Resources: Where to go from here?

Journals

- IEEE: Transactions on Computer Graphics and Visualization (TVCG)
- IEEE: Computer Graphics and Applications (CG&A)
- Sage Publishers: Information Visualization

Books

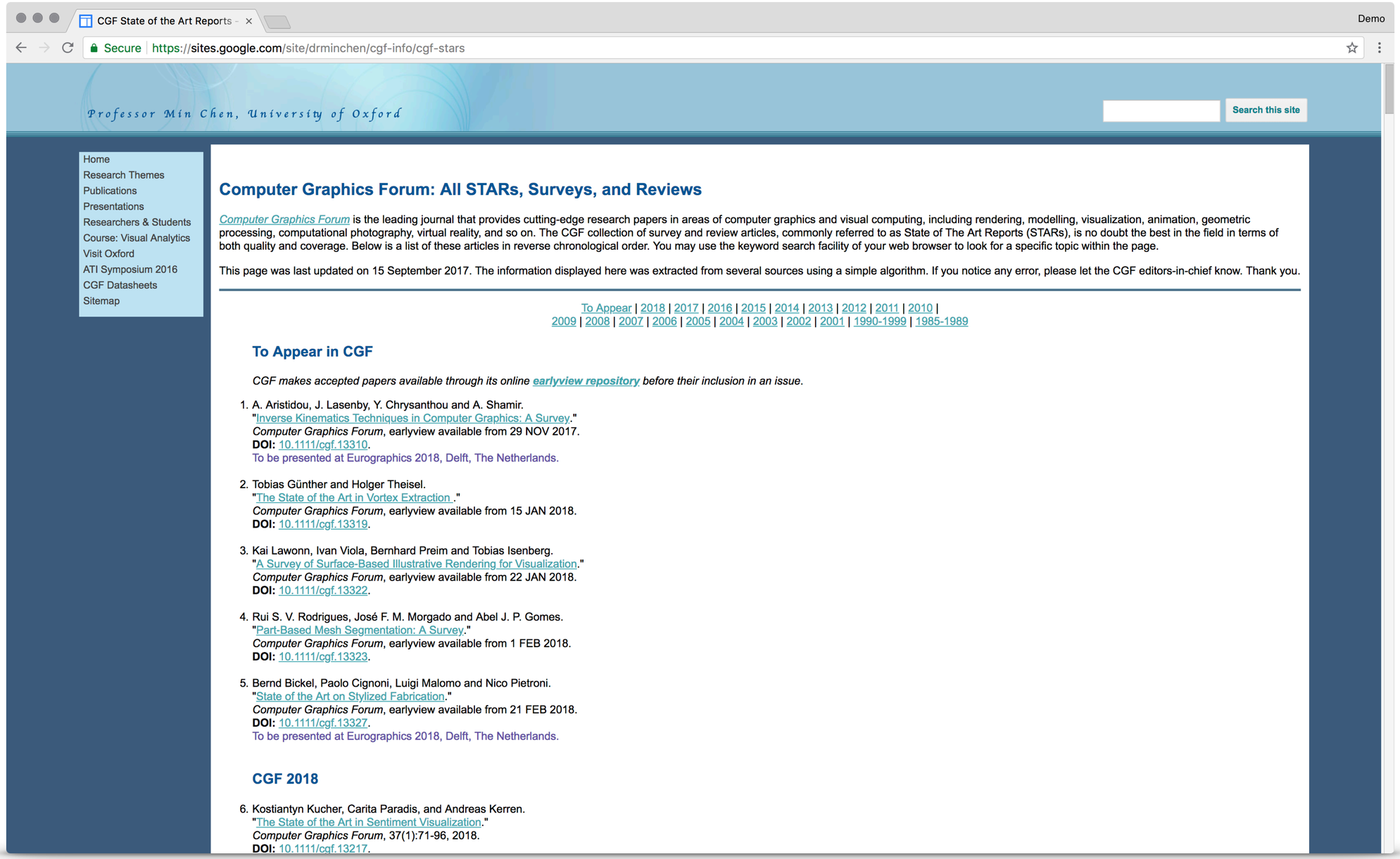
- Miriah Meyer: Making Data Visual
- Tamara Munzner: Visualization Analysis & Design (text book)
- Edward Tufte books
- Stephen Few: Show me the Numbers / Information Dashboard Design
- Alberto Cairo: The {Functional, Truthful} Art
- Andy Kirk: Data Visualization

