe Shibuya, Pascal Glissmann, Olivier Arcioli, Andreas Henrich, Benedikt Groß, Stephan Bogner, Herwig Scherabon, Jieliang Luo, Sam Green, Mauro Martino, Alice Grishchenko, Nima Dehmamy, Hendrik Strobelt, Albert-László Barabási, Dietmar Offenhuber, Mieka West, Sheelagh Carpendale, Rebecca Ruige Xu, Sean Hongsheng Zhai, Fan Xiang, Shunshan Zhu

**Annotated projects by:** David Bihanic, Pedro Cruz, John Wihbey, Avni Ghosh, Steve Costa, Ryan Chao, Felipe Shibuya, Pascal Glissmann, Andreas Henrich, Olivier Arcioli, David Hunter, Charles Perin

**Performance by:** Jiayue Wu Wu, Donghao Ren

**Demonstrations by:** Paul Heinicker, Lukáš Likavčan, Qiao Lin, March Daria Stupina, Christophe Hurter, Charles Giulio, Daniel McDuff, Pourang Irani, Johannes Liem, Eirini Goudarouli, Steven Hirschorn, Jo Wood, Charles Perin, Hyemi Song

# WEDNESDAY, 24 OCTOBER

9:00-10:40 AM

Convention Hall 1, Section C

**VAST Papers****DS Ensemble and Provenance**

Chair: Eric Ragan

[J] **Visual Analysis of the Temporal Evolution of Ensemble Forecast Sensitivities**, Alexander Kumpf, Marc Rautenhaus, Michael Riemer, Rüdiger Westermann

[J] **EnsembleLens: Ensemble-based Visual Exploration of Anomaly Detection Algorithms with Multidimensional Data**, Ke Xu, Meng Xia, Xing Mu, Yun Wang, Nan Cao

[T] **Exploring Variability within Ensembles of Decadal Climate Predictions**, Christopher P. Kappe, Michael Böttger, Heike Leitte

[J] **KnowledgePearls: Provenance-Based Visualization Retrieval**, Holger Stitz, Samuel Gratzl, Harald Piringer, Thomas Zichner, Marc Streit

[J] **Enhancing Web-based Analytics Applications through Provenance**, Akhilesh Camisetty, Chaitanya Chandurkar, Maoyuan Sun, David Koop

Convention Hall 1, Section D

**InfoVis Papers****Time**

Chair: Enrico Bertini

[J] **Comparing Similarity Perception in Time Series Visualizations**, Anna Gogolou, Theophanis Tsandilas, Themis Palpanas, Anastasia Bezerianos

[T] **A Multiresolution Streamgraph Approach to Explore Hierarchical Time Series**, Erick Cuenca, Arnaud Sallaberry, Florence Ying Wang, Pascal Poncelet

[T] **Line Graph or Scatter Plot? Automatic Selection of Methods for Visualizing Trends in Time Series**, Yunhai Wang, Fubo Han, Lifeng Zhu, Oliver Deussen, Baoquan Chen

[T] **A Vector Field Design Approach to Animated Transitions**, Yong Wang, Daniel Archambault, Carlos E. Scheidegger, Huamin Qu

[J] **Temporal Treemaps: Static Visualization of Evolving Trees**, Wiebke Köpp, Tino Weinkauf

Estrel Hall A+B

**SciVis Papers****BA Biomedical Visualization**

Chair: Barbora Kozlikova

[J] **Visual Analysis of Aneurysm Data using Statistical Graphics**, Monique Meuschke, Tobias Günther, Philipp Berg, Ralph Wickenhofer, Markus Gross, Bernhard Preim, Kai Lawonn

[J] **Interactive Visualization of 3D Histopathology in Native Resolution**, Martin Falk, Anders Ynnerman, Darren Treanor, Claes Lundström

[J] **Visualization of Neuronal Structures in Wide-field Microscopy Brain Images**, Saeed Boorboor, Shreeraj Jadhav, Mala Ananth, David Talmage, Lorna W Role, Arie Kaufman

[T] **Classification of Blood Flow Patterns in Cerebral Aneurysms**, Monique Meuschke, Steffen Oeltze-Jafra, Oliver Beuing, Bernhard Preim, Kai Lawonn

Estrel Hall C

**VAST Papers****DS BA Text**

Chair: Jian Zhao

[T] **Bridging Text Visualization and Mining: A Task-Driven Survey**, Shixia Liu, Xiting Wang, Christopher Collins, Wenwen Dou, Fangxin Ouyang, Mennatallah El-Assady, Liu Jiang, Daniel Keim

[J] **Doccurate: A Curation-Based Approach for Clinical Text Visualization**, Nicole Sultanum

[J] **VIS Author Profiles: Interactive Descriptions of Publication Records Combining Text and Visualization**, Shahid Latif, Fabian Beck, Devin Singh, Michael Brudno, Fanny Chevalier

[T] A Visual Analytics Framework for Identifying Topic Drivers in Media, Yafeng Lu, Hong Wang, Steven Landis, Ross Maciejewski

[T] Visualizing a Thinker's Life, Patrick Riehmann, Dora Kiesel, Martin Kohlhaas, Bernd Fröhlich

Room IV

### VISAP: Arts Program

#### Session 1: Arts and Society

Chair: Jeremy Boy

**Paper: Seeking New Ways to Visually Represent Uncertainty in Data**, Aaron Hill, Clare Churchouse, Michael Schober

**Annotated Project: Process of Simulating Tree Rings for Immigration in the U.S.**, Pedro Cruz, John Wihbey, Avni Ghosh, Steve Costa, Ruan Chao, Felipe Shibuya

**Paper: Art, Affect and Color: Creating Engaging Expressive Scientific Visualizations**, Francesca Samsel, Lyn Bartram, Annie Bares

**Annotated Project: Designing Beautiful Evidence in an Era of Complexity—When Graphics Reveal Social Changes and Issues**, David Bihanic

Various Artist Talks

10:40–11:00 AM

Coffee Break

11:00 AM–12:40 PM

Convention Hall 1, Section C

### VAST Papers

#### AP Applications

Chair: Jörn Kohlhammer

[T] Commercial Visual Analytics Systems – Advances in the Big Data Analytics Field, Michael Behrisch, Dirk Streeb, Florian Stoffel, Daniel Seebacher, Stefan Hagen Weber, Sebastian Mittelstaedt, Hanspeter Pfister, Daniel Keim

[J] BitExTract: Interactive Visualization for Extracting Bitcoin Exchange Intelligence, Xuanwu Yue, Xinhuan Shu, Xinyu ZHU, Xinnan Du, Zheqing Yu, Dimitrios Papadopoulos, Siyuan Liu

[T] KAVAGait: Knowledge-Assisted Visual Analytics for Clinical Gait Analysis, Markus Wagner, Djordje Slijepcevic, Brian Horsak, Alexander Rind, Matthias Zeppelzauer, Wolfgang Aigner

[T] Precision Risk Analysis of Cancer Therapy with Interactive Nomograms and Survival Plots, G. Elisabeta Marai, Chihua Ma, Andrew T. Burks, Filippo Pellolio, Guadalupe Canahuate, David M. Vock, Abdallah S.R. Mohamed, C. David Fuller

[C] VUSphere: Visual Analysis of Video Utilization in Online Distance Education, Huan He, Qinghua Zheng, Bo Dong

Convention Hall 1, Section D

### InfoVis Papers

#### Graphs & Trees

Chair: Yingcai Wu

[J] Juniper: A Tree+Table Approach to Multivariate Graph Visualization, Carolina Nobre, Marc Streit, Alexander Lex

[T] Graph Thumbnails: Identifying and Comparing Multiple Graphs at a Glance, Vahan Yoghoudjian, Tim Dwyer, Karsten Klein, Kim Marriott, Michael Wybrow

[J] Structure-Based Suggestive Exploration: A New Approach for Effective Exploration of Large Networks, Fangzhou Guo, Wei Chen, Dongming Han, Jiacheng Pan, Xiaotao Nie, Jiazhi Xia, Xiaolong (Luke) Zhang

[J] Structure-aware Fisheye Views for Efficient Large Graph Exploration, Yunhai Wang, Yanyan Wang, Yinqi Sun, Haifeng Zhang, Chi-Wing Fu, Michael Sedlmair, Baoquan Chen, Oliver Deussen

[J] Graphicle: Exploring Units, Networks, and Context in a Blended Visualization Approach, Timothy Major, Rahul C. Basole

Estrel Hall A+B

### SciVis Papers

#### Volume Visualization

Chair: Timo Ropinski

[J] Interactive Obstruction-free Lensing for Volumetric Data Visualization, Michael Traoré, Christophe Hurter, Alexandru Telea

[J] Dynamic Volume Lines: Visual Comparison of 3D Volumes through Space-filling Curves, Johannes Weissenböck, Bernhard Fröhler, Eduard Gröller, Johann Kastner, Christoph Heinzl

[J] A Declarative Grammar of Flexible Volume Visualization Pipelines, Min Shih, Charles Rozhon, Kwan-Liu Ma

[T] Multi-Material Volume Rendering with a Physically-Based Surface Reflection Model, Oleg Igouchkine, Yubo Zhang, Kwan-Liu Ma

[T] A Generative Model for Volume Rendering, Matthew Berger, Jixian Li, Joshua A. Levine

Estrel Hall C

### InfoVis Papers

#### UX Devices: Small & Large

Chair: Wesley Willet

[J] Vistrates: A Component Model for Ubiquitous Analytics, Sriram Karthik Badam, Andreas Mathisen, Roman Rädle, Clemens Nylandsted Klokmose, Niklas Elmquist

[J] SmartCues: A Multitouch Query Approach for Details-on-Demand through Dynamically Computed Overlays, Hariharan Subramonyam, Eytan Adar

[J] Multiple Coordinated Views at Large Displays for Multiple Users: Empirical Findings on User Behavior, Movements, and Distances, Ricardo Langner, Ulrike Kister, Raimund Dachselt

