# Alexander Lex

**Associate Professor**, SCI Institute
School of Computing, University of Utah
Personal Website: http://alexander-lex.net
Visualization Design Lab: http://vdl.sci.utah.edu

72 South Central Campus Drive,
Salt Lake City, UT 84112, USA
+1 857 284 2969
alex@sci.utah.edu

## BIOGRAPHY

Alexander Lex is an Associate Professor of Computer Science at the Scientific Computing and Imaging Institute and the School of Computing at the University of Utah. Alex co-directs the Visualization Design Lab and conducts research on visualization methods and systems to help solve today's data analysis problems in the biomedical sciences. Alex is a co-founder of datavisyn, a company developing visual analytics solutions for the pharmaceutical industry.

Before joining the University of Utah, he was a lecturer and post-doctoral researcher at Harvard University. He received his PhD, master's, and undergraduate degrees from the Graz University of Technology, and was a visiting researcher at the Department for Biomedical Informatics at Harvard Medical School. Alex is the recipient of an NSF CAREER award and multiple best paper awards or honorable mentions at IEEE VIS, ACM CHI, BioVis, and other conferences. He also received a best dissertation award from his alma mater.

## Research Interest

Interactive data visualization, bioinformatics, visualization for biomedicine, data analysis methods for scientists and experts, visual analytics, human computer interaction, data science.

## Professional Appointments

**University of Utah**
*Associate Professor* at the School of Computing. *Since 07/2020*
*Assistant Professor* at the School of Computing. *07/2015-06/2020*
*Faculty Member* at the Scientific Computing and Imaging Institute.
*Member* of the Huntsman Cancer Institute.

**datavisyn** *Since 12/2017*
*Co-Founder* and *Advisor*.
`http://datavisyn.io`

**Harvard University** *10/2012 – 05/2015*
*Post-Doctoral Fellow* at the Visual Computing Group at SEAS.
*Lecturer*, teaching CS 171, Visualization, *01/2015 – 05/2015*.

**Graz University of Technology** *03/2012 – 09/2012*
*Post-Doctoral Researcher*.

**Department for Biomedical Informatics** at **Harvard Medical School** *08/2011 – 09/2011*
*Visiting Researcher*.

**Graz University of Technology** *08/2010 – 09/2012*
*Lecturer* ("Universitätsassistent").

**Graz University of Technology** *08/2008 – 07/2012*
*Research Assistant*.

## Education

**Post-Doctoral Training** *10/2012 – 05/2015*
Harvard University
Mentor: Prof. Hanspeter Pfister

**Doctoral Program in Computer Science** *09/2008 – 03/2012*
Graz University of Technology
Thesis: Visualization of Multidimensional Data with Applications in Molecular Biology
Advisor: Prof. Dieter Schmalstieg
graduated with highest distinction

**Visiting PhD Student** *08/2011 – 09/2011*
Harvard Medical School
Advisors: Prof. Peter Park, Dr. Nils Gehlenborg

**Master's Program** ("Dipl.-Ing.") *09/2006 – 07/2008*
*Software Development and Business Management*
Graz University of Technology
graduated with highest distinction

**Visiting Graduate Student** *09/2006 – 05/2007*
McMaster University, Hamilton, ON, Canada

**Bachelor's Program** ("Bakk.rer.soc.oec") *09/2002 – 09/2006*
*Software Engineering and Knowledge Management*
Graz University of Technology

## HONORS AND AWARDS

**Honorable Mention Award (Poster)**, IEEE VIS, 2019.

**NSF CAREER Award**, 2018.

**Honorable Mention Award** (top 3 paper out of 183 submissions), EuroGraphics/IEEE EuroVis, 2016.

**Human Technology Interface Award** for the work on cancer subtype visualization (StratomeX), awarded by the State of Styria, 2015.