Meetings

- IEEE VIS Conference (http://ieeevis.org)
- EuroVis Conference (URL changing all the time :( )
- IEEE/ISCB BioVis (http://biovis.net)
- AMIA/IEEE Visual Analytics in Healthcare (http://www.visualanalyticshealthcare.org/)
- VizBi Meeting (http://vizbi.org)
- Visual Computing in Biology and Medicine (VCBM)

State-of-the-Art Reports (STARs)

- “State-of-the-Art Reports (STARs) are intended to provide up-to-date and comprehensive surveys on topics of interest to the visualization research community.”
- Presented at EuroVis and published in Computer Graphics Forum



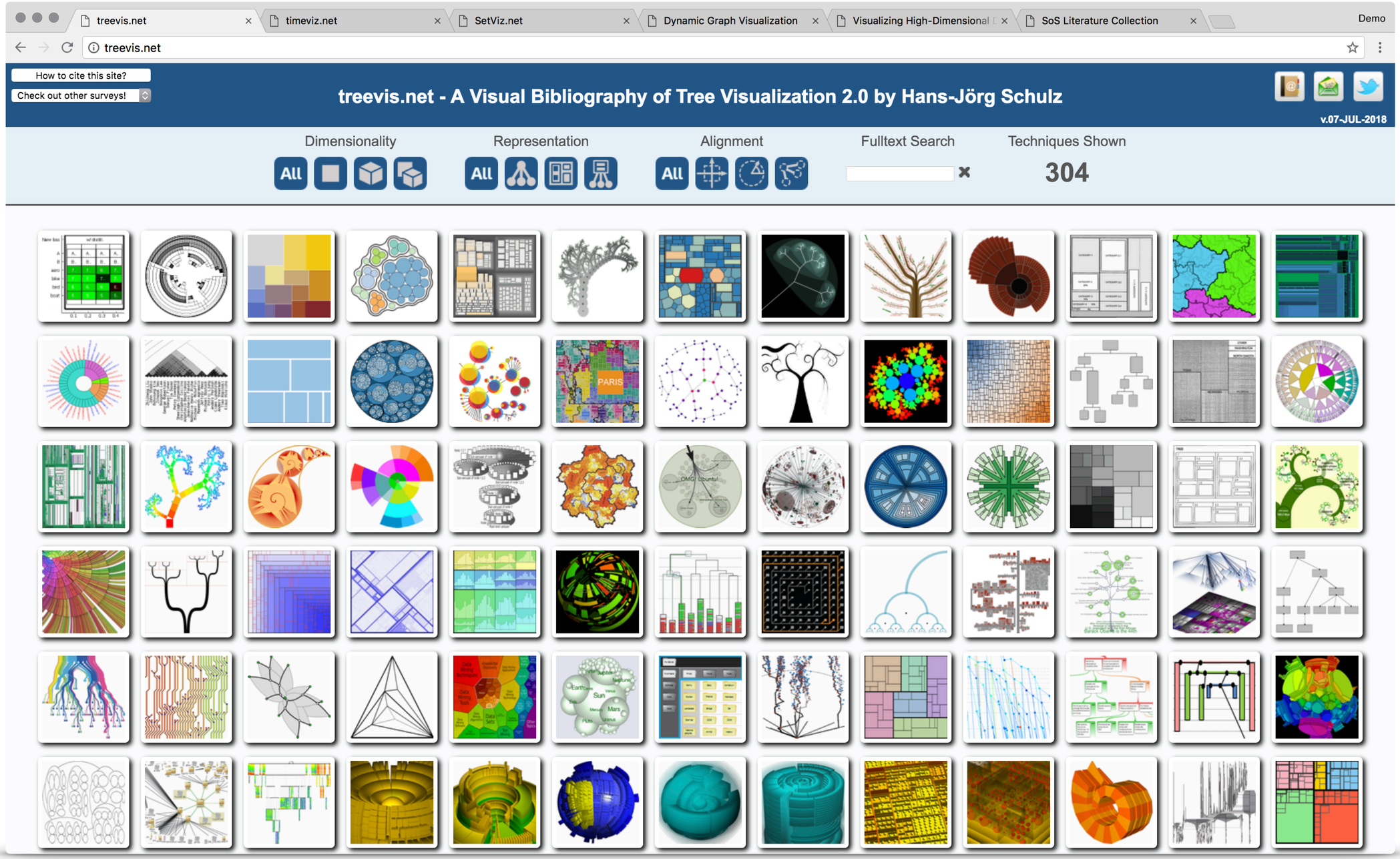
https://sites.google.com/site/drminchen/cgf-info/cgf-stars

