

**EuroVis 2020**  
**Eurographics / IEEE VGTC Conference on Visualization 2020**

Norrköping, Sweden  
May 25 – 29, 2020

---

Organized by



EUROGRAPHICS  
THE EUROPEAN ASSOCIATION  
FOR COMPUTER GRAPHICS



IEEE Visualization and Graphics Technical  
Committee

---

**Conference Chairs**

Anders Ynnerman, Linköping University, Sweden  
Matthew Cooper, Linköping University, Sweden  
Ingrid Hotz, Linköping University, Sweden  
Patric Ljung, Linköping University, Sweden

**Full Papers Chairs**

Ivan Viola, King Abdullah University of Science and Technology, Saudi Arabia  
Michael Gleicher, University of Wisconsin, Madison, USA  
Tatiana Landesberger von Antburg, Karlsruhe Institute of Technology and Technische Universität Darmstadt,  
Germany

**STARs Chairs**

Noeska Smit, University of Bergen, Norway  
Steffen Oeltze-Jafra, University of Magdeburg, Germany  
Bei Wang, University of Utah, USA

**Short Papers Chairs**

Andreas Kerren, Linnaeus University, Sweden  
Christoph Garth, University of Kaiserslautern, Germany  
G. Elisabeta Marai, University of Illinois at Chicago, USA

**Posters Chairs**

Jan Byška, Masaryk University Brno, Czech Republic  
Stefan Jänicke, University of Southern Denmark, Denmark

**Industrial Chairs**

Anders Carlsson, Visual Sweden, Sweden  
Matthew Cooper, Linköping University, Sweden

## Preface

EuroVis 2020, the Eurographics / IEEE VGTC Conference on Visualization was scheduled to be held in Norrköping, Sweden from May 25-29th, 2020. The conference was planned to be co-located with the annual Eurographics conference, marking the first time for a collocated conference. We were looking forward to bringing the international visualization community together at the conference in Norrköping.

Unfortunately, the COVID-19 pandemic forced a change in plans for the conference. Shortly after the papers selection process was completed, the conference committee chose to re-organize the event as a joint Eurographics-EuroVis virtual conference. While we cannot convene in Norrköping, we look forward to sharing this year's program in an online event. This year, the EuroVis proceedings will be published under a Gold Open Access model that makes the papers available to everyone.

EuroVis has been an annual event since its inception in 1990. Over the years, the venue has changed names. It was originally started as the Eurographics Workshop on Visualization in Scientific Computing, and was called VisSym between 1999 and 2005. Since 2005, the conference has been called the Eurographics / IEEE VGTC Conference on Visualization, or EuroVis for short. This change of name is fitting: the conference broadly covers the field of visualization. Topics include visualization techniques for spatial data, such as volumetric, tensor, and vector field datasets, and for non-spatial data, such as graphs, text, and high-dimensional datasets. EuroVis also covers the theory of visualization, hardware acceleration, large datasets, perception, interaction, user studies, information visualization, visual analytics, and many application areas of visualization.

The full papers proceedings for EuroVis is published as a special issue of the Computer Graphics Forum journal. For 2020, the process of selecting papers for the proceedings happened according to plan. 168 manuscripts were submitted in early December 2019. For this year, authors were given the option of anonymous submission (i.e., double-blind optional). During a first review cycle, each paper received four reviews, two from members of the International Program Committee (IPC) and two from external reviewers selected by the IPC members. The four reviewers held an online discussion and recommended conditional acceptance or rejection to the Full Papers Program Chairs. During the discussion process, the Paper Chairs invited responses on the reviews from authors. Based on the recommendations and responses, the Papers Chairs selected one of three outcomes for each paper: conditional acceptance, a recommendation for fast-track consideration in Computer Graphics Forum, or rejection. Papers conditionally accepted in the first round were revised by the authors and subject to a second round of review. After the second round of review, 48 papers were accepted, yielding an acceptance rate of 26.8%. Six other papers were invited to a “fast-track” process to undergo revision for consideration in a future issue of Computer Graphics Forum.

EuroVis is a global event. While it has always been held in Europe, the community comes from around the globe. This year, the Full Papers International Program Committee consisted of 79 members representing the global visualization research community, from Australia, North America, Asia and Europe. The papers are similarly from around the world.