[J] Visualizing Ranges over Time on Mobile Phones: A Task-Based Crowdsourced Evaluation, Matthew Brehmer, Bongshin Lee, Petra Isenberg, Eun Kyung Choe

[J] Glanceable Visualization: Studies of Data Comparison Performance on Smartwatches, Tanja Blascheck, Lonni Besançon, Anastasia Bezerianos, Bongshin Lee, Petra Isenberg

Room IV

### CG&A Papers

#### Session 1

Chair: Theresa-Marie Rhyne

**Physical Visualization of Geospatial Datasets**, Hessam Djavaherpour, Ali Mahdavi-Amiri, Faramarz F. Samavati

**Typology of Uncertainty in Static Geolocated Graphs for Visualization**, Tatiana von Landesberger, Sebastian Bremm, Marcel Wunderlich

**Impact of Spatial Scales on the Intercomparison of Climate Scenarios**, Wei Luo, Michael Steptoe, Zheng Chang, Robert Link, Leon Clarke, Ross Maciejewski

**Urban Space Explorer: A Visual Analytics System for Urban Planning**, Alireza Karduni, Isaac Cho, Ginette Wessel, William Ribarsky, Eric Sauda, Wenwen Dou

**Name Profiler Toolkit**, Feng Wang, Brett Hansen, Ryan Simmons, Ross Maciejewski

12:40–2:20 PM

Lunch Break

1:00-2:20 PM

Convention Hall 1, Section C

**Open Discussion Session: Restructuring IEEE VIS for the Future**

Organizers: Hans Hagen, Daniel Keim, Tamara Munzner, Stephen North, Hanspeter Pfister

Please join us! For more information, please see p. 9.

2:20-4:00 PM

Convention Hall 1, Section C

**VAST Papers****DS High Dimensional Data**

Chair: Cagatay Turkyay

**[J] SIRIUS: Dual, Symmetric, Interactive Dimension Reductions**, Michelle Dowling, John Wenskovitch, J.T. Fry, Leanna House, Scotland Leman, Chris North**[T] A Perception-Driven Approach to Supervised Dimensionality Reduction for Visualization**, Yunhai Wang, Kang Feng, Xiaowei Chu, Jian Zhang, Chi-Wing Fu, Michael Sedlmair, Xiaohui Yu, Baoquan Chen**[C] SMARTexplore: Simplifying High-Dimensional Data Analysis through a Table-Based Visual Analytics Approach**, Michael Blumenschein, Michael Behrisch, Stefanie Schmid, Simon Butscher, Deborah R. Wahl, Karoline Villinger, Britta Renner, Harald Reiterer, Daniel Keim**[T] ColorMapND: A Data-Driven Approach and Tool for Mapping Multivariate Data to Color**, Shenghui Cheng, Wei Xu, Klaus Mueller**[C] EmbeddingVis: A Visual Analytics Approach to Comparative Network Embedding Inspection**, Quan Li, Kristanto Sean Njotoprawiro, Hammad Haleem, Qiaoan Chen, Chris Yi, Xiaojuan Ma

Convention Hall 1, Section D

**InfoVis Papers****AP Text & Communication**

Chair: Shixia Liu

**[J] Evaluating ‘Graphical Perception’ with CNNs**, Daniel Haehn, James Tompkin, Hanspeter Pfister**[J] NLIZE: A Perturbation-Driven Visual Interrogation Tool for Analyzing and Interpreting Natural Language Inference Models**, Shusen Liu, Zhimin Li, Tao Li, Vivek Srikumar, Valerio Pascucci, Peer-Timo Bremer**[J] Elastic Documents: Coupling Text and Tables through Contextual Visualizations for Enhanced Document Reading**, Sriram Karthik Badam, Zhicheng Liu, Niklas Elmquist**[J] Augmenting Visualizations with Interactive Data Facts to Facilitate Interpretation and Communication**, Arjun Srinivasan, Steven Drucker, Alex Endert, John Stasko**[J] What Do We Talk About When We Talk About Dashboards?**, Alper Sarikaya, Michael Correll, Lyn Bartram, Melanie Tory, Danyel A. Fisher

Estrel Hall A+B

**SciVis Papers****SS Space and Physics**

Chair: Jens Krüger

**[J] Visualization of Bubble Formation in Porous Media**, Hui Zhang, Steffen Frey, Holger Steeb, David Uribe, Thomas Ertl, Wenping Wang**[J] Gaia Sky: Navigating the Gaia Catalog**, Toni Sagristà Sellés, Stefan Jordan, Thomas Müller, Filip Sadlo**[J] Interactive 3D Visual Analysis of Atmospheric Fronts**, Michael Alexander Kern, Timothy David Hewson, Andreas Schäfler, Rüdiger Westermann, Marc Rautenhaus**[J] An Interactive Framework for Visualization of Weather Forecast Ensembles**, Bo Ma, Alireza Entezari**[T] Animation Plans for Before-And-After Satellite images**, María-Jesús Lobo, Caroline Appert, Emmanuel Pietriga

Estrel Hall C

**SciVis Contest****SS The visualization and analysis of deep water asteroid impacts**

Chair: John Patchett, Thomas Wischgoll

Asteroids of various sizes, speeds, and compositions are zipping around the solar system with potential future Earth engagements. Most of the earth is covered in ocean and impacts would likely occur in deep ocean water. The IEEE SciVis Contest 2018 is dedicated to the visualization and analysis of simulations designed to study asteroid impacts in deep ocean water.

Room IV

**VIS Panel****Perspectives in Color Research for Scientific Visualization: Understanding the Lenses and Languages**

Panelists: Francesca Samsel, Roxana Bujack, Lyn Bartram, Karen Schloss, Gerik Scheuermann

To date most of the design, construction, and evaluation of color-maps and tools have been developed within individual disciplines. Our panelists bring expertise that originates outside of computer science disciplines onto the visualization challenges. Each panelist will introduce their field, expertise, and its potential to contribute to scientific visualization. The panel has been designed to address our broader goals: highlighting a range of expertise beyond computer science; creating language toward common terminology to facilitate dialogue; listening to and understanding the domain sciences needs; and identifying opportunities for collaborative research avenues.

2:30-4:00 PM

Room 30310

**Meetups: Inviwo**

Organizers: Timo Ropinski

During the meetup users and developers of the Inviwo visualization framework ([www.inviwo.org](http://www.inviwo.org)) will meet and discuss latest developments.

4:00-4:20 PM

Coffee Break

4:20-5:20 PM

Estrel Hall A+B

**VIS Fast Forward (Thu & Fri Sessions)**

5:20-7:00 PM

Foyers

**Posters + Networking + Hiring events**

7:00-9:00 PM

Convention Hall 1, Section C+D

**VIS Dinner Banquet**

# THURSDAY, 25 OCTOBER

9:00-10:40 AM

Estrel Hall C

Convention Hall 1, Section C

## VAST Papers

### Security, Privacy, and Anomaly

Chair: Nan Cao

[J] **Vulnus: Visual Vulnerability Analysis for Network Security**, Marco Angelini, Graziano Blasilli, Tiziana Catarci, Simone Lenti, Giuseppe Santucci

[J] **GraphProtector: a Visual Interface for Employing and Assessing Multiple Privacy Preserving Graph Algorithms**, Xumeng Wang, Wei Chen, Huihua Guan, Wenlong Chen, Rusheng Pan, Jia-Kai Chou, Chris Bryan, Kwan-Liu Ma

[J] **Situ: Identifying and explaining suspicious behavior in networks**, John Goodall, Eric Ragan, Chad Steed, Joel Reed, Gregory Richardson, Kelly Huffer, Robert Bridges, Jason Laska

[Honorable Mention] [J] **A Visual Analytics Framework for the Detection of Anomalous Call Stack Trees in High Performance Computing Applications**, Cong Xie, Wei Xu, Klaus Mueller

[J] **Lessons Learned Developing a Visual Analytics Solution for Investigative Analysis of Scamming Activities**, Jay Koven, Cristian Felix, Hossein Siadati, Enrico Bertini, Markus Jakobsson

Convention Hall 1, Section D

## InfoVis Papers

### UX Immersive Analytics

Chair: Jagoda Walny

[J] **Origin-Destination Flow Maps in Immersive Environments**, Yalong Yang, Tim Dwyer, Bernhard Jenny, Kim Marriott, Maxime Cordeil, Haohui Chen

[J] **FiberClay: Sculpting Three Dimensional Trajectories to Reveal Structural Insights**, Christophe Hurter, Nathalie Henry Riche, Steven Drucker, Maxime Cordeil, Richard Alligier, Romain Vuillemot

[J] **DXR: A Toolkit for Building Immersive Data Visualizations**, Ronell Sicat, Jiabao Li, JunYoung Choi, Maxime Cordeil, Won-Ki Jeong, Benjamin Bach, Hanspeter Pfister

[J] **Information Olfaction: Harnessing Scent to Convey Data**, Biswaksen Patnaik, Andrea Batch, Niklas Elmquist

[J] **Dynamic Composite Data Physicalization Using Wheeled Micro-Robots**, Mathieu Le Goc, Charles Perin, Sean Follmer, Jean-Daniel Fekete, Pierre Dragicevic

Estrel Hall A+B

## SciVis Papers

### Tensors

Chair: Ingrid Hotz

[J] **Robust and Fast Extraction of 3D Symmetric Tensor Field Topology**, Lawrence Roy, Prashant Kumar, Yue Zhang, Eugene Zhang

[J] **DT-MRI Streamsurfaces Revisited**, Michael Ankele, Thomas Schultz

[J] **Tensor Field Visualization using Fiber Surfaces of Invariant Space**, Felix Raith, Christian Blecha, Thomas Nagel, Francesco Parisio, Olaf Kolditz, Fabian Günther, Markus Stommel, Gerik Scheuermann