Some Relevant Examples

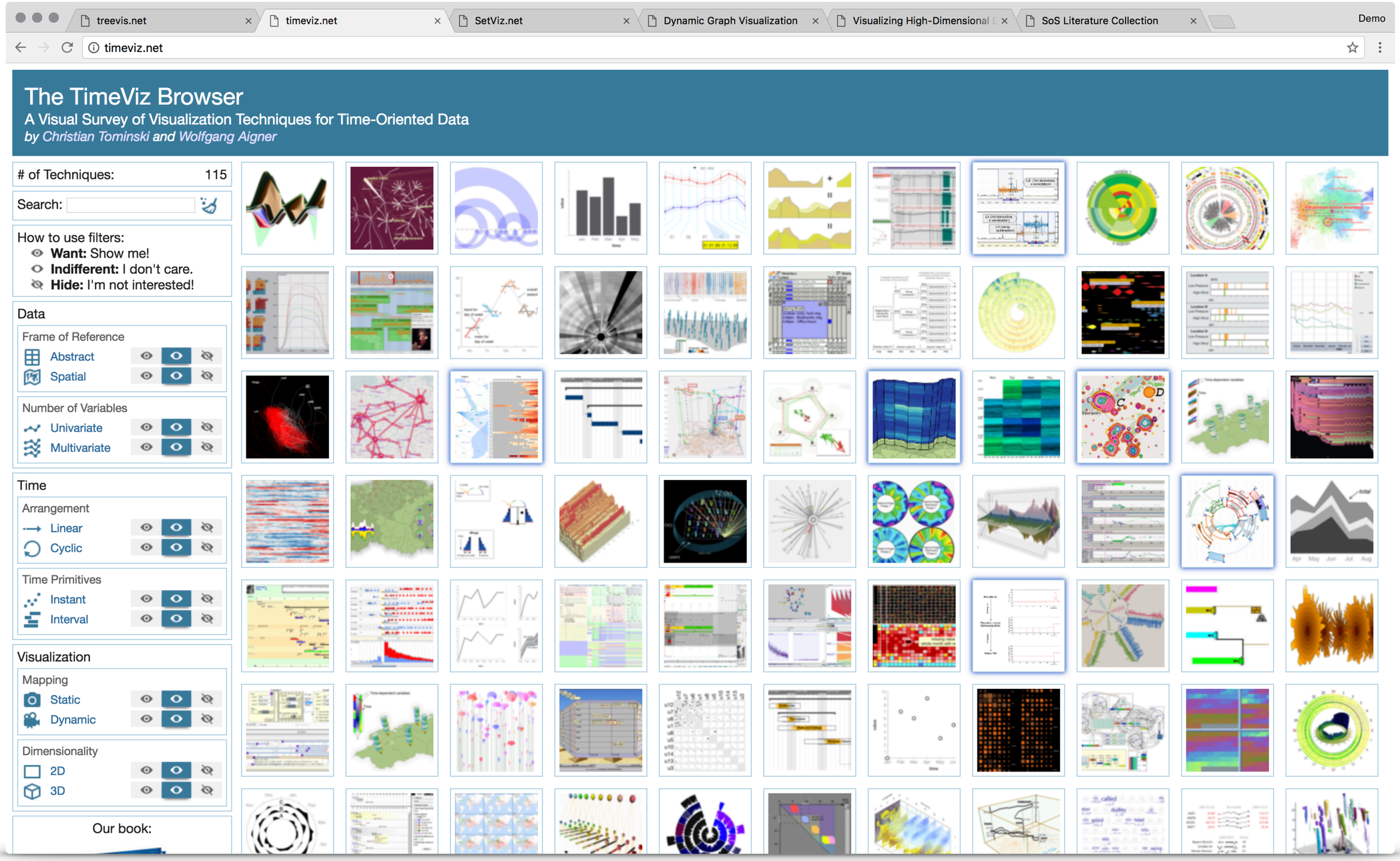
- Graphs
  - A Taxonomy and Survey of Dynamic Graph Visualization (2017)
  - Visualizing Group Structures in Graphs: A Survey (2017)
  - Visual Analysis of Large Graphs: State-of-the-Art and Future Research Challenges (2011)
- Tabular Data
  - Matrix Reordering Methods for Table and Network Visualization (2016)
  - Visualization of Multi-Variate Scientific Data (2016)
- Sets
  - The State-of-the-Art of Set Visualization (2016)