We would like to thank everyone who has made the event possible. We thank the authors of all submissions for providing us with such a broad range of exciting work to select from. We thank the International Program Committee for their work in identifying external reviewers and guiding the review process. We thank the reviewers for their work in selecting the papers and providing feedback to authors. We thank the chairs of the other conference tracks for their help in making EuroVis such a successful event: Short Papers chairs Andreas Kerren, Christoph Garth, and G. Elisabeta Marai; STAR chairs Noeska Smit, Steffen Oeltze-Jafra, and Bei Wang; the Posters Chairs Jan Byška and Stefan Jänicke; and all the chairs of Eurographics and all the co-located workshops. We thank Stefanie Behnke for her assistance in preparing the publications. We thank the EuroVis steering committee for giving the Papers Chairs flexibility to implement experimental changes to the papers process. And we thank the EGEV organizing

committee, including Anders Ynnerman, Matthew Cooper, Ingrid Hotz, and Patric Ljung for their efforts in creating the conference and re-imagining it as the world situation required.

Technical conferences, such as EuroVis, serve an important role in bringing the research community together to share ideas. While the COVID-19 pandemic precludes us from coming together physically, we still value the opportunity to share ideas and collegiality.

Eurographics Conference on Visualization (EuroVis) 2020

M. Gleicher, T. von Landesberger, and I. Viola  
(Guest Editors)

## International Programme Committee

Wolfgang Aigner – FH St. Pölten, Austria  
Daniel Archambault – University of Swansea, UK  
Peter Bak – IBM, Israel  
Michael Behrisch – Harvard School of Engineering and Applied Sciences, USA  
Johanna Beyer – Harvard University, USA  
Tanja Blascheck – Universität Stuttgart, Germany  
Stefan Bruckner – University of Bergen, Norway  
Roxana Bujack – Los Alamos National Lab, USA  
Hamish Carr – University of Leeds, UK  
Remco Chang – Tufts University, USA  
Wei Chen – Zhejiang University, China  
Yi-Jen Chiang – NYU, USA  
Helmut Doleisch – Siemens Digital Industries Software, Austria  
Wenwen Dou – University of North Carolina at Charlotte, USA  
Achim Ebert – University of Kaiserslautern, Germany  
Alex Endert – Georgia Tech, USA  
Thomas Ertl – Stuttgart, Germany  
Steven Franconeri – Northwest University, USA  
Enrico Gobbetti – CRS4, Italy  
Eduard Gröller – Vienna University of Technology, Austria  
Markus Hadwiger – KAUST, Kingdom of Saudi Arabia  
Charles Hansen – University of Utah, USA  
Christopher G. Healey – NC State University, USA  
Yun Jang – Sejong University, South Korea  
Alark Joshi – University of San Francisco, USA  
Aaron Knoll – University of Utah, USA  
Steffen Koch – University of Stuttgart, Germany  
Robert Kosara – Tableau, USA  
Barbora Kozlikova – Masaryk University, Czech Republic  
Michael Krone – University of Tuebingen, Germany  
Jens Krueger – University of Duisburg-Essen, Germany  
David Laidlaw – Brown University, USA  
Joshua Levine – University of Arizona, USA  
Alexander Lex – University of Utah, USA  
Leo Li – Adobe Systems, USA  
Shixia Liu – Tsinghua University, China  
Kresimir Matkovic – VRVis, Austria  
Gabriel Mistelbauer – University of Magdeburg, Germany  
Lace Padilla – University of California, USA  
Renato Pajarola – University of Zurich, Switzerland