[T] **Tensor Decompositions for Integral Histogram Compression and Look-Up**, Rafael Ballester-Ripoll, Renato Pajarola

## VAST Papers

### DS Interactive Analytics and Design

Chair: Adam Perer

[J] **An Interactive Method to Improve Crowdsourced Annotations**, Changjian Chen, Shixia Liu, Yafeng Lu, Fangxin Ouyang, Bin Wang

[J] **RegressionExplorer: Interactive Exploration of Logistic Regression Models with Subgroup Analysis**, Jarke van Wijk, Marcel van 't Veer, Patrick Houthuizen, Eveline H. J. Mestrom, Erik H.H.M. Korsten, Arthur R.A. Bouwman

[J] **Drag and Track: A Direct Manipulation Interface for Contextualizing Data Instances within a Continuous Parameter Space**, Daniel Orban, Daniel Keefe, Ayan Biswas, James Ahrens, David Rogers

[J] **Clustrophile 2: Guided Visual Clustering Analysis**, Marco Cavallo, Çağatay Demiralp

[J] **InkPlanner: Supporting Prewriting via Intelligent Visual Diagramming**, Zhicong Lu, Mingming Fan, Yun Wang, Jian Zhao, Michelle Annett, Daniel Wigdor

Room IV

## VISAP: Arts Program

### Session 2: Paths and Memories

Chair: Till Nagel

Paper: **Nostalgia: A Human-Machine Transliteration**, Raphael Arar

Annotated Project: **Cycles and (A)Symmetry | Exploring the Design of Sharable Personal Visualizations**, Charles Perin

Paper: **Shifted Maps: Revealing Spatio-Temporal Topologies in Movement Data**, Heike Otten, Lennart Hildebrand, Till Nagel, Marian Dörk, Boris Müller

Annotated Project: **The Phaistos Project—Forty-Five Symbols**, Pascal Glissmann, Andreas Henrich, Olivier Arcioli

Various Artist Talks

10:40-11:00 AM

Coffee Break

10:40-11:40 AM

Room 30310

## Meetups: Building an Inclusive VIS Community

Organizers: Michelle Borkin, Kelly Gaither, R. Jordan Crouser, Meg Pirrung

Diversity of perspective is the key to innovation, but ensuring equal access requires concrete action. To this end, the members of the IEEE VIS 2018 Inclusivity & Diversity Committee invite you to this community forum to connect, share your experiences, and explore what it means to build an inclusive VIS community. To learn more about Inclusivity & Diversity at VIS and its current initiatives, please visit: <http://ieevis.org/year/2018/info/inclusion-and-diversity/inclusivity>

11:00 AM-12:40 PM

Convention Hall 1, Section C

## VAST Papers

### DS Deep Learning

Chair: Torsten Möller

[T] **Visual Analytics in Deep Learning: An Interrogative Survey for the Next Frontiers**, Fred Hohman, Minsuk Kahng, Robert Pienta, Duen Horng

[C] **Analyzing the Noise Robustness of Deep Neural Networks**, Mengchen Liu, Shixia Liu, Hang Su, Kelei Cao, Jun Zhu

[Honorable Mention] [J] **DQNVis: A Visual Analytics Approach to Understand Deep Q-Networks**, Junpeng Wang, Liang Gou, Han-Wei Shen, Hao Yang

[J] **RetainVis: Visual Analytics with Interpretable and Interactive Recurrent Neural Network on Electronic Medical Records**, Bum Chul Kwon, Min-Je Choi, Joanne Kim, Edward Choi, Young Bin Kim, Soonwook Kwon, Jimeng Sun, Jaegul Choo

[J] **GAN Lab: Understanding Complex Deep Generative Models using Interactive Visual Experimentation**, Minsuk Kahng, Nikhil Thorat, Duen Horng Chau, Fernanda Viegas, Martin Wattenberg

*Convention Hall 1, Section D*

#### InfoVis Papers

##### DJ Design & Storytelling

Chair: Jessica Hullman

[J] **A Framework for Creative Visualization-Opportunities Workshops**, Ethan Kerzner, Sarah Goodwin, Jason Dykes, Sara V. Jones, Miriah Meyer

[T] **ATOM: A Grammar for Unit Visualizations**, Deokgun Park, Steven M. Drucker, Roland Fernandez, Niklas Elmquist

[Honorable Mention] [J] **Design Exposition with Literate Visualization**, Jo Wood, Alexander Kachkaev, Jason Dykes

[J] **iStoryline: Effective Convergence to Hand-drawn Storylines**, Tan Tang, Sadia Rubab, Jiewen Lai, Weiwei Cui, Lingyun Yu, Yingcai Wu

[J] **Narvis: Authoring Narrative Slideshows for Introducing Data Visualization Designs**, Qianwen Wang, Zhen Li, Siwei Fu, Weiwei Cui, Huamin Qu

*Estrel Hall A+B*

#### SciVis Papers

##### SS Scalable Techniques

Chair: Steffen Fey

[J] **Culling for Extreme-Scale Segmentation Volumes: A Hybrid Deterministic and Probabilistic Approach**, Johanna Beyer, Haneen Mohammed, Marco Agus, Ali K. Al-Awami, Hanspeter Pfister, Markus Hadwiger

[J] **CPU Iso-surface Ray Tracing of Adaptive Mesh Refinement Data**, Feng Wang, Ingo Wald, Qi Wu, Will Usher, Chris R. Johnson

[T] **Efficient Local Statistical Analysis via Point-Wise Histograms in Tetrahedral Meshes and Curvilinear Grids**, Bo Zhou, Yi-Jen Chiang, Cong Wang

[T] **Shadow Accrual Maps: Efficient Accumulation of City-Scale Shadows over Time**, Fabio Miranda, Harish Doraiswamy, Marcos Lage, Luc Wilson, Mondrian Hsieh, Cláudio T. Silva

[T] **A Scalable Hybrid Scheme for Ray-Casting of Unstructured Volume Data**, Roba Binyahib, Tom Peterka, Matthew Larsen, Kwan-Liu Ma, Hank Childs

*Estrel Hall C*

#### InfoVis Papers

##### UX Interaction

Chair: Manuela Waldner

[Honorable Mention] [J] **Charticulator: Interactive Construction of Bespoke Chart Layouts**, Donghao Ren, Bongshin Lee, Matthew Brehmer

[J] **Embedded Merge & Split: Visual Adjustment of Data Grouping**, Ali Sarvghad, Bahador Saket, Alex Endert, Nadir Weibel

[T] **Smart Brushing for Parallel Coordinates**, Richard Roberts, Robert S. Laramee, Gary A Smith, Paul Brookes, Tony D'Cruze

[T] **Multidimensional Projection for Visual Analytics: Linking Techniques with Distortions, Tasks, and Layout Enrichment**, Luis

Gustavo Nonato, Michael Aupetit

[T] **Exploration Strategies for Discovery of Interactivity in Visualizations**, Tanja Blascheck, Lindsay MacDonald Vermeulen, Jo Vermeulen, Charles Perin, Wesley Willett, Thomas Ertl, Sheelagh Carpendale

*Room IV*

#### CG&A Papers

##### SS UX Session 2

Chair: Gerik Scheuermann

**OpenSpace: Changing the Narrative of Public Dissemination in Astronomical Visualization from What to How**, Alexander Bock, Emil Axelsson, Carter Emmart, Masha Kuznetsova, Charles Hansen, Anders Ynnerman

**Belle2VR: A Virtual-Reality Visualization of Subatomic Particle Physics in the Belle II Experiment**, Zach Duer, Leo Piilonen, George Glasson

**Application-Driven Design: Help Students Understand Employment and See the “Big Picture”**, Li Liu, Deborah Silver, Karen Bemis

**Management of Cerebral Aneurysm Descriptors based on an Automatic Ostium Extraction**, Monique Meuschke, Tobias Günther, Ralph Wickenhöfer, Markus Gross, Bernhard Preim, Kai Lawonn

**Toward a Multimodal Diagnostic Exploratory Visualization of Focal Cortical Dysplasia**, Shin-Ting Wu, Raphael Voltoline, Wallace S. Loos, J.A. Iván Rubianes, Lionis S. Watanabe, Bárbara J. Amorim, A. Carolina Coan, Fernando Cendes, Clarissa L. Yasuda

**12:40–2:20 PM**

Lunch Break

**1:00–2:20 PM**

*Estrel Hall C*

VIS 2019 Kick-off Meeting

**2:20–4:00 PM**

*Convention Hall 1, Section C*

#### VAST Papers

##### Graph and Image

Chair: Fabian Beck

[J] **ViBr: Visualizing Bipartite Relations at Scale with the Minimum Description Length Principle**, Gromit Yeuk-Yin Chan, Panpan Xu, Zeng Dai, Liu Ren

[C] **Segue: Overviewing Evolution Patterns of Egocentric Networks by Interactive Construction of Spatial Layouts**, Po-Ming Law, Yanhong Wu, Rahul Basole

[J] **A Visual Analytics Framework for Spatiotemporal Trade Network Analysis**, Hong Wang, Yafeng Lu, Shade Shutters, Michael Steptoe, Feng Wang, Steven Landis, Ross Maciejewski

[T] **A Semantic-based Method for Visualizing Large Image Collections**, Xiao Xie, Xiwen Cai, Junpei Zhou, Nan Cao, Yingcai Wu

[T] **PhotoRecomposer: Interactive Photo Recomposition by Cropping**, Yuan Liang, Xiting Wang, Song-Hai Zhang, Shi-Min Hu, Shixia Liu

*Convention Hall 1, Section D*

#### InfoVis Papers

##### Perception & Cognition 1

Chair: Danielle Szafir

[Honorable Mention] [J] **Mapping Color to Meaning in Colormap Data Visualizations**, Karen B. Schloss, Connor C. Gramazio, Allison T. Silverman, Madeline L. Parker, Audrey S. Wang