Even More Examples

- Imaging
  - A Survey of Visualization for Live Cell Imaging (2017)
- Molecular Structures
  - Visualization of Biomolecular Structures: State of the Art Revisited (2017)
  - Visual Analysis of Biomolecular Cavities: State of the Art (2016)
- General
  - State-of-the-Art Report in Web-based Visualization (2016)
  - The State of the Art in Integrating Machine Learning into Visual Analytics (2017)



http://treevis.net/



http://timeviz.net/

treevis.net | timeviz.net | SetViz.net | Dynamic Graph Visualization | Visualizing High-Dimensional | SoS Literature Collection | Demo

www.cvast.tuwien.ac.at/~alsallakh/SetViz/literature/www/index.html

SetViz.net

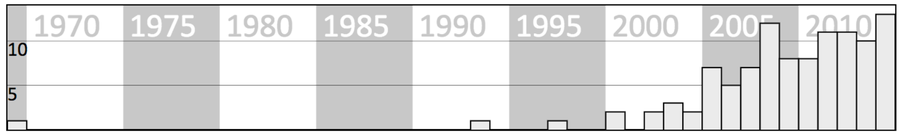
Digital library for the survey **Visualizing Sets and Set-typed Data: State-of-the-Art and Future Challenges**

SurVis

Selectors clear

search ... search

Timeline



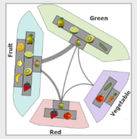
Tags

category: ?3 aggregation-based10 euler-diagrams61 euler-like4 matrix-based7 node-link5 overlays18 scatterplot1

other: 3

1. AlricaMap [online] (2010) | URL | Google Scholar | Google
"Official languages in Africa",
"Wikimedia Commons",
category:overlays
select similar BibTeX

2. AlqadahEtAl2014 [Article] (2014) | Google Scholar | Google
Evaluating the Impact of Clutter in Euler Diagrams
Alqadah, M Stapleton, G Howse, J Chapman, P
category:euler-diagrams
select similar BibTeX



3. alsallakh2013radial Visualization and Computer Graphics, IEEE Trans. on (2013) | Google Scholar | Google
Radial Sets: Interactive Visual Analysis of Large Overlapping Sets
Alsallakh, Bilal Aigner, Wolfgang Miksch, Silvia Hauser, Helwig
category:aggregation-based
select similar BibTeX

4. Baron1969 [Article] (1969) | Google Scholar | Google
A note on the historical development of logic diagrams: Leibniz Euler and Venn
Baron, Margaret E
category:euler-diagrams
select similar BibTeX

5. basole2013understanding Visualization and Computer Graphics, IEEE Trans. on (2013) | Google Scholar | Google
Understanding Interfirm Relationships in Business Ecosystems with Interactive Visualization
Basole, Rahul C Clear, Trustin Hu, Mengdie Mehrotra, Harshit Stasko, John
category:aggregation-based
select similar BibTeX

6. BenoyRodgers2007 [inproceedings] (2007) | Google Scholar | Google
Evaluating the comprehension of Euler diagrams
Benoy, F Rodgers, P
category:euler-diagrams
select similar BibTeX

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107 publications

http://www.cvast.tuwien.ac.at/~alsallakh/SetViz/literature/www/index.html

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dynamicgraphs.fbeck.com

Dynamic Graph Visualization

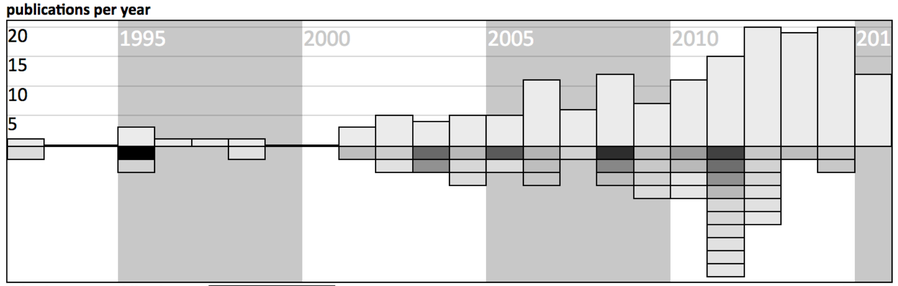
Digital library for publication **The State of the Art in Visualizing Dynamic Graphs** select

SurVis

Selectors clear search ... search

Timeline

publications per year



#citations per publication 1 45 min #citations - 5 +

Keywords

filter ... min - 1 +

type: technique$_{71}$ application$_{55}$ evaluation$_{36}$

time: animation$_{94}$ timeline$_{80}$ generic$_{15}$

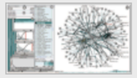
paradigm: node-link$_{135}$ matrix$_{15}$ generic$_{14}$ list$_{2}$

evaluation: case_study$_{103}$ user_study$_{25}$ survey$_{16}$ none$_{11}$ expert$_{10}$ algorithmic$_{8}$ theoretical$_{2}$