## International Programme Committee

Margit Pohl – Vienna University of Technology, Austria  
Helen Purchase – University of Glasgow, UK  
Jonathan Roberts – Bangor University, UK  
Paul Rosenthal – University of Rostock, Germany  
Filip Sadlo – University of Heidelberg, Germany  
Beatriz Sousa Santos – University of Aveiro, Portugal  
Giuseppe Santucci – Sapienza University of Rome, Italy  
Arvind Satyanarayan – MIT, USA  
Karen Schloss – University of Wisconsin, USA  
Tobias Schreck – Graz University of Technology, Austria  
Thomas Schultz – University of Bonn, Germany  
Hans-Jörg Schulz – Aarhus University, Denmark  
Heidrun Schumann – University of Rostock, Germany  
Michael Sedlmair – University of Stuttgart, Germany  
Claudio Silva – New York University, USA  
Mike Sips – GFZ German Research Centre for Geosciences, Germany  
Aidan Slingsby – City, University London, UK  
John Stasko – Georgia Institute of Technology, USA  
Hendrik Strobelt – IBM Research, USA  
Danielle Szafrir – University of Colorado Boulder, USA  
Alexandru Telea – Utrecht University, the Netherlands  
Julien Tierny – Sorbonne, France  
Christian Tominski – University of Rostock, Germany  
Melanie Tory – Tableau Research, USA  
Xavier Tricoche – Purdue University, USA  
Pere-Pau Vázquez – Universitat Politècnica de Catalunya, Spain  
Katerina Vrotsou – Linköping University, Sweden  
Manuela Waldner – TU Vienna, Austria  
Chaoli Wang – University of Notre Dame, USA  
Yunhai Wang – Shandong University, China  
Yu-Shuen Wang – National Chiao Tung University, Taiwan  
Gunther Weber – Berkeley Lab, USA  
Tino Weinkauf – KTH Stockholm, Sweden  
Rüdiger Westermann – TU München, Germany  
Jo Wood – City University of London, UK  
Hsiang-Yun Wu – TU Vienna, Austria  
Yingcai Wu – Zhejiang University, China  
Hsu-Chun Yen – National Taiwan University, Taiwan  
Xiaoru Yuan – Peking University, China

## Reviewers

Aboulhassan, Amal	Federico, Paolo	Kehrer, Johannes
Acevedo, Daniel	Fernstad, Sara	Kerren, Andreas
Afzal, Shehzad	Ferreira, Nivan	Kersting, Kristian
Agus, Marco	Frey, Steffen	Kim, Nam Wook
Alexander, Eric	Fröhler, Bernhard	Kim, Sung-Hee
Alsallakh, Bilal	Fu, Siwei	Kim, Younghoon
Amini, Fereshteh	Fujiwara, Takanori	Klacansky, Pavol
Andrienko, Gennady	Gadiraju, Ujwal	Klein, Karsten
Aupetit, Michaël	Gehlenborg, Nils	Ko, Sungahn
Bach, Benjamin	Gehrman, Sebastian	Krause, Josua
Beck, Fabian	Ghani, Sohaib	Krekhov, Andrey
Bell, Mark	Ghoniem, Mohammad	Krüger, Robert
Berenjkoub, Marzieh	Giesen, Joachim	Kucher, Kostiantyn
Berger, Matthew	Godwin, Alex	Kumpf, Alexander
Bernard, Jürgen	Gonçalves, Daniel	Kurzhals, Kuno
Bigelow, Alex	Goodwin, Sarah	Kwon, Oh-Hyun
Billeter, Markus	Gracanin, Denis	Lanir, Joel
Bolstad, Mark	Grosset, Pascal	Law, Po-Ming
Bolte, Fabian	Grossmann, Nicholas	Lee, Doris Jung-Lin
Bradel, Lauren	Gschwandtner, Theresia	Lee, Ju-Hwan
Brehmer, Matthew	Günther, Tobias	Li, Jianping
Brownlee, Carson	Guo, Hanqi	Li, Jie
Bryan, Chris	Han, Jun	Lin, Chun-Cheng
Carmo, Maria Beatriz	Hauser, Helwig	Lin, Wen-Chieh
Cashman, Dylan	Hazarika, Subhashis	Liu, Mengchen
Chan, Gromit Yeuk-Yin	He, Wenbin	Liu, Shusen
Chandrasegaran, Senthil	Hege, Hans-Christian	Lucas, Philipp
Chattpadhyay, Amit	Heimerl, Florian	Ma, Bo
Chen, Guoning	Heine, Christian	Ma, Yuxin
Chen, Siming	Heinzl, Christoph	Mariott, Kim
Choo, Jaegul	Hermosilla Casajus, Pedro	Martins, Samuel
Cmentowski, Sebastian	Hernández, Benjamín	May, Thorsten
Collins, Christopher	Hofmann, Lutz	McGuffin, Michael
Correll, Michael	Höllt, Thomas	Meiguins, Bianchi Serique
Dachsbacher, Carsten	Hotz, Ingrid	Meuschke, Monique
Dachselt, Raimund	Huang, Weidong	Miao, Haichao
Diakopoulos, Nicholas	Hummel, Mathias	Miksch, Silvia
Diehl, Alexandra	Hurter, Christophe	Ming, Yao
Doppler Haider, Johanna	Isaacs, Katherine	Moritz, Dominik
Drori, Iddo	Itoh, Masahiko	Morrical, Nate
Dutta, Soumya	Itoh, Takayuki	Murthy, L. R. D.
Eggert, Daniel	Iuricich, Federico	Natarajan, Vijay
El-Assady, Mennatallah	Jackson, Cullen	Nguyen, Phong
Elliott, Madison	Jänicke, Stefan	Nguyen, Quang Vinh
Elmqvist, Niklas	Jeong, Dong Hyun	Niedermann, Benjamin
Espadoto, Mateus	Jones, Mark W.	Nobre, Carolina
Fabrikant, Sara	Karer, Benjamin	Nocke, Thomas
Faccin Vernier, Eduardo	Keck, Mandy	Nonato, Luis Gustavo
Faust, Rebecca	Keegan, Brian	Onoue, Yosuke