[J] Optimizing Color Assignment for Perception of Class Separability in Multiclass Scatterplots, Yunhai Wang, Xin Chen, Tong Ge, Chen Bao, Michael Sedlmair, Chi-Wing Fu, Oliver Deussen, Baoquan Chen  
 [J] Looks Good To Me: Visualizations As Sanity Checks, Michael Correll, Mingwei Li, Gordon L Kindlmann, Carlos Scheidegger

[T] Is There a Robust Technique for Selecting Aspect Ratios in Line Charts?, Yunhai Wang, Zeyu Wang, Lifeng Zhu, Jian Zhang, Chi-Wing Fu, Changhe Tu, Baoquan Chen, Zhanglin Cheng

[J] Image-based Aspect Ratio Selection, Yunhai Wang, Zeyu Wang, Chi-Wing Fu, Hansjörg Schmauder, Oliver Deussen, Daniel Weiskopf

*Estrel Hall A+B*

#### SciVis Papers

##### Topology, Geometry, and Precision

Chairs: Bei Wang

[J] Persistence Atlas for Critical Point Variability in Ensembles, Guillaume Favelier, Noura Faraj, Brian Summa, Julien Tierny

[J] Probabilistic Asymptotic Decider for Topological Ambiguity Resolution in Level-Set Extraction for Uncertain 2D Data, Tushar Athawale, Chris R. Johnson

[J] Hexahedral Mesh Structure Visualization and Evaluation, Kaoji Cotrik Xu, Guoning Chen

[J] Shared-Memory Parallel Computation of Morse-Smale Complexes with Improved Accuracy, Attila Gyulassy, Peer-Timo Bremer, Valerio Pascucci

[J] A Study of the Trade-off between Reduced Precision and Resolution for Scientific Data Analysis and Visualization, Duong Hoang, Pavol Klacansky, Harsh Bhatia, Peer-Timo Bremer, Peter Lindstrom, Valerio Pascucci

*Estrel Hall C*

#### SciVis Short Papers

##### Visual Abstractions, Perceptual Study and Immersive Visualization

Chairs: João L. D. Comba

An Organic Visual Metaphor for Public Understanding of Conditional Co-occurrences, Keshav Dasu, Takanori Fujiwara, Kwan-Liu Ma

VAPLI: Novel Visual Abstraction for Protein-Lipid Interactions, Naif Alharbi, Matthieu Chavent, Michael Krone, Robert S. Laramee

Color Interpolation for Non-Euclidean Color Spaces, Max Zeyen, Tobias Post, Hans Hagen, James Ahrens, David Rogers, Roxana Bujack

VRGE: An Immersive Visualization Application for the Geosciences, David A. B. Hyde, Tyler R. Hall, Jef Caers

3De Interactive Lenses for Visualization in Virtual Environments, Roberta C. R. Mota, Allan Rocha, Julio D. Silva, Usman R. Alim, Ehud Sharlin

Toward A Deep Understanding of What Makes a Scientific Visualization Memorable, Rui Li, Jian Chen

Ordering Perceptions about Perceptual Order, Roxana Bujack, Terece L. Turton, David Rogers, James Ahrens

QuFlow: Visualizing Parameter Flow in Quantum Circuits for Understanding Quantum Computation, Siyuan Lin, Hao Jiang, Lingyun Sun

*Room IV*

#### VIS Panel

##### AP Meet the Founders: How to Start and Sustain a Business in the Visualization Space

Panelists: Robert Kosara, Lisa Avila, Jeffrey Heer, Anders Ynnerman

Visualization is not just an academic pursuit, there are also a number of successful companies that have come out of visualization research or are closely related. This panel brings together some of the founders of these companies to discuss how to start a small

business based on research and how to sustain and keep building it as a business. We will talk about what were good and bad decisions, what was easier and harder than expected, and be open to questions from anybody who might be considering starting their own business (or is just curious).

**4:00–4:20 PM**

Coffee Break

**4:10–6:00 PM**

*Room IV*

#### Meetups: VIS Job-Fair Meetup

Organizers: Anastasia Bezerianos, Jonathan Woodring, Weiwei Cui  
 As a complement to the Asynchronous Job Fair, we are organizing a job “speed-dating” meetup. Its goal is to bring together job seekers and employers in one venue to trade CV and employment information. Both job seekers and employers should attend with the expectation to be prepared with “low-tech” information, such as paper and flyers to exchange. If you are an interested job seeker, please bring your contact information to share, such as printed CVs, email addresses on notecards or business cards, for example. Likewise for employers, please be prepared with business cards, brochure, and other paper-based information.

**4:20–6:00 PM**

*Convention Hall 1, Section C*

#### VAST Papers

##### Explainable ML

Chair: Jaegul Choo

[J] RuleMatrix: Visualizing and Understanding Classifiers with Rules, Yao Ming, Huamin Qu, Enrico Bertini

[Honorable Mention] [J] Seq2Seq-Vis: A Visual Debugging Tool for Sequence to Sequence Models, Hendrik Strobelt, Sebastian Gehrmann, Michael Behrisch, Adam Perer, Hanspeter Pfister, Alexander M. Rush

[J] Manifold: A Model-Agnostic Framework for Interpretation and Diagnosis of Machine Learning Models, Jiawei Zhang, Yang Wang, Piero Molino, Lezhi Li, David Ebert

[J] Visual Analytics for Topic Model Optimization Based on User-Steerable Speculative Execution, Mennatallah El-Assady, Fabian Sperrle, Oliver Deussen, Daniel Keim, Christopher Collins

[J] VIS4ML: An Ontology for Visual Analytics Assisted Machine Learning, Dominik Sacha, Matthias Kraus, Daniel Keim, Min Chen

*Convention Hall 1, Section D*

#### InfoVis Papers

##### Perception & Cognition 2

Chair: Karen Schloss

[J] Mitigating the Attraction Effect with Visualizations, Evanthish Dimara, Gilles Baily, Anastasia Bezerianos, Steven Franconeri

[J] Face to Face: Evaluating Visual Comparison, Brian David Ondov, Nicole Jardine, Niklas Elmquist, Steven Franconeri

[T] Task-Based Effectiveness of Basic Visualizations, Bahador Saket, Alex Endert, Çağatay Demiralp

[J] At a Glance: Approximate Entropy as a Measure of Line Chart Visualization Complexity, Eugene Wu, Remco Chang, Abigail Mosca, Gabriel Ryan

[T] Correlation Judgment and Visualization Features: A Comparative Study, Fumeng Yang, Lane Harrison, Ronald A. Rensink, Steven Franconeri, Remco Chang

**SciVis Papers****Interaction and Multivariate Data**

Chairs: Luis Gustavo Nonato

**[Honorable Mention] [J] Firefly: Illumination Drones for Interactive Visualization**, Sergej Stoppel, Magnus Paulson Erga, Stefan Bruckner

**[J] CoDDA: A Flexible Copula-based Distribution Driven Analysis Framework for Large-Scale Multivariate Data**, Subhashis Hazarika, Soumya Dutta, Han-Wei Shen, Jen-Ping Chen

**[J] Details-First, Show Context, Overview Last: Supporting Exploration of Viscous Fingers in Large-Scale Ensemble Simulations**, Timothy Basil Luciani, Andrew T Burks, Cassiano Sugiyama, Jonathan Komperda, G. Elisabetta Marai

**[T] A Model of Spatial Directness in Interactive Visualization**, Stefan Bruckner, Tobias Isenberg, Timo Ropinski, Alexander Wiebel

**[T] Decal-Lenses: Interactive Lenses on Surfaces for Multivariate Visualization**, Allan Rocha, Julio Daniel Silva, Usman R. Alim, Sheelagh Carpendale, Mario Costa Sousa

**SciVis Short Papers****Flow, Astrophysics, and Computationally Intensive Data Visualization**

Chairs: Joshua Levine

**Cluster-Based Visualization for Merger Tree Data: The Challenge of Missing Expectations**, Annie Preston, Kwan-Liu Ma

**Visualization of Uncertainty for Computationally Intensive Simulations Using High Fidelity Emulators**, Ayan Biswas, Earl Lawrence, James Ahrens

**A Lagrangian Method for Extracting Eddy Boundaries in the Red Sea and the Gulf of Aden**, Anke Friederici, Habib Toye, Ibrahim Hoteit, Tino Weinkauf, Holger Theisel, Markus Hadwiger

**FTLE Ridge Lines for Long Integration Times**, Thomas Wilde, Christian Rössl, Holger Theisel

**Ocean Current Segmentation at Different Depths and Correlation with Temperature in a MPAS-Ocean Simulation**, Petra Gospodnetic, Divya Banesh, Philip Wolfram, Mark Petersen, Hans Hagen, James Ahrens, Markus Rauhut

**TimeTubes: Automatic Extraction of Observable Blazar Features from Long-Term, Multi-Dimensional Datasets**, Naoko Sawada, Masanori Nakayama, Makoto Uemura, Issei Fujishiro

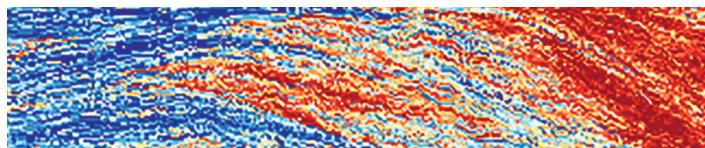
**aflik: Pluggable Visual Programming Environment with Quick Feedback Loop Tuned for Astrophysical Observations**, Malik Olivier Boussejra, Kazuya Matsubayashi, Yuriko Takeshima, Shunya Takekawa, Rikuo Uchiki, Makoto Uemura, Issei Fujishiro

**Biclusters based Visual Exploration of Multivariate Scientific Data**, Xiangyang He, Yubo Tao, Qirui Wang, Hai Lin

**6:00-7:00 PM****Meetups: Visualization Meets Vision Science**

Organizers: Madison Elliott, Zoya Bylinskii, Christine Nothelfer, Cindy Xiong, Danielle Albers Szafir

Vision science provides both an empirical basis for techniques and design practices in visualization and a suite of methods and approaches for understanding visualizations—including what data trends people see, what statistics they extract, and what they ultimately remember. Visualization provides a real world platform for vision scientists to investigate how our perceptual and cognitive systems interpret visualized information and problems for understanding how we transform visual information to knowledge. Come meet with visualization and vision science experts to share cutting



edge research at this growing interdisciplinary intersection! We will engage in lightning talks and open discussion, which provide an opportunity to ask questions, share new research ideas, and extend your professional networks. All are welcome, and interested presenters can submit an abstract for a 2-3 minute “lightning talk” about their latest work by September 21, 2018.