application: social$_{45}$ generic$_{42}$ software_engineering$_{30}$ document$_{30}$ infrastructure$_{12}$ biology$_{12}$ business$_{8}$ sports$_{7}$ geo$_{5}$ media$_{3}$ eye_tracking$_{2}$

other: mental_map$_{44}$ compound_graph$_{28}$ 3d$_{24}$ force-directed_layout$_{22}$ general-purpose_layout$_{22}$ directed_graph$_{20}$ weighted_graph$_{18}$ radial$_{18}$ juxtaposed_node-link$_{15}$ offline_problem$_{15}$ online_problem$_{15}$ taxonomy$_{12}$ special-purpose_layout$_{12}$ superimposed_node-link$_{11}$ fixed_nodes$_{10}$ clustering$_{10}$ transition_problem$_{9}$ software_evolution$_{9}$ linear_arrangement$_{9}$ graph_difference$_{8}$ integrated_node-link$_{7}$ tasks$_{6}$ ego_network$_{5}$ omitted_links$_{5}$ program_execution$_{5}$ multivariate_graph$_{5}$ social_media$_{5}$ bipartite$_{4}$ intra-cell_timelines$_{4}$ layered_matrices$_{4}$ map_metaphor$_{4}$ orthogonal_layout$_{3}$ network_metrics$_{3}$ hierarchical_layout$_{3}$ animated_timeline$_{3}$ evaluation_framework$_{3}$ time_aggregation$_{3}$ aesthetic_criteria$_{3}$ sparklines$_{3}$ gestalt_laws$_{2}$ planar_graph$_{2}$ edge_bundling$_{1}$ acyclic_graph$_{1}$

162 publications sorted by selector agreement and publication key



1. Abello2013Modular TVCG (2013) | DOI | Google Scholar | Google

A Modular Degree-of-Interest Specification for the Visual Analysis of Large Dynamic Networks

Abello, James Hadlak, Steffen Schumann, Heidrun Schulz, Hans-Jörg

Abstract: *Large dynamic networks are targets of analysis in many fields. Tracking temporal changes at scale in these networks is challenging due in part to the fact that small changes can be missed or drowned-out by the rest of the network. For static networks, current approaches allow the identification o...* ▶

type:technique time:animation paradigm:node-link evaluation:case_study application:document compound_graph force-directed_layout network_metrics online_problem special-purpose_layout

select similar cited by this 3 citing this 2 BibTeX

2. Ahlers2014Replicable GraphViP (2014) | URL | Google Scholar | Google

Replicable Security Monitoring: Visualizing Time-Variant Graphs of Network Metadata

Ahlers, Volker Heine, Felix Hellmann, Bastian Kleiner, Carsten Renners, Leonard Rossow, Thomas Steuerwald, Ralf

Abstract: *Monitoring a computer network's security state is a di cult task as network components rarely share their information. The IF-MAP speci fication de fines a client/server-based protocol that enables network components to share security information among each other, which is represented in a graph ...* ▶

type:application time:animation paradigm:node-link evaluation:none application:infrastructure graph_difference

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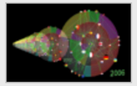

3. Ahmed2010Visual VINCI (2010) | DOI | Google Scholar | Google

Visual analysis of history of World Cup: A dynamic network with dynamic hierarchy and geographic clustering

Ahmed, Adel Fu, Xiaoyan Hong, Seok-Hee Nguyen, Quan Hoang Xu, Kai

Abstract: *In this paper, we present new visual analysis methods for history of the FIFA World Cup competition data, a social network from Graph Drawing 2006 Competition. Our methods are based on the use of network analysis method, and new visualization methods for dynamic graphs with dynamic hierarchy and ...* ▶

type:application time:timeline paradigm:node-link evaluation:case_study application:sports 3d clustering compound_graph radial superimposed_node-link

select similar cited by this 5 citing this 2 BibTeX

4. Ahn2011Temporal SBP (2011) | DOI | Google Scholar | Google

Temporal Visualization of Social Network Dynamics: Prototypes for Nation of Neighbors

Ahn, Jae-wook Taieb-Maimon, Meirav Sopan, Awalin Plaisant, Catherine Shneiderman, Ben

Abstract: *Information visualization is a powerful tool for analyzing the dynamic nature of social communities. Using Nation of Neighbors community network as a testbed, we propose five principles of implementing temporal visualizations for social networks and present two research prototypes: NodeXL and Tem...* ▶

type:application time:animation time:timeline paradigm:node-link evaluation:expert application:social directed_graph

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www.sci.utah.edu/~shusenl/highDimSurvey/website/

E-mail the Authors (Shusen Liu, Dan Maljovec, Bei Wang, Peer-Timo Bremer, Valerio Pascucci)

Visualizing High-Dimensional Data: Advances in the Past Decade

SurVis

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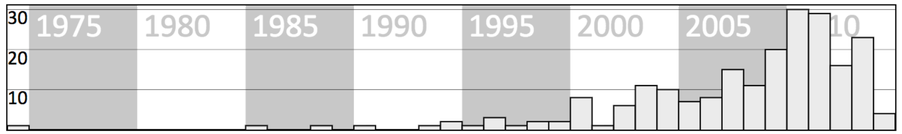
Timeline



Tags

pipeline stage: data transformation$_{106}$ view transformation$_{25}$ visual mapping$_{91}$

user involvement: computation centric$_{84}$ interactive exploration$_{127}$ model manipulation$_{7}$

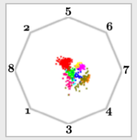
paper type: application$_{7}$ survey$_{12}$ system$_{11}$ technical$_{186}$ theory$_{4}$

data type: high-dimension function$_{1}$ high-dimensional function$_{13}$ high-dimensional points$_{177}$ nominal data$_{16}$ spatial data$_{9}$ time series$_{5}$

analysis method: clustering$_{44}$ color blending$_{1}$ conjunctive relationship$_{1}$ cross-filtering$_{2}$ data abstraction$_{12}$ data subset$_{2}$ dimension relationship$_{17}$ dimension similarity$_{4}$ dimensionality reduction$_{27}$ distance metric$_{7}$ feature extraction$_{9}$ histogram$_{2}$ not applicable$_{35}$ optimization$_{1}$ precision measure$_{5}$ projection$_{26}$ projection information$_{1}$ quality measure$_{6}$ qualtiy measure$_{1}$ regression$_{8}$ scagnostics$_{3}$ segmentation$_{1}$ space-filling curves$_{1}$ statistic$_{4}$ subspace$_{15}$ topological analysis$_{12}$

visual method: animation$_{7}$ bar charts$_{7}$ color blending$_{1}$ focus+context$_{6}$ glyphs$_{12}$ graph$_{5}$ heat map$_{1}$ hierarchy$_{18}$ isosurface$_{4}$ magic lens$_{4}$ node-link$_{3}$ not applicable$_{5}$ novel visual encoding$_{34}$ parallel coordinates$_{54}$ pixel-based$_{9}$ progressive update$_{3}$ radviz$_{4}$ rendering enhancement$_{4}$ scatterplot$_{97}$ scatterplot pipeline stage:view transformation$_{1}$ skeleton$_{2}$ star coordinates$_{2}$ starplot$_{2}$ surfaces$_{8}$ treemap$_{4}$ volume visualization$_{5}$

other: clutter reduction$_{15}$ filtering$_{1}$ histogram$_{1}$ machine learning$_{6}$ matching$_{1}$ parameter exploration$_{7}$ perception$_{5}$ query$_{8}$ ranking$_{17}$ reordering$_{4}$ segmentation$_{1}$ sensitivity analysis$_{4}$ uncertainty$_{3}$ interactive exploration$_{1}$ user study$_{14}$ view optimization$_{21}$ visual data mining$_{5}$ visualization$_{1}$



1. AlbuquerqueEisemannLehmann2010 [inproceedings] (2010) | DOI | Google Scholar | Google

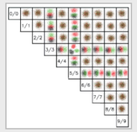
Improving the visual analysis of high-dimensional datasets using quality measures

Albuquerque, Georgia Eisemann, Martin Lehmann, Dirk J Theisel, Holger Magnor, Marcus

Abstract: *Modern visualization methods are needed to cope with very high-dimensional data. Efficient visual analytical techniques are required to extract the information content in these data. The large number of possible projections for each method, which usually grow quadratically or even exponentially w...* ▶

pipeline stage:view transformation user involvement:computation centric paper type:technical data type:high-dimensional points analysis method:quality measure visual method:pixel-based visual method:radviz view optimization +

select similar BibTeX



2. AlbuquerqueLoweMagnor2011 Visualization and Computer Graphics, IEEE Transactions on (2011) | DOI | Google Scholar | Google

Synthetic Generation of High-Dimensional Datasets

Albuquerque, G. Lowe, T. Magnor, M.

Abstract: *Generation of synthetic datasets is a common practice in many research areas. Such data is often generated to meet specific needs or certain conditions that may not be easily found in the original, real data. The nature of the data varies according to the application area and includes text, graph...* ▶

pipeline stage:data transformation user involvement:computation centric paper type:technical data type:high-dimensional points analysis method:projection visual method:scatterplot +

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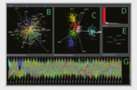

3. AnandWilkinsonDang2012 [inproceedings] (2012) | DOI | Google Scholar | Google

Visual pattern discovery using random projections

Anand, Anushka Wilkinson, Leland Dang, Tuan Nhon

Abstract: *An essential element of exploratory data analysis is the use of revealing low-dimensional projections of high-dimensional data. analysis method:Projection Pursuit has been an effective method for finding interesting low-dimensional projections of multidimensional spaces by optimizing a score func...* ▶

pipeline stage:data transformation user involvement:interactive exploration paper type:technical data type:high-dimensional points analysis method:projection analysis method:subspace visual method:parallel coordinates visual method:scatterplot +

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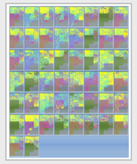

4. AnkerstBerchtoldKeim1998 [inproceedings] (1998) | DOI | Google Scholar | Google

Similarity clustering of dimensions for an enhanced visualization of multidimensional data

Ankerst, Mihael Berchtold, Stefan Keim, Daniel A

Abstract: *The order and arrangement of dimensions (variates) is crucial for the effectiveness of a large number of visualization techniques such as parallel coordinates, scatterplots, recursive pattern, and many others. We describe a systematic approach to arrange the dimensions according to their similari...* ▶

pipeline stage:visual mapping user involvement:computation centric paper type:technical data type:high-dimensional points analysis method:dimension similarity visual method:parallel coordinates view optimization +

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http://www.sci.utah.edu/~shusenl/highDimSurvey/website/

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sos.swansea.ac.uk

SoS Literature Collection

-- Survey of Surveys (SoS) - Mapping the Landscape of Survey Papers in Information Visualization

SurVis

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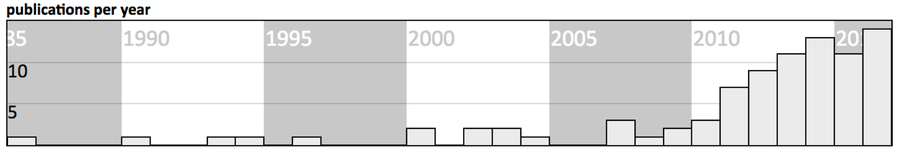
Timeline

publications per year



Keywords

filter ... min - 1 +

type: survey$_{86}$

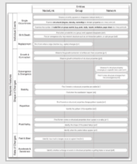
pipeline-stage: visual_mapping_&_structure$_{35}$ exploration_&_rendering$_{22}$ interaction_&_analysis$_{19}$ data_enhancement_&_transformation$_{5}$ perception$_{5}$

topic: general$_{12}$ graphs$_{10}$ text-focus$_{9}$ softvis$_{6}$ geospatial$_{5}$ data-types$_{5}$ hierarchical$_{4}$ focus+context$_{4}$ coordinated_multiple_views$_{4}$ parallel-coordinates$_{3}$ glyphs$_{3}$ high-dimensional$_{3}$ frameworks$_{3}$ systems$_{3}$ networks$_{3}$ finance$_{2}$ healthcare$_{2}$ temporal$_{2}$ security$_{2}$ provenance$_{1}$

open-research: nis$_{44}$ evaluation$_{20}$ scalability$_{13}$ interaction techniques$_{12}$ missing visualisation scenarios$_{11}$ extended data dimensions$_{10}$ tasks$_{8}$ fuzzyness and uncertainty$_{7}$ generic tools$_{6}$ context-sensitive tool$_{5}$ missing scenarios$_{5}$ time-varying data$_{4}$ heterogeneity$_{3}$ design guidelines$_{3}$ n/a$_{3}$ real-time data$_{2}$ surveys$_{2}$ filter techniques$_{2}$ similarity calculation$_{1}$ composite visualisation$_{1}$ perceptual tuning$_{1}$ real-world data$_{1}$ systemization$_{1}$ inner structure of space-time cubes$_{1}$ non-planar media$_{1}$?$_{1}$ extend classification$_{1}$ accuracy vs. ability$_{1}$ model refinements$_{1}$ new data-sources$_{1}$ provenance$_{1}$ distance calculation$_{1}$ context-sensitive tools$_{1}$ system complexity$_{1}$ global vs. local algorithms$_{1}$ design guidelines$_{1}$ temporal views in 3d parallel coordinates$_{1}$ clutter reduction methods$_{1}$ longitudinal studies$_{1}$ performance$_{1}$ subspace clustering$_{1}$ topological data analysis$_{1}$ limitations$_{1}$ memorability$_{1}$ user study$_{1}$ systemisation$_{1}$ occlusion$_{1}$ privacy preservation$_{1}$ semi-automatic$_{1}$ new visualisation environments$_{1}$ evaluation$_{1}$ benchmark systems$_{1}$ data-type analysis$_{1}$ generic frameworks$_{1}$ perceptual evaluation$_{1}$ context-sensitive scenarios$_{1}$ facet usage$_{1}$ high-level context with low-level detail$_{1}$

other: exploration$_{13}$ iconic displays$_{12}$ standard 2d/3d displays$_{9}$ clustering$_{9}$ stacked display$_{8}$ geometrically-transformed displays$_{8}$ node-link$_{8}$ dense pixel display$_{7}$ color$_{6}$ pattern discovery$_{6}$ matrix$_{5}$ timeline$_{5}$ radial$_{5}$ monitoring$_{5}$ manipulate$_{4}$ glyph$_{4}$ filter$_{4}$ parallel-plot$_{4}$ temporal composition$_{4}$ n/a$_{3}$ edge-bundling$_{3}$ stacked data$_{3}$ juxtaposed visualisation$_{3}$ flow$_{3}$ heatmap$_{3}$ superimposed visualisation$_{3}$ tree$_{3}$ encoding$_{2}$ quantitative evaluation$_{2}$ systematic$_{2}$ visualization$_{2}$ textual$_{2}$ big data$_{2}$ structural composition$_{2}$ facet$_{2}$ extended data dimensions$_{2}$ data visualization$_{2}$ tasks$_{2}$ nested visualisation$_{2}$ node attribute$_{2}$ glyph design$_{2}$ glyphs$_{2}$ guidelines$_{2}$ layout$_{2}$ treemap$_{2}$ prediction$_{2}$ visual exploration$_{1}$ massive data sets$_{1}$ multiscale visualizations$_{1}$ visual analytics$_{1}$

86 publications sorted by selector agreement and publication key



1. ahn2014task IEEE transactions on visualization and computer graphics (2014) | DOI | Google Scholar | Google

A task taxonomy for network evolution analysis

Jae-wook Ahn Catherine Plaisant Ben Shneiderman

Abstract: *Visualization has proven to be a useful tool for understanding network structures. Yet the dynamic nature of social media networks requires powerful visualization techniques that go beyond static network diagrams. To provide strong temporal network visualization tools, designers need to understan...* ▶

other:design space other:node-link other:tasks type:survey pipeline-stage:interaction_&_analysis topic:networks open-research:missing scenarios open-research:scalability open-research:time-varying data

select similar Citation BibTeX

2. alencar2012seeing Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery (2012) | DOI | Google Scholar | Google

Seeing beyond reading: a survey on visual text analytics

Alencar, Aretha B de Oliveira, Maria Cristina F Paulovich, Fernando V

Abstract: *We review recent visualization techniques aimed at supporting tasks that require the analysis of text documents, from approaches targeted at visually summarizing the relevant content of a single document to those aimed at assisting exploratory investigation of whole collections of documents.Techn...* ▶

type:survey pipeline-stage:interaction_&_analysis topic:text-focus open-research:nis

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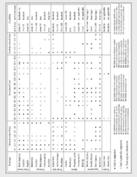


3. alsallakh2014visualising [inproceedings] (2014) | DOI | URL | Google Scholar | Google

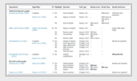
Visualizing sets and set-typed data: State-of-the-art and future challenges

Bilal Alsallakh Luana Micallef Wolfgang Aigner Helwig hauser Silvia Miksch Peter Rodgers

Abstract: *A variety of data analysis problems can be modelled by defining multiple sets over a collection of elements and analyzing the relations between these sets. Despite their simple concept, visualizing sets is a non-trivial problem due to the large number of possible relations between them. We provid...* ▶

other:dense pixel display other:exploration other:filter other:geometrically-transformed displays other:iconic displays other:manipulate other:stacked display other:standard 2d/3d displays other:structural composition type:survey pipeline-stage:data_enhancement_&_transformation topic:hierarchical open-research:context-sensitive tool open-research:evaluation open-research:fuzzyness and uncertainty open-research:generic tools open-research:interaction techniques open-research:missing visualisation scenarios open-research:scalability open-research:time-varying data

select similar Citation BibTeX



4. archambault2013map International Journal of Human-Computer Studies (2013) | DOI | Google Scholar | Google

The 'map' in the mental map: Experimental results in dynamic graph drawing

Daniel Archambault Helen C. Purchase

Abstract: *Preserving the mental map is frequently cited by dynamic graph drawing algorithm designers as an important optimization criterion. There have been a number of definitions for mental map preservation and many different algorithmic approaches to drive dynamic graph drawing to satisfy these definiti...* ▶

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