Ošlejšek, Radek	Schneider, Jens	Wang, Xiting
Papka, Michael E.	Schwab, Michail	Wang, Yun
Park, Ji Hwan	Shen, Han-Wei	Wang, Zeyu
Perer, Adam	Sicat, Ronell	Wang, Zhe
Perin, Charles	Solteszova, Veronika	Waschk, Andre
Peterka, Tom	Sorger, Johannes	Wenger, Raphael
Pezzotti, Nicola	Spinner, Thilo	Wenskovitch, John
Pfeiffer, Linda	Srinivasan, Arjun	Wiebel, Alexander
Pfister, Hanspeter	Stone, John	Wiegreffe, Daniel
Pinaud, Bruno	Stone, Maureen	Witt, Jessica
Plaisant, Catherine	Suh, Ashley	Wongsuphasawat, Krist
Pobitzer, Armin	Sun, Maoyuan	Wu, Aoyu
Potter, Kristi	Talbot, Justin	Wu, Yanhong
Promann, Marlen	Tao, Jun	Xia, Jiazhi
Prouzeau, Arnaud	Tennekes, Martijn	Xie, Cong
Qu, Huamin	Theisel, Holger	Xu, Kai
Quan, Nguyen	Therón, Roberto	Xu, Panpan
Quinan, P. Samuel	Thompson, John	Yang, Yalong
Raidou, Renata Georgia	Trapp, Matthias	Yue, Xuanwu
Reina, Guido	Turkay, Cagatay	Zeckzer, Dirk
Ren, Donghao	Usher, Will	Zellmann, Stefan
Ritsos, Panagiotis	Valdivia, Paola	Zeng, Wei
Rocha, Allan	van Wijk, Jarke	Zhang, Eugene
Rodgers, Peter	Vierjahn, Tom	Zhang, Xiaolong
Roessl, Christian	Vuillemot, Romain	Zhang, Yu
Rusnak, Vit	Wall, Emily	Zheng, Hao
Saket, Bahador	Wallner, Günter	Zhou, Zhiguang
Scheuermann, Gerik	Wang, Feng	
Schmidt, Johanna	Wang, Qianwen	

## TABLE OF CONTENTS

### Volumes

<i>CPU Ray Tracing of Tree-Based Adaptive Mesh Refinement Data</i>	1
Feng Wang, Nathan Marshak, Will Usher, Carsten Burstedde, Aaron Knoll, Timo Heister, and Chris R. Johnson	
<i>Knowledge-Assisted Comparative Assessment of Breast Cancer using Dynamic Contrast-Enhanced Magnetic Resonance Imaging</i>	13
Kai Nie, Pascal Baltzer, Bernhard Preim, and Gabriel Mistelbauer	
<i>Hairy Slices II: Depth Cues for Visualizing 3D Streamlines Through Cutting Planes</i>	25
Andrew H. Stevens, Colin Ware, Thomas Butkiewicz, David Rogers, and Greg Abram	
<i>Representative Isovalue Detection and Isosurface Segmentation Using Novel Isosurface Measures</i>	37
Cuilan Wang	

### Visualization Applications and Machine Learning

<i>DRLViz: Understanding Decisions and Memory in Deep Reinforcement Learning</i>	49
Theo Jaunet, Romain Vuillemot, and Christian Wolf	
<i>MotionGlyphs: Visual Abstraction of Spatio-Temporal Networks in Collective Animal Behavior</i>	63
Eren Cakmak, Hanna Schäfer, Juri Buchmüller, Johannes Fuchs, Tobias Schreck, Alex Jordan, and Daniel A. Keim	
<i>Reading Traces: Scalable Exploration in Elastic Visualizations of Cultural Heritage Data</i>	77
Mark-Jan Bludau, Viktoria Brüggemann, Anna Busch, and Marian Dörk	
<i>Bombalytics: Visualization of Competition and Collaboration Strategies of Players in a Bomb Laying Game</i>	89
Shivam Agarwal, Günter Wallner, and Fabian Beck	