**Honorable Mention Award** (top 3 paper out of 196 submissions), IEEE InfoVis, 2014.

**Honorable Mention Award** (top 5% paper, 3200 submissions), ACM CHI, 2014.

**Best Paper Award** (of 152 submissions), IEEE InfoVis, 2013.

**Honorable Mention Award**, IEEE BioVis Contest, 2013.

**Excellence in Teaching Scholarship**, funding a guest lecture at JKU Linz, awarded by the state of Upper Austria, 2013.

**Best Dissertation Award** by the "Forum Technology and Society", Graz University of Technology, 2012.

**Best Paper Award** (of 32 submissions), IEEE BioVis, 2012.

**3rd Best Paper Award** (of 202 submissions), EuroGraphics/IEEE EuroVis, 2012.

**Best Paper Award** (of 172 submissions), IEEE InfoVis, 2011.

**Best Student Paper Award** (of 88 submissions), ACM Graphics Interface, 2010.

## RESEARCH GRANTS AND CONTRACTS

### Merit-Review Based Grants at the University of Utah

*For multi-PI grants, my share and the share going to the University of Utah (if different) are given.*

**EAGER: Understanding and Mitigating Misinformation in Visualizations On Social Media**, PI: Alexander Lex, NSF IIS 2041136, 2021–2022. $ 200,000 ($ 100,000).

**Collaborative Research: Framework: Software: HDR: Reproducible Visual Analysis of Multivariate Networks with MultiNet**, PI: Miriah Meyer, Co-PI, NSF OAC 18350904, 01/2019–12/2022. $ 2,022,200 (Utah: $ 1,115,768, Lex: $ 529,929).

**CAREER: Enabling Reproducibility of Interactive Visual Data Analysis**, PI: Alexander Lex, NSF IIS 1751238, 2018–2023. $ 512,245.
Research Experiences for Undergraduates (REU) Supplement 2020. $ 16,000.

**Lineage: Integrating Clinical and Genetic Data with Genealogical Records**, PI: Alexander Lex, Utah Genome Project Seed Grant, 2018–2019. $ 46,454.

**Increasing the State's Resiliency to Fluctuations in Defense Spending by Strengthening the Carbon Composite Sector Knowledge Base**, PI: Greg Jones, Co-PI, Department of Defense, 2016–2018. $ 3,792,367 ($ 172,961).

**Visual Analysis of Genomic and Clinical Data from Large Patient Cohorts**, PI: Peter Park, NIH U01 CA198935, Co-Investigator, Subcontract, 2015–2018. $ 1,524,006, ($ 243,966).

### Sponsored Research Agreements at the University of Utah

**Visualizing Blood Transfusion Data.** Funded by ARUP Laboratories, 2019–2020. $ 153,133

**Visualization and Interaction with a Workforce Needs Prediction Model.** Funded by the State of Utah, 2019–2020. $ 156,133

**cTracks: Visualizing Copy Number Data.** Funded by ARUP Laboratories, 2018–2019. $ 126,420

**Visualizing Copy Number Data.** Funded by ARUP Laboratories, 2017. $ 47,218.

**Visualizing Outcome Scores Associated with Orthopaedic Surgery.** Funded by the Department of Orthopaedics, University of Utah, 2017. $ 24,800.

**Visualizing Survey Data.** Funded by the College of Nursing, University of Utah, 2016. $ 12,400.

**Visualizing Patient Referral Flow.** Funded by the University Hospital, University of Utah, 2016. $ 12,400.

### Prior Funding

*I contributed significantly to the writing and execution of these grants.*

**Integrative Pathway-Based Visualization of Heterogeneous Data**, PI: Hanspeter Pfister, sponsored research agreement with Novartis Institutes for Biomedical Research, 2014–2016.

**Diagnostics of Tumor Heterogeneity — a new Steering Factor for Colorectal Cancer?** PI: Gerald Höfler, funded by the state of Styria, Austria, 2012–2014.

**Caleydoplex — Information Exploration in Teams.**, PI: Dieter Schmalstieg, funded by the Austrian Science Fund (FWF), Grant no. P22902, 2011–2014.