**Meetups: Broadening Intellectual Diversity of Visualization Research Papers**

Organizers: Bongshin Lee, G. Elisabetta Marai, Danielle Albers Szafir, Kate Isaacs, Cagatay Turkyay, Sheelagh Carpendale

This meetup is being proposed as a follow-up discussion session to the breakout group discussion at the BIRS Workshop, “Restructuring VIS for the Future,” held in June 2018. In this meetup, we will discuss broader types of contributions with aims to promote a healthy growth of the visualization community, to increase intellectual diversity, and to better demonstrate the value and impact of visualization research. We fully acknowledge the value of the paper types (Munzner, 2008) to the community so far (in particular to the paper writing and reviewing process). However, we also note that paper types specify mostly the paper structure due to their prescriptive nature. Contribution types can give a broader scope to the types of papers that are considered acceptable (e.g., exciting and emerging research that does not fit exactly into a paper type) and can offer more transient and flexible criteria to evaluate visualization research. To facilitate initial discussion, we will provide a set of research contribution types with example papers, along with a brief review of contribution types in other research communities. While this would not be exhaustive it would serve as a good starting point. We will discuss the concrete next steps we can and should take to ensure a successful implantation and application of the research contribution types. We also plan to continue our discussion and communication with the meetup participants through a Slack channel.

**6:15-7:00 PM****Meetups: Velo Club de Vis**

Organizers: Jason Dykes

A chance for VIS cyclists to discuss cycling and to prepare and sign in for Le Tour de VIS - the IEEE VIS post-conference road ride. <https://www.gicentre.net/velo-club-rides/>

**7:00 PM****Meetups: Good Food Meets Good Science**

Organizers: Daniel Archambault, Andreas Kerren

Tired of bad food? Didn’t have something local when attending the conference and regretted it? Want the good scientific discussions to continue around a local specialty of the area? This meetup is designed to take participants to a restaurant serving good food that is a local specialty of the area. We aim for an accessible price so that anyone can attend. People can sign up on a first come first served basis. The audience should bring an interesting scientific topic to discuss at dinner. An appetite for local cuisine is also highly recommended.

# FRIDAY, 26 OCTOBER

9:00-10:40 AM

Convention Hall 1, Section C

## VAST Papers

### DS Event, Sequence, and ML

Chair: Carlos Scheidegger

[J] **MAQUI: Interweaving Queries and Pattern Mining for Recursive Event Sequence Exploration**, Po-Ming Law, Zhicheng Liu, Sana Malik, Rahul Basole

[J] **iForest: Interpreting Random Forests via Visual Analytics**, Xun Zhao, Yanhong Wu, Dik Lun Lee, Weiwei Cui

[J] **Visual Progression Analysis of Event Sequence Data**, Shunan Guo, Zhuochen Jin, David Gotz, Fan Du, Hongyuan Zha, Nan Cao

[T] **StreamExplorer: A Multi-Stage System for Visually Exploring Events in Social Streams**, Yingcai Wu, Zhitian Chen, Guodao Sun, Xiao Xie, Nan Cao, Shixia Liu, Weiwei Cui

[J] **Duet: Helping Data Analysis Novices Conduct Pairwise Comparisons by Minimal Specification**, Po-Ming Law, Rahul Basole, Yanhong Wu

Convention Hall 1, Section D

## InfoVis Papers

### Uncertainty & Error

Chair: Lace Padilla

[J] **Visualizing Uncertain Tropical Cyclone Predictions using Representative Samples from Ensembles of Forecast Tracks**, Le Liu, Lace M. K. Padilla, Sarah Creem-Regehr, Donald House

[J] **Hypothetical Outcome Plots Help Untrained Observers Judge Trends in Ambiguous Data**, Alex Kale, Francis Nguyen, Matthew Kay, Jessica Hullman

[J] **In Pursuit of Error: A Survey of Uncertainty Visualization Evaluation**, Jessica Hullman, Xiaoli Qiao, Michael Correll, Alex Kale, Matthew Kay

[J] **Where's My Data? Evaluating Visualizations with Missing Data**, Hayeong Song, Danielle Albers Szafir

[J] **A Framework for Externalizing Implicit Error Using Visualization**, Nina McCurdy, Julie Gerdes, Miriah Meyer

Estrel Hall C

## SciVis Papers

### SS Time-Varying Data

Chair: Steffen Oeltze-Jafra

[J] **Exploring Time-Varying Multivariate Volume Data Using Matrix of Isosurface Similarity Maps**, Jun Tao, Martin Imre, Chaoli Wang, Nitesh V Chawla, Hanqi Guo, Gökhan Sever, Seung Hyun Kim

[J] **Visual Analysis of Spatio-Temporal Relations of Pairwise Attributes in Unsteady Flow**, Marzieh Berenkoub, Rodolfo Ostilla Monico, Robert S. Laramee, Guoning Chen

[J] **Time-Dependent Flow Seen Through Approximate Observer Killing Fields**, Markus Hadwiger, Matej Mlejnek, Thomas Theussl, Peter Rautek

[T] **An Exploratory Framework for Cyclone Identification and Tracking**, Akash Anil Valsangkar, Joy Merwin Monteiro, Vidya Narayanan, Ingrid Hotz, Vijay Natarajan

[T] **Popup-Plots: Warping Temporal Data Visualization**, Johanna Schmidt, Dominik Fleischmann, Bernhard Preim, Norbert Brandle, Gabriel Mistelbauer

10:40-11:00 AM

Coffee Break

11:00-12:00 PM

Convention Hall 1, Section C

### AP VIS Capstone

Speaker: Joachim M. Buhmann, ETH Zurich

**Can I Believe What I See?—Information-Theoretic Algorithm Validation**

Please see p. 5 for Capstone details.

12:00-12:30 PM

Convention Hall 1, Section C

### AP VIS Closing

VIS 2018 General Chair: Holger Theisel, University of Magdeburg

VIS 2019 General Chair: Brian Fisher, Simon Fraser University

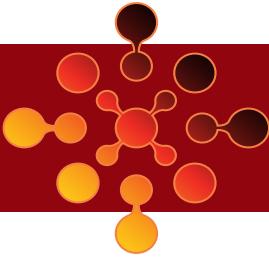
## Papers: TVCG-VIS-CG&A Partnership

The proceedings of VAST, InfoVis, and SciVis are published as a special issue of the flagship journal *IEEE Transactions on Visualization and Computer Graphics* (TVCG). The special issue has the publication date of January in the following year and is published online the first day of the conference, with Early Access preprints publicly available before VIS at <https://www.computer.org/csdn/trans/tg/preprint/index.html>. All authors of regular TVCG papers from the previous year in the area of visualization have been invited to give an oral presentation about their work at VIS; these talks are integrated within the topical papers sessions. This closely coupled relationship between TVCG and VIS supports the timely exchange of new ideas and rapid dissemination of visualization research via an integrated forum for both publications and presentations.

The VAST Conference-only and SciVis Short Papers tracks feature additional papers with innovative advances and applications in visual analytics and in scientific visualization that may have focus outside the scope of TVCG; these full archival papers will appear in the IEEE Digital Library. These talks are also integrated within the topical papers sessions.

In addition, authors of papers from the *IEEE Computer Graphics and Applications* (CG&A) from the previous year in the area of visualization have been invited to give an oral presentation about their work at VIS; these talks are collected into two CG&A-focused sessions.

# POSTERS & CONTESTS



## VIS Posters

**Health Visualizations at Home: Who Sees What Where**, Bon Adriel Aseniero, Anthony Tang, Sheelagh Carpendale

**A Multi-View Image-Based Volume Visualization Technique**, Salaheddin Alakkari, John Dingliana

**Situated Visualizations of Office Noise to Promote Personal Health**, Mina Alipour, Pierre Dragicevic, Tobias Isenberg, Petra Isenberg

**Study of Multiple View Layout Strategies in Visualization**, Hayder M. Al-maneea, Jonathan C. Roberts

**Effects of Declinism and Distinction Biases on Data Visualization**, Hasan Alp Boz, Rafiye Kececi, Yasemin Yasaroglu, Selim Balcisoy

**An Interactive Tool for Feature Analysis of Outliers in Multi-Dimensional Data**, Kentaro Asai, Tsukasa Fukusato, Takeo Igarashi

**Multi-Dimensional Projections Explorer: Searching through Techniques, Quality Measures, Analytic Tasks, and Layout Enrichments**, Michaël Aupetit, Mosammatt Samiha Sadeka, Ali Sajjad, Luis Gustavo Nonato

**Zooming on Tokens: Seamless Display Modes for Annotation Analysis**, Martin Baumann, Steffen Koch, Harutyun Minasyan, Thomas Ertl

**Refolding the Earth: Interactive Myriahedral Projection and Fabrication**, Nicolas Belmonte, Yang Wang

**[Honorable Mention] Integrated Visualization of Structure and Attribute Similarity of Multivariate Graphs**, Philip Berger, Mohammad Chegini, Heidrun Schumann, Christian Tominski

**Mure.js: Toward Flexible Authoring and Reshaping of Networks**, Alex Bigelow, Carolina Nobre, Alexander Lex, Miriah Meyer