### Applications

<i>VA-TRAC: Geospatial Trajectory Analysis for Monitoring, Identification, and Verification in Fishing Vessel Operations</i>	101
Syver Storm-Furru and Stefan Bruckner	
<i>Orchard: Exploring Multivariate Heterogeneous Networks on Mobile Phones</i>	115
Philipp Eichmann, Darren Edge, Nathan Evans, Bongshin Lee, Matthew Brehmer, and Christopher White	
<i>Ocupado: Visualizing Location-Based Counts Over Time Across Buildings</i>	127
Michael Oppermann and Tamara Munzner	
<i>A Visual Analytics Approach to Facilitate Crime Hotspot Analysis</i>	139
José F. de Queiroz Neto, Emanuele Santos, Creto Augusto Vidal, and David S. Ebert	

### Machine Learning

<i>QUESTO: Interactive Construction of Objective Functions for Classification Tasks</i>	153
Subhajit Das, Shenyu Xu, Michael Gleicher, Remco Chang, and Alex Endert	
<i>PEAX: Interactive Visual Pattern Search in Sequential Data Using Unsupervised Deep Representation Learning</i>	167
Fritz Lekschas, Brant Peterson, Daniel Haehn, Eric Ma, Nils Gehlenborg, and Hanspeter Pfister	

## TABLE OF CONTENTS

<i>Boxer: Interactive Comparison of Classifier Results</i>	181
Michael Gleicher, Aditya Barve, Xinyi Yu, and Florian Heimerl	
<i>Classifier-Guided Visual Correction of Noisy Labels for Image Classification Tasks</i>	195
Alex Bäuerle, Heiko Neumann, and Timo Ropinski	
<b>User-Centered Visual Design and Interaction</b>	
<i>Understanding the Design Space and Authoring Paradigms for Animated Data Graphics</i>	207
John R. Thompson, Zhicheng Liu, Wilmot Li, and John Stasko	
<i>VisuaLint: Sketchy In Situ Annotations of Chart Construction Errors</i>	219
Aspen K. Hopkins, Michael Correll, and Arvind Satyanarayan	
<i>Many At Once: Capturing Intentions to Create And Use Many Views At Once In Large Display Environments</i>	229
Jillian Aurisano, Abhinav Kumar, Abeer Alsaiari, Barbara Di Eugenio, and Andrew E. Johnson	
<b>Dimension Reduction and Projections</b>	
<i>Quantitative Evaluation of Time-Dependent Multidimensional Projection Techniques</i>	241
Eduardo Faccin Vernier, Rafael Garcia, Iron Prando da Silva, João L. D. Comba, and Alexandru C. Telea	
<i>Phase Space Projection of Dynamical Systems</i>	253
Nemanja Bartolovic, Markus Gross, and Tobias Günther	
<b>Interaction and Storytelling</b>	
<i>Short-Contact Touch-Manipulation of Scatterplot Matrices on Wall Displays</i>	265
Patrick Riehmann, Gabriela Molina León, Joshua Reibert, Florian Echtler, and Bernd Froehlich	
<i>Structure and Empathy in Visual Data Storytelling: Evaluating their Influence on Attitude</i>	277
Johannes Liem, Charles Perin, and Jo Wood	
<i>Co-creating Visualizations: A First Evaluation with Social Science Researchers</i>	291
Gabriela Molina León and Andreas Breiter	
<b>Topology</b>	
<i>Extraction of Distinguished Hyperbolic Trajectories for 2D Time-Dependent Vector Field Topology</i>	303
Lutz Hofmann and Filip Sadlo	
<i>Fiber Surfaces for many Variables</i>	317
Christian Blecha, Felix Raith, Arne Jonas Präger, Thomas Nagel, Olaf Kolditz, Jobst Maßmann, Niklas Röber, Michael Böttlinger, and Gerik Scheuermann	
<i>Visual Analysis of the Finite-Time Lyapunov Exponent</i>	331
Antoni Sagristà, Stefan Jordan, and Filip Sadlo	
<i>Fuzzy Contour Trees: Alignment and Joint Layout of Multiple Contour Trees</i>	343
Anna-Pia Lohfink, Florian Wetzel, Jonas Lukasczyk, Gunther H. Weber, and Christoph Garth	
<b>Networks and Sets</b>	
<i>Metro Maps on Octilinear Grid Graphs</i>	357
Hannah Bast, Patrick Brosi, and Sabine Storandt	