**InGeneious — Visualization of Biomolecular and Clinical Data.** PI: Dieter Schmalstieg, funded by the Austrian Research Promotion Agency (FFG), BRIDGE program, Grant no. 385567, 2009–2011.

### Scholarships and other Personal Grants

Erwin Schrödinger Scholarship awarded by the Austrian Science Fund: **Visual Analysis of Heterogeneous Data using Semantic Subsets.** Funding two years of post-doctoral research at Harvard University and a one-year return phase at Graz University of Technology. 2013–2016.

Scholarship for short time academic research and expert courses abroad (KUWI). Granted by the Graz University of Technology. 2011.

Research grant for students ("Förderstipendium") awarded by the Faculty of Computer Science, Graz University of Technology. 2007.

Joint Study scholarship for student exchange with McMaster University, Hamilton, On, Canada. 2006.

## PUBLICATIONS

*Students primarily supervised by me at the University of Utah are underlined, other Utah students are italic.*
◆ *indicates one of the ten most important publications*

### Journal Papers

1. Jen Rogers, Austin H Patton, Luke Harmon, **Alexander Lex**, Miriah Meyer, *Insights From Experiments With Rigor in an EvoBio Design Study*, IEEE Transactions on Visualization and Computer Graphics (InfoVis), 2021.
2. Carolina Nobre, Marc Streit, Miriah Meyer, **Alexander Lex**, *The State of the Art in Visualizing Multivariate Networks*, Computer Graphics Forum (EuroVis), vol. 38, pp.807-832, 2019. ◆
3. Jen Rogers, Nicholas Spina, Ashley Neese, Rachel Hess, Darrel Brodke, **Alexander Lex**, *Composer: Visual Cohort Analysis of Patient Outcomes*, Applied Clinical Informatics, vol. 10, no. 02, pp. 278-285, 2019.
4. Katarina Furmanova, Samuel Gratzl, Holger Stitz, Thomas Zichner, Miroslava Jaresova, **Alexander Lex**, Marc Streit, *Taggle: Scalable Visualization of Tabular Data through Aggregation*, Information Visualization, vol.19, no. 02, pp. 114-136, 2019.
5. *Yan Zheng*, *Yi Ou*, **Alexander Lex**, Jeff M. Phillips, *Visualization of Big Spatial Data using Coresets for Kernel Density Estimates*, IEEE Transactions on Big Data, early access, 2019.
6. G.E. Marai, Bruno Pinaud, Katja Bühler, **Alexander Lex**, John H. Morris, *10 Simple Rules to Create Biological Network Figures for Communication*, PLOS Computational Biology, vol. 15, no 9, pp. e1007244, 2019.
7. Carolina Nobre, Marc Streit, **Alexander Lex**, *Juniper: A Tree+Table Approach to Multivariate Graph Visualization*, IEEE Transactions on Visualization and Computer Graphics (InfoVis), vol. 25, no. 1, pp. 544-554, 2019. ◆
8. Carolina Nobre, Nils Gehlenborg, Hilary Coon, **Alexander Lex**, *Lineage: Visualizing Multivariate Clinical Data in Genealogy Graphs*, IEEE Transactions on Visualization and Computer Graphics, vol. 25, no. 3, pp. 1543-1558, 2019. ◆
9. Michael Kern, **Alexander Lex***, Nils Gehlenborg, Chris R. Johnson, *Interactive Visual Exploration And Refinement Of Cluster Assignments.* BMC Bioinformatics, vol. 18, no. 1, pp. 406, 2017. **corresponding author*
10. Jake R. Conway, **Alexander Lex**, Nils Gehlenborg, *UpSetR: An R Package For The Visualization Of Intersecting Sets And Their Properties.* Oxford Bioinformatics, vol. 33, no. 18, pp. 2938-2940, 2017.
11. *Ethan Kerzner*, **Alexander Lex**, Crystal Lynn Sigulinsky, Timothy Urness, Bryan William Jones, Robert E. Marc, Miriah Meyer, *Graffinity: Visualizing Connectivity In Large Graphs.* Computer Graphics Forum (EuroVis), vol. 36, no. 3, pp. 251-260, 2017.
12. Christian Partl, Samuel Gratzl, Marc Streit, Anne Mai Wassermann, Hanspeter Pfister, Dieter Schmalstieg, and **Alexander Lex**, *Pathfinder: Visual Analysis of Paths in Graphs.* Computer Graphics Forum (EuroVis), vol. 35, no. 3, pp. 71-80, 2016. **Honorable Mention Award.**