**Scaling Up Parallel Coordinate Plot with Color-coded Stacked Histograms**, Jinwook Bok, Bohyoung Kim, Jinwook Seo

**Dual View: Multivariate Visualization Using Linked Layouts of Objects and Dimensions**, David Borland, David Gotz

**Towards a Framework for Immersive Analytics on the Web**, Peter W. S. Butcher, Nigel W. John, Panagiotis D. Ritsos

**t-viSNE: A Visual Inspector for the Exploration of t-SNE**, Angelos Chatzimpampas, Rafael M. Martins, Andreas Kerren

**Designing Narrative Slideshows for Learning Analytics**, Qing Chen, Zhen Li, Ting-Chuen Pong, Huamin Qu

**Bridging the Gap between Visual Analytics and Storytelling: General Framework and Application to Social Media Data**, Siming Chen, Jie Lie, Gennady Andrienko, Natalia Andrienko, Phong H. Nguyen, Cagatay Turkyay

**HCT: A Visual Analysis Method for Tree Comparison Based on Circular Treemap**, Yi Chen, Yue Li, Cheng Lv

**Towards Concept-Driven Visual Analytics**, In Kwon Choi, Swati Mishra, Kyle Harris, Nirmal Kumar Raveendranath, Taylor Childers, Khairi Reda

**Creating Explorable Visualization Design Spaces for Domain Experts: An Example from Infectious Disease Genomic Epidemiology**, Anamaria Crisan, Jennifer L. Gardy, Tamara Munzner

**Visual Querying and Exploring of Large Multilayer Graphs**, Erick Cuenca, Arnaud Sallaberry, Dino Ienco, Pascal Poncelet

**Arctic Movement: Visualization of a Photographic Collection**, Katherine Currier, Sheelagh Carpendale

**ComVisMD-A Visualization Tool for Compact Display of Multidimensional Data: An Illustration on Cricket Players Data**, Shridhar B. Dandin, Mireille Ducassé

**Privacy Protected Thematic Maps**, Edwin de Jonge, Peter-Paul de Wolf

**ConfusionFlow: Visualizing Neural Network Confusion Across Epochs**, Martin Ennemoser, Peter Ruch, Holger Stitz, Hendrik Strobelt, Marc Streit

**Combining Multiple View Components for Exploratory Visualization**, Vladimir Guchev, Paolo Buono, Cristina Gena

**BubbleUp: Toward Better Analysis for Temporal Event Data**, Wenjun Guo, Seungwook Kim, Seongmin Mun, Kyungwon Lee

**A Visualization Tool for Intellectual Property Law Research in China**, Jin Han, Jingyi Zhu, Ling Ma, Bindu Chib

**Comparing Rendering Performance of Common Web Technologies for Large Graphs**, Tom Horak, Ulrike Kister, Raimund Dachselt

**Simultaneous Worlds: Using Physical Models to Contextualize and Compose Visualizations**, Carmen Hull, Sheelagh Carpendale, Wesley Willett

**A Visual Analytics Framework for Automated Machine Learning**, Shah Rukh Humayoun, Dylan Cashman, Florian Heimerl, Remco Chang

**Views as Rich Menus for Other Views: A Case Study on Personal Data Visualization**, Tina Huynh, Søren Knudsen, Sheelagh Carpendale

**Discovering the Data Mapping of an Unfamiliar Visualization**, Lisa Hynes, Tina Huynh, Sarah Storteboom, Jagoda Walny, Christian Frisson, Doris Kosminsky, Mieka West, Sheelagh Carpendale, Wesley Willett

**Creating Small Unit-Based Glyph Visualisations**, James R. Jackson, Panagiotis D. Ritsos, Jonathan C. Roberts

**Spatial Comparison of Cricketers**, Adhitya Kamakshidasan

**CLIPPR: Maximally Informative CLIPPed PROjections with Bounding Regions**, Bo Kang, Dylan Cashman, Remco Chang, Jefrey Lijffijt, Tijl De Bie

**TasteGraph: A Visual Analytics Tool for Profiling Media Audiences' Tastes**, Ahmad Karawash, Sara Diamond, Marcus A. Gordon, Jad Al Rabbaa, Roxolyana Shepko-Hamilton, Greice C. Mariano, Lan-Xi Dong, Afroz Samaei, Hugh Ritchie

**ViaVelox—A System to Visually Analyze GPS-Tracked Bike Rides**, Deniz Kaya, Büsra Keles, Dimitry Nagorny, Pascal Perle, Philip Pregler, Lisa Rudolf, Martin Schröder, Ugur Tunali, Till Nagel

**Visualizing Learning Experiences Using Conversation Flows**, Mandy Keck, Alexander Maasch, Romy Bürger, Rainer Groh

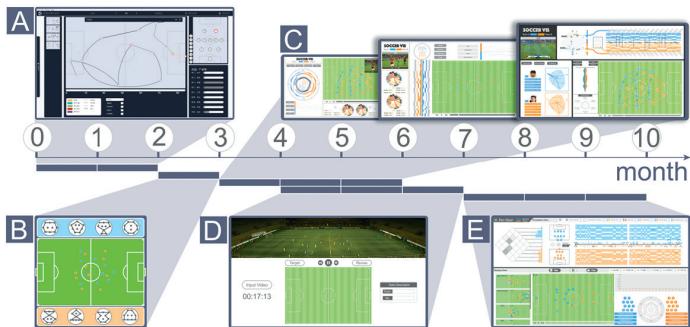
**Visual Version Comparison of Multidimensional Data Sets Using Glyphs**, Mandy Keck, Dietrich Kammer, Rainer Groh

**Improving Barycentric Embeddings of Topic Spaces**, Dora Kiesel, Patrick Riehmann, Fan Fan, Yamen Ajjour, Henning Wachsmuth, Benno Stein, Bernd Froehlich

**Fostering Data Humanism with DataPortraits: Empowering People to Create a Personalized Visual Vocabulary**, Nam Wook Kim, Hyejin Im, Nathalie Henrie Riche, Krzysztof Gajos, Hanspeter Pfister

**Virtual Lenses for Immersive Analytics**, Sven Kluge, Stefan Gladisch, Uwe Freiherr von Lukas, Christian Tominski

- Highlighting Text Regions of Interest with Character-Based LSTM Recurrent Networks**, Johannes Knittel, Steffen Koch, Thomas Ertl
- MEXPRESS: 2018 Update**, Alexander Koch, Tim De Meyer, Jana Jeschke, Wim Van, Manon van
- ST Sequence Miner: Visual Event Sequence Pattern Mining with Spatio-temporal Log Data**, Baran Koseoglu, Erdem Kaya, Selim Balci soy
- Towards Visual Data Exploration at Wall-Sized Displays by Combining Physical Navigation with Spatially-Aware Devices**, Ricardo Langner, Raimund Dachselt
- [Honorable Mention] A Scale-Space Filtering Approach for the Multi-Resolution Illustrative Visualization of Multivariate Data**, Jenny Hyunjung Lee, Klaus Mueller
- [Best Poster] Conveying Uncertainty in Archived War Diaries with GeoBlobs**, Johannes Liem, Eirini Goudarouli, Steven Hirschorn, Jo Wood, Charles Perin
- Visualizing Attention in Sequence-to-Sequence Summarization Models**, Halden Lin, Tongshuang Wu, Kanit Wongsuphasawat, Yejin Choi, Jeffrey Heer
- Visualizing Dynamic Networks of Long Sequences with Pixel Matrix Array**, Lijing Lin, Liwenhan Xie, Zhuo Zhang, Xiaoru Yuan
- [Honorable Mention] Visualizing Time in Temporal Event Sequences**, Jessica Magallanes-Castaneda, Lindsey van Gemeren, Steven Wood, Maria-Cruz Villa-Uriol
- Perceptually Optimized Color Selection for Visualization**, Subhrajyoti Maji, John Dingliana
- Assessing Dot-Map Aggregations**, Wouter Meulemans, Martijn Tennekes
- On Minimum-Displacement Overlap Removal**, Wouter Meulemans
- Analysis and Graph Visualization of Eye Tracking Data with a Static Stimulus**, Yuri Miyagi, Daniel Weiskopf, Takayuki Itoh
- Towards Data Science for the Masses: A Study of Data Scientists and Their Interactions with Clients**, Abigail Mosca, Shannon Robinson, Meredith Clarke, Rebecca Redelmeier, Sebastian Coates, Dylan Cashman, Remco Chang
- Bonus Miracle Tool: Visual Exploration of Nutrients across the Baltic Sea Region**, Carlo Navarra, Tina Nesi, Juile Wilk, Alena Bartosova, René Capell
- [Best Poster] Developing Virtual Reality Visualizations of Dinosaur Track Creation with Scientific Sketching**, Johannes Novotny, Joshua Tveite, Morgan L. Turner, Stephen Gatesy, Fritz Drury, Peter Falkingham, David H. Laidlaw
- [Best Poster] CerebroVis: Topology- and Constraint-based Network Layout for the Visualization of Cerebrovascular Arteries**, Aditya Pandey, Harsh Shukla, Geoffrey S. Young, Lei Qin, Cody Dunne, Michelle A. Borkin
- GitHub Viz: An Interactive Visualization to Acquire Knowledge from Authoritative Developers**, Chanhee Park, Sungjun Do, Eunjeong Lee, Hanna Jang, Sungchan Jeong, Hyunwoo Han, Kyungwon Lee
- Toward an Analysis of Practitioner-Oriented Resources for Visualization Design**, Paul Parsons, Ya-Hsin Hung, Ali Baigelenov
- The Symmetry of My Life II**, Charles Perin
- Personal Patient-Generated Data Visualizations for Diabetes Patients**, Fateme Rajabiyazdi, Charles Perin, Lora Oehlberg, Sheelagh Carpendale
- The Voronoi Projection**, Philippe Rivière
- Composer: Visual Cohort Analysis of Patient Outcomes**, Jennifer Rogers, Nicholas Spina, Ashley Neese, Rachel Hess, Darrel Brodke, Alexander Lex
- Visualising E-mail Communication to Improve E-discovery**, Mithileysh Sathiyaranarayanan, Cagatay Turkay, Jason Dykes
- EasyPZ.js: A Library for Pan and Zoom Visualizations**, Michail Schwab, James Tompkin, Jeff Huang, Michelle A. Borkin
- Design and Development of a Dashboard for the Visualization and Assessment of Students Work in a Remote Lab**, V. Serrano, J. Cuadros, J. Garcia-Zubia, U. Hernandez-Jayo, L. Mompó
- Interactive Visual Tools Supporting Effective Health State Understanding of Patient with Comorbidities**, Marek Skokan, Jan Hreno
- Characterising Farms by the Movement of Animals through Them**, Aidan Slingsby, Andy Paterson, Mark Rigby, Katherine Grace, Phong Nguyen, Charles Perin, Cagatay Turkay, Dalal Aljasem
- Towards a Visual Analytics Pipeline for the Analysis of Recurring Patterns in Time Series Data**, Florian Spechtenhauser, Rastislav Hronsky, Torsten Möller, Harald Piringer
- [Best Poster] Urban DataSphere: Exploring Immersive Multiview Visualizations in Cities**, Maxim Spur, Vincent Toure
- Visual Analysis of Abnormal Thickness of Intraretinal Layers**, Jörg Stüwe, Martin Röhlig, Heidrun Schumann, Ruby Kala Prakasam, Oliver Stachs
- TopoLines: Topological Smoothing for Line Charts**, Ashley Suh, Christopher Salgado, Mustafa Hajij, Paul Rosen
- Road Accidents in the UK (Analysis and Visualization)**, Anjul K. Tyagi, Ayush Kumar, Anshul Gandhi, Klaus Mueller
- PolyViz - A Visualization System for Special Kind of Multipartite Graphs.**, Tolga Uslu, Alexander Mehler
- Visualizing the Results of Product Costing Plausibility Checks with Parallel Hierarchies**, Zana Vosough
- Subspace Shapes: Enhancing High-Dimensional Subspace Structures via Ambient Occlusion Shading**, Bing Wang, Klaus Mueller
- [Honorable Mention] Data Embroidery: Exploring Alternative Mediums for Personal Physicalization**, Kendra Wannamaker, Lora Oehlberg, Sheelagh Carpendale, Wesley Willett
- [Honorable Mention] Evaluation of Guide Wire Proficiency During a Catheter-based Intervention**, Johannes Waschke, Katja Isabel Paul, Peter Lanzer, Mario, Hlawitschka
- Manual and Automatic Tree Editing with Applications to Microbiome Time-series Data**, Zehua Zeng, Niklas Elmquist, Catherine Plaisant
- Increasing Understanding of Survey Re-Weighting with Visualization**, Yufei Zhang, David Borland, David Gotz



## Doctoral Colloquium

### Panelists

Anastasia Bezerianos, Fanny Chevalier, Tim Dwyer, Bongshin Lee, Ross Maciejewski, Silvia Miksch, Timo Ropinski, Marc Streit, Jarke van Wijk

### Session 1

**Visual Analytics for Fraud Detection and Monitoring**, Roger A. Leite, *TU Wien, Austria*

**Visual Analytics for Machine In the Loop (VAMIL) Data Analysis**, Dylan Cashman, *Tufts University, United States*

**Interactive Visualization of Multidimensional Hierarchical Aggregates with Parallel Hierarchies**, Zana Vosough, *SAP SE, Germany*

**Pairwise Visual Comparison of Directed Acyclic Graphs**, Kathrin Ballweg, *Technische Universität Darmstadt, Germany*

**Investigating Information Visualization with Children**, Fearn Bishop, *University of St Andrews, United Kingdom*

**Investigation into the Viability of the Use of the Assessment of Information Visualisation Literacy as an Aid in the Design of Visualisation Systems for Non-Expert Users**, David Concannon, *University College London, United Kingdom*

### Session 2

**Visual Analytics Methodologies in Causality Analysis**, Hong Wang, *Arizona State University, United States*

**Supporting Visual Analysis for Data Exploration through Exploitable**, Zhe Cui, *University of Maryland, United States*

**Visual Storytelling of Big Imaging Data**, Lorenzo Amabili, *University of Groningen, Netherlands*

**Stepping Closer To A Science of Interaction: A Paradigm for Studying the Cognitive Mechanisms of Interaction**, Amy Fox, *University of California San Diego, United States*

### Session 3

**Dimension Reduction and Clustering Algorithm Combinations for Exploratory Data Analysis**, John Wenskovitch, *Virginia Polytechnic Institute and State University, United States*

**Bridging the (Visual) Gap for Comprehensive Understanding of Clinical Text**, Nicole Sultanum, *University of Toronto, Canada*

**Do We Know Where the Big One Will Strike? Evaluating Uncertainty Visualization Approaches for Earthquake Forecasts**, Max Schneider, *University of Washington, United States*

## VAST Challenge

**VAST Challenge 2018: Suspense at the Wildlife Preserve**, R. Jordan Crouser, Kristin Cook, John Fallon, Jereme Haack, Kristen Liggett, Diane Staheli, Mark A. Whiting

### [Mini-Challenge 1 Award: Application of Visual Data Science]

Applied Visual Data Science, Andrei Rukavina, Sergio Banchero

### [Mini-Challenge 1 Award: Excellent Comprehensive Submission]

Audio Explorer, Colin Scruggs, Cameron Henkel, Charles D. Stolper

### [Mini-Challenge 1 Honorable Mention: Critical Thinking]

Visual Bird Watcher: Interactive Visual Analysis on Bird Distribution and Migration, Chuyue Ye, Sihang Li, Gang Li, Liang Tang, Dengfeng Zhang, Xinyue Luan, Zhuo Zhang, Xiaoru Yuan

### [Mini-Challenge 1 Honorable Mention: Interactive Analytic Tool]

Interactive Webtool for Tempospatial Data and Visual Audio Analysis, Benedikt Bäumle, Ina Boesecke, Raphael Buchmüller, Yannick Metz, Juri Buchmüller, Eren Cakmak, Wolfgang Jentner, Daniel A. Keim

### [Mini-Challenge 2 Award: Elegant Design of an Interactive Display]

Identifying Patterns and Anomalies within Spatiotemporal Water Sampling Data, Isabel Piljek, Giuliana Dehn, Jannik Frauendorf, Ziad Salem, Yerzhan Niyazbayev, Juri Buchmüller, Eren Cakmak, Wolfgang Jentner, Florian Stoffel, Daniel A. Keim

### [Mini-Challenge 2 Award: Strong Support for Exploratory Analysis]

MTDES: Multi-dimensional Temporal Data Exploration System, Vung V. Pham, Tommy Dang

### [Mini-Challenge 2 Honorable Mention: Clarity of Narrative]

Unearthing the X-Streams: Visualizing Water Contamination, Akangsha Bandalkul, Angad Srivastava, Kishan Bharadwaj Shridhar, Ong Guan Jie Jason, Zhang Yanrong

### [Mini-Challenge 2 Honorable Mention: Use of Projection to Highlight Outliers]

Time Series Projection to Highlight Trends and Outliers, Eren Cakmak, Daniel Seebacher, Juri Buchmüller, Daniel A. Keim

### [Mini-Challenge 3 Award: Insights Generated through Use of a Custom Tool]

Visual Analysis for Subgroups in a Dynamic Network, Qi Ma, Xueshi Wei, Liwenhan Xie, Zhiyi Yin, Yiping Liu, Chuanning Huang, Xiaoru Yuan

### [Mini-Challenge 3 Honorable Mention: Representation of Small-Scale Temporal Patterns]

TimeMatrix: Visual Representation for Temporal Pattern Detection in Dynamic Networks, Tommy Dang, Vung V. Pham

### [Mini-Challenge 1] Interactive Classification Using Spectrograms and Audio Glyphs

Eren Cakmak, Udo Schlegel, Matthias Miller, Juri Buchmüller, Wolfgang Jentner, Daniel A. Keim

### [Mini-Challenge 1] They Do Move! Visual Analytics of Rose-Crested Blue Pipit Habitat

Elena Ginina, Michael Beham, Denis Gracanin, Rainer Splechtna, Kresimir Matkovic

### [Mini-Challenge 1] PhoenixMap: Spatio-Temporal Distribution Analysis with Deep Learning Classifications

Junhan Zhao, Xiang Liu, Chen Guo, Ryan Guan, Josephine Zhang, Baijian Yang, Zhenyu Qian, Yingjie Chen

### [Mini-Challenge 2] Multilevel Visual Clustering Exploration for Incomplete Time-series in Water Samples

Daniel Alcaide, Jan Aerts

### [Mini-Challenge 2] A Unified Approach for Sampling and Measurement Joint Analysis

Pablo Santoro, Rubén Flecha, Juan Pablo Pilorget

### [Mini-Challenge 2] Using Tableau to Discover the Effect of Chemical Release at Wildlife Preserve

Bo Sun, Benjamin Weidner, Simon Su

### [Mini-Challenge 2] River-water Quality Exploration

Michael Beham, Rainer Splechtna, Denis Gracanin, Elena Ginina, Kresimir Matkovic

### [Mini-Challenge 2] ContourMap: Contour based Visualization of Water Chemical Data

Chen Guo, Ryan Guan, Josephine Zhang, Yingjie Victor Chen, Zhenyu Cheryl Qian

### [Mini-Challenge 3] Discovering Suspicious Patterns Using a Graph Based Approach

Sirisha Velampalli, Lenin Mookiah, William Eberle

### [Mini-Challenge 3] A Visualization Study on Visual Analysis to Explore the Organizational Structure of the Group within a Factory

Bo Sun, Ce Pang

## SciVis Contest

[Invited presentation] Deep Water Impacts, Galen Gisler, Robert Weaver

[Honorable Mention] Artistic Representations of the Deep Water Impact Ensemble Data Set, Matt Rehme

[Honorable Mention] Visualization and Analysis of Deep Water Asteroid Impacts, Raphael Imahorn, Irene Baeza Rojo, Tobias Günther

[Winner of the 2018 SciVis Contest] Visualizing Deep Water Asteroid Impacts: Interactive Visual Analysis of Multi-run Spatio-temporal Simulations, Simon Leistikow, Karim Huesmann, Alexey Fofonov, Lars Linsen

Preview of 2019 SciVis Contest, Silvio Rizzi

## LDAV Posters

Exploring Visualization Techniques with HACC Simulation Data, Joseph Adamo, JD Emberson, Edouard Brooks, Silvio Rizzi, Joseph Insley, Michael E. Papka

In Situ Visualization and Analysis to Design Large Scale Experiments in Computational Fluid Dynamics, Bennett Bernardoni, Nicola Ferrier, Joseph Insley, Michael E. Papka, Saumil Patel, Silvio Rizzi

Citation Network Visualization of Reference Papers Based on Influence Groups, Gyeongcheol Choi, Suhyun Lim, Taerin Yoon, Kyungwon Lee

Method for Improving RadViz's Navigation Function Based on Focusing and Filtering, Hyunwoo Han, Taerin Yoon, Hyoji Ha, Juwon Hong, Kyungwon Lee

Complexity Estimation for Feature Tracking Data, Dirk N. Helmrich, Andrea Schnorr, Torsten W. Kuhlen, Bernd Hentschel

A Comprehensive Informative Metric for Summarizing HPC System Status, Yawei Hui, Byung Hoon Park, Christian Engelmann

Towards In-Situ Vortex Identification for Peta-Scale CFD Using Contour Trees, Marius K. Koch, Paul H. J. Kelly, Peter E. Vincent

A Flow Visualization Using Parallel 3D Line Integral Convolution for Large Scale Unstructured Grid Data, Yangguang Liao

A Large Data Visualization Framework for SPARC64 fx HPC Systems—Case Study: K Computer Operational Environment, Jorji Nonaka, Kenji Ono, Naohisa Sakamoto, Kengo Hayashi, Motohiko Matsuda, Fumiyo Shoji, Kentaro Oku, Masahiro Fujita, Kazuma Hatta

Comparison of Multiple Large Fluid-Structure Interaction Simulations in Virtual Reality, Daniel Orban, Seth Johnson, Hakizumwami Birali Runesha, Lingyu Meng, Bethany Juhnke, Arthur Erdman, Francesca Samsel, Daniel F. Keefe

## VizSec Posters

Doing User Behaviour Analytics through Interactive Visual User Profiles, Phong H. Nguyen, Siming Chen, Natalia Andrienko, Gennady Andrienko, Olivier Thonnard, Alysson Bessani, Cagatay Turkay

Designing Visualisation Enhancements for SIEM Systems, Phong H. Nguyen, Siming Chen, Natalia Andrienko, Michael Kamp, Linara Adlova, Gennady Andrienko, Olivier Thonnard, Alysson Bessani, Cagatay Turkay

Visual Content Privacy Leaks on Social Media Networks, Jasmine DeHart, Christian Grant

Email Campaign Explorer for Detecting Malicious Email Campaigns, Awalin Sopan

NetSet: A Set Visualization Tool for Network Metadata Exploration and Threat Hunting, Brett Fouss, Dennis Ross, Shannon Robinson, Kenneth Alperin

Exploring the Role of Experts' Knowledge in Visualizations for Cyber Security, Fabian Böehm, Noëlle Rakotondravony, Günther Pernul, Hans P. Reiser

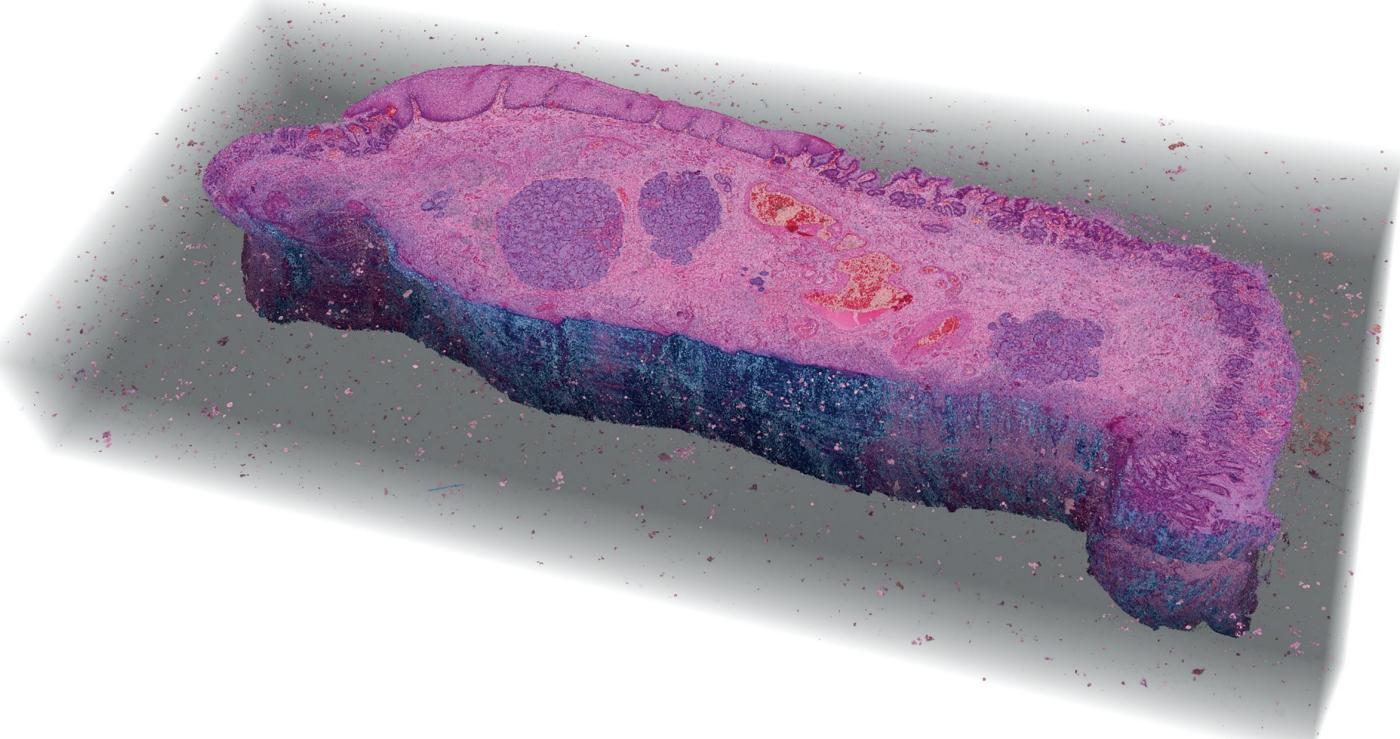
Towards Bridging the Gap Between Visual Cybersecurity Analytics and Non-Experts by Means of User Experience Design, Marija Schufrin, Alex Ulmer, David Sessler, Jörn Kohlhammer

Multi-layer Onion-ring Visualization of Distributed Clusters for SmartX Multiview Visibility and Security, Jun-Sik Shin, Muhammad Usman, JongWon Kim

An Exploration of User Centered and System Based Approaches to Cyber Situation Awareness, Margaret Varga, Carsten Winkelhotz, Susan Traeber-Burdin

Visualizing Remote Network Reactions with Firewall Probe, Hyuga Kobayashi, Hideya Ochiai, Hiroshi Esaki

Heterogeneous Logs Graph Visualization and Clustering for Attack Traces Discovery, Laetitia Leichtnam, Éric Totel, Nicolas Prigent, Mé Ludovic



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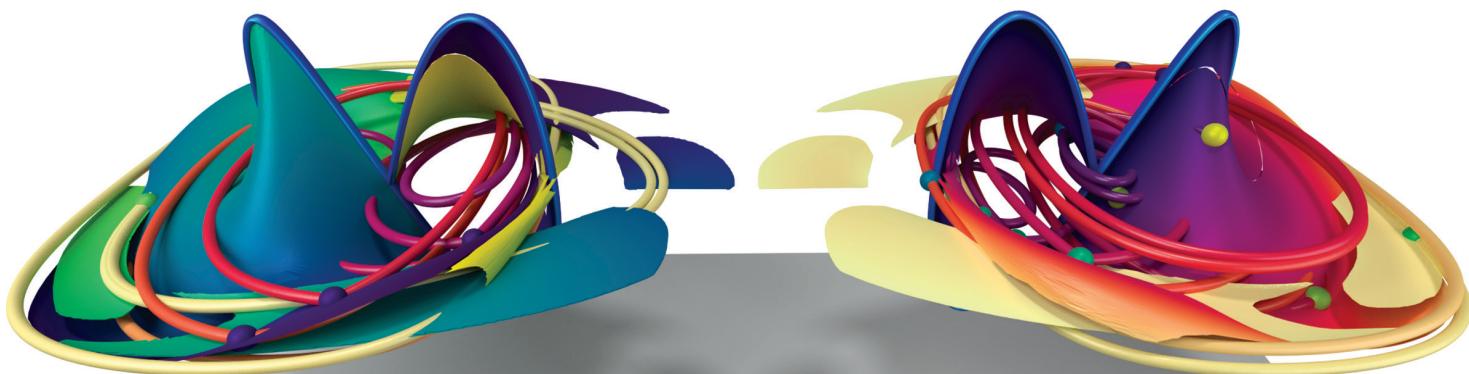
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