## TABLE OF CONTENTS

<i>Augmenting Node-Link Diagrams with Topographic Attribute Maps</i>	369
Reinhold Preiner, Johanna Schmidt, Katharina Krösl, Tobias Schreck, and Gabriel Mistelbauer	
<i>Set Streams: Visual Exploration of Dynamic Overlapping Sets</i>	383
Shivam Agarwal and Fabian Beck	
<i>Quantitative Comparison of Time-Dependent Treemaps</i>	393
Eduardo Vernier, Max Sondag, João Comba, Bettina Speckmann, Alexandru Telea, and Kevin Verbeek	
<b>Vectors and Tensors</b>	
<i>PAVED: Pareto Front Visualization for Engineering Design</i>	405
Lena Cibulski, Hubert Mitterhofer, Thorsten May, and Jörn Kohlhammer	
<i>A Globally Conforming Lattice Structure for 2D Stress Tensor Visualization</i>	417
Junpeng Wang, Jun Wu, and Rüdiger Westermann	
<i>Feature Driven Combination of Animated Vector Field Visualizations</i>	429
María Jesús Lobo, Alexandru Telea, and Christophe Hurter	
<b>Space and Time</b>	
<i>LOCALIS: Locally-adaptive Line Simplification for GPU-based Geographic Vector Data Visualization</i>	443
Alireza Amiraghdam, Alexandra Diehl, and Renato Pajarola	
<i>Data Comets: Designing a Visualization Tool for Analyzing Autonomous Aerial Vehicle Logs with Grounded Evaluation</i>	455
David Saffo, Aristotelis Leventidis, Twinkle Jain, Michelle A. Borkin, and Cody Dunne	
<i>GTMapLens: Interactive Lens for Geo-Text Data Browsing on Map</i>	469
Chao Ma, Ye Zhao, Shamal AL-Dohuki, Jing Yang, Xinyue Ye, Farah Kamw, and Md Amiruzzaman	
<b>Visual Analytics for Problem Solving</b>	
<i>WarehouseVis: A Visual Analytics Approach to Facilitating Warehouse Location Selection for Business Districts</i>	483
Quan Li, Qiangqiang Liu, Chunfeng Tang, Zhiwei Li, Shuaichao Wei, Xianrui Peng, Minghua Zheng, Tianjian Chen, and Qiang Yang	
<i>Resolving Conflicting Insights in Asynchronous Collaborative Visual Analysis</i>	497
Jianping Kelvin Li, Shenyu Xu, Yecong (Chris) Ye, and Kwan-Liu Ma	
<i>SeqDynamics: Visual Analytics for Evaluating Online Problem-solving Dynamics</i>	511
Meng Xia, Min Xu, Chuan-en Lin, Ta Ying Cheng, Huamin Qu, and Xiaojuan Ma	
<i>SEEVVis: A Smart Emergency Evacuation Plan Visualization System with Data-Driven Shot Designs</i>	523
Quan Li, Yingjie J. Liu, Li Chen, Xingchao C. Yang, Yi Peng, Xiaoru R. Yuan, and Maddegedara Lalith Lakshman Wijerathne	
<b>Multivariate Data Visualization</b>	
<i>Evaluating Reordering Strategies for Cluster Identification in Parallel Coordinates</i>	537
Michael Blumenschein, Xuan Zhang, David Pomerenke, Daniel A. Keim, and Johannes Fuchs	

## TABLE OF CONTENTS

<i>Sunspot Plots: Model-based Structure Enhancement for Dense Scatter Plots</i>	551
Thomas Trautner, Fabian Bolte, Sergej Stoppel, and Stefan Bruckner	
<i>v-plots: Designing Hybrid Charts for the Comparative Analysis of Data Distributions</i>	565
Michael Blumenschein, Luka J. Debbeler, Nadine C. Lages, Britta Renner, Daniel A. Keim, and Mennatallah El-Assady	

### Graphs and Charts

<i>Sublinear Time Force Computation for Big Complex Network Visualization</i>	579
Amyra Meidiana, Seok-Hee Hong, Marnijati Torkel, Shijun Cai, and Peter Eades	
<i>Infomages: Embedding Data into Thematic Images</i>	593
Darius Coelho and Klaus Mueller	
<i>Canis: A High-Level Language for Data-Driven Chart Animations</i>	607
Tong Ge, Yue Zhao, Bongshin Lee, Donghao Ren, Baoquan Chen, and Yunhai Wang	