13. Samuel Gratzl, **Alexander Lex**, Nils Gehlenborg, Nicola Cosgrove, and Marc Streit, *From Visual Exploration to Storytelling and Back Again.* Computer Graphics Forum (EuroVis), vol. 35, no. 3, pp. 491-500, 2016.

14. Hendrik Strobelt, Bilal Alsallakh, Joseph Botros, Brant Peterson, Mark Borowsky, Hanspeter Pfister, and **Alexander Lex**, *Vials: Visualizing Alternative Splicing of Genes.* IEEE Transactions on Visualization and Computer Graphics (InfoVis), vol. 22, no. 1, pp. 399-408, 2016.

15. Marc Streit*, **Alexander Lex***, Samuel Gratzl, Christian Partl, Dieter Schmalstieg, Hanspeter Pfister, Peter J. Park, and Nils Gehlenborg, *Guided visual exploration of genomic stratifications in cancer.* Nature Methods, vol. 11, no. 9, pp. 884–885, 2014. **equal contribution*

16. **Alexander Lex**, Nils Gehlenborg, Hendrik Strobelt, Romain Vuillemot, and Hanspeter Pfister, *UpSet: Visualization of Intersecting Sets.* IEEE Transactions on Visualization and Computer Graphics (InfoVis), vol. 20, no. 12, pp. 1983–1992, 2014. ◆

17. Christian Partl, **Alexander Lex**, Marc Streit, Hendrik Strobelt, Anne Mai Wasserman, Hanspeter Pfister, and Dieter Schmalstieg, *ConTour: Data-Driven Exploration of Multi-Relational Datasets for Drug Discovery.* IEEE Transactions on Visualization and Computer Graphics (VAST), vol. 20, no. 12, pp. 1883–1892, 2014.

18. Samuel Gratzl, Nils Gehlenborg, **Alexander Lex**, Hanspeter Pfister, and Marc Streit, *Domino: Extracting, Comparing, and Manipulating Subsets across Multiple Tabular Datasets.* IEEE Transactions on Visualization and Computer Graphics (InfoVis), vol. 20, no. 12, pp. 2023–2032, 2014. **Honorable Mention Award.**

19. Cagatay Turkay, **Alexander Lex**, Marc Streit, Hanspeter Pfister, and Helwig Hauser, *Characterizing Cancer Subtypes using the Dual Analysis Approach in Caleydo.* IEEE Computer Graphics and Applications, vol. 34, no. 2, pp. 38–47, 2014.

20. **Alexander Lex**, Christian Partl, Denis Kalkofen, Marc Streit, Anne Mai Wasserman, Samuel Gratzl, Dieter Schmalstieg, and Hanspeter Pfister, *Entourage: Visualizing Relationships between Biological Pathways using Contextual Subsets.* IEEE Transactions on Visualization and Computer Graphics (InfoVis), vol. 19, no. 12, pp. 2536–2545, 2013. ◆

21. Samuel Gratzl, **Alexander Lex**, Nils Gehlenborg, Hanspeter Pfister, and Marc Streit, *LineUp: Visual Analysis of Multi-Attribute Rankings.* IEEE Transactions on Visualization and Computer Graphics (InfoVis), vol. 19, no. 12, pp. 2277–2286, 2013. **Best Paper Award.** ◆

22. Christian Partl, **Alexander Lex**, Marc Streit, Denis Kalkofen, Karl Kashofer, and Dieter Schmalstieg