## Author Index

- Abram, Greg ..... 25  
Agarwal, Shivam ..... 89, 383  
AL-Dohuki, Shamal ..... 469  
Alsaiari, Abeer ..... 229  
Amiraghdam, Alireza ..... 443  
Amiruzzaman, Md ..... 469  
Aurisano, Jillian ..... 229  
Baltzer, Pascal ..... 13  
Bartolovic, Nemanja ..... 253  
Barve, Aditya ..... 181  
Bast, Hannah ..... 357  
Bäuerle, Alex ..... 195  
Beck, Fabian ..... 89, 383  
Blecha, Christian ..... 317  
Bludau, Mark-Jan ..... 77  
Blumenschein, Michael ..... 537, 565  
Bolte, Fabian ..... 551  
Borkin, Michelle A. ..... 455  
Böttlinger, Michael ..... 317  
Brehmer, Matthew ..... 115  
Breiter, Andreas ..... 291  
Brosi, Patrick ..... 357  
Bruckner, Stefan ..... 101, 551  
Brüggemann, Viktoria ..... 77  
Buchmüller, Juri ..... 63  
Burstedde, Carsten ..... 1  
Busch, Anna ..... 77  
Butkiewicz, Thomas ..... 25  
Cai, Shijun ..... 579  
Cakmak, Eren ..... 63  
Chang, Remco ..... 153  
Chen, Baoquan ..... 607  
Chen, Li ..... 523  
Chen, Tianjian ..... 483  
Cheng, Ta Ying ..... 511  
Cibulski, Lena ..... 405  
Coelho, Darius ..... 593  
Comba, João ..... 393  
Comba, João L. D. ..... 241  
Correll, Michael ..... 219  
Das, Subhajit ..... 153  
Debbeler, Luka J. ..... 565  
Diehl, Alexandra ..... 443  
Dörk, Marian ..... 77  
Dunne, Cody ..... 455  
Eades, Peter ..... 579  
Ebert, David S. ..... 139  
Echtler, Florian ..... 265  
Edge, Darren ..... 115  
Eichmann, Philipp ..... 115  
El-Assady, Mennatallah ..... 565  
Endert, Alex ..... 153  
Eugenio, Barbara Di ..... 229  
Evans, Nathan ..... 115  
Froehlich, Bernd ..... 265  
Fuchs, Johannes ..... 63, 537  
Garcia, Rafael ..... 241  
Garth, Christoph ..... 343  
Ge, Tong ..... 607  
Gehlenborg, Nils ..... 167  
Gleicher, Michael ..... 153, 181  
Gross, Markus ..... 253  
Günther, Tobias ..... 253  
Haehn, Daniel ..... 167  
Heimerl, Florian ..... 181  
Heister, Timo ..... 1  
Hofmann, Lutz ..... 303  
Hong, Seok-Hee ..... 579  
Hopkins, Aspen K. ..... 219  
Hurter, Christophe ..... 429  
Jain, Twinkle ..... 455  
Jaunet, Theo ..... 49  
Johnson, Andrew E. ..... 229  
Johnson, Chris R. ..... 1  
Jordan, Alex ..... 63  
Jordan, Stefan ..... 331  
Kamw, Farah ..... 469  
Keim, Daniel A. ..... 63, 537, 565  
Knoll, Aaron ..... 1  
Kohlhammer, Jörn ..... 405  
Kolditz, Olaf ..... 317  
Krösl, Katharina ..... 369  
Kumar, Abhinav ..... 229  
Lages, Nadine C. ..... 565  
Lee, Bongshin ..... 115, 607  
Lekschas, Fritz ..... 167  
León, Gabriela Molina ..... 265, 291  
Leventidis, Aristotelis ..... 455  
Li, Jianping Kelvin ..... 497  
Li, Quan ..... 483, 523  
Li, Wilmot ..... 207  
Li, Zhiwei ..... 483  
Liem, Johannes ..... 277  
Lin, Chuan-en ..... 511  
Liu, Qiangqiang ..... 483  
Liu, Yingjie J. ..... 523  
Liu, Zhicheng ..... 207  
Lobo, María Jesús ..... 429  
Lohfink, Anna-Pia ..... 343  
Lukasczyk, Jonas ..... 343  
Ma, Chao ..... 469  
Ma, Eric ..... 167  
Ma, Kwan-Liu ..... 497  
Ma, Xiaojuan ..... 511  
Marshak, Nathan ..... 1  
Maßmann, Jobst ..... 317  
May, Thorsten ..... 405  
Meidiana, Amyra ..... 579  
Mistelbauer, Gabriel ..... 13, 369  
Mitterhofer, Hubert ..... 405  
Mueller, Klaus ..... 593  
Munzner, Tamara ..... 127  
Nagel, Thomas ..... 317  
Neto, José F. de Queiroz ..... 139  
Neumann, Heiko ..... 195  
Nie, Kai ..... 13  
Oppermann, Michael ..... 127  
Pajarola, Renato ..... 443  
Peng, Xianrui ..... 483  
Peng, Yi ..... 523  
Perin, Charles ..... 277  
Peterson, Brant ..... 167  
Pfister, Hanspeter ..... 167  
Pomerenke, David ..... 537  
Präger, Arne Jonas ..... 317  
Preim, Bernhard ..... 13  
Preiner, Reinhold ..... 369  
Qu, Huamin ..... 511  
Raith, Felix ..... 317  
Reibert, Joshua ..... 265  
Ren, Donghao ..... 607  
Renner, Britta ..... 565

## Author Index

- |                             |          |                               |          |
|-----------------------------|----------|-------------------------------|----------|
| Riehmann, Patrick .....     | 265      | Tang, Chunfeng .....          | 483      |
| Röber, Niklas .....         | 317      | Telea, Alexandru .....        | 393, 429 |
| Rogers, David .....         | 25       | Telea, Alexandru C. ....      | 241      |
| Ropinski, Timo .....        | 195      | Thompson, John R. ....        | 207      |
| Sadlo, Filip .....          | 303, 331 | Torkel, Marnijati .....       | 579      |
| Saffo, David .....          | 455      | Trautner, Thomas .....        | 551      |
| Sagristà, Antoni .....      | 331      | Usher, Will .....             | 1        |
| Santos, Emanuele .....      | 139      | Verbeek, Kevin .....          | 393      |
| Satyanarayan, Arvind .....  | 219      | Vernier, Eduardo .....        | 241, 393 |
| Schäfer, Hanna .....        | 63       | Vidal, Creto Augusto .....    | 139      |
| Scheuermann, Gerik .....    | 317      | Vuillemot, Romain .....       | 49       |
| Schmidt, Johanna .....      | 369      | Wallner, Günter .....         | 89       |
| Schreck, Tobias .....       | 63, 369  | Wang, Cuilan .....            | 37       |
| Silva, Iron Prando da ..... | 241      | Wang, Feng .....              | 1        |
| Sondag, Max .....           | 393      | Wang, Junpeng .....           | 417      |
| Speckmann, Bettina .....    | 393      | Wang, Yunhai .....            | 607      |
| Stasko, John .....          | 207      | Ware, Colin .....             | 25       |
| Stevens, Andrew H. ....     | 25       | Weber, Gunther H. ....        | 343      |
| Stopfel, Sergej .....       | 551      | Wei, Shuaichao .....          | 483      |
| Storandt, Sabine .....      | 357      | Westermann, Rüdiger .....     | 417      |
| Storm-Furru, Syver .....    | 101      | Wetzels, Florian .....        | 343      |
|                             |          | White, Christopher .....      | 115      |
|                             |          | Wijerathne, Maddegedara ..... | 523      |
|                             |          | Wolf, Christian .....         | 49       |
|                             |          | Wood, Jo .....                | 277      |
|                             |          | Wu, Jun .....                 | 417      |
|                             |          | Xia, Meng .....               | 511      |
|                             |          | Xu, Min .....                 | 511      |
|                             |          | Xu, Shenyu .....              | 153, 497 |
|                             |          | Yang, Jing .....              | 469      |
|                             |          | Yang, Qiang .....             | 483      |
|                             |          | Yang, Xingchao C. ....        | 523      |
|                             |          | Ye, Xinyue .....              | 469      |
|                             |          | Ye, Yecong (Chris) .....      | 497      |
|                             |          | Yu, Xinyi .....               | 181      |
|                             |          | Yuan, Xiaoru R. ....          | 523      |
|                             |          | Zhang, Xuan .....             | 537      |
|                             |          | Zhao, Ye .....                | 469      |
|                             |          | Zhao, Yue .....               | 607      |
|                             |          | Zheng, Minghua .....          | 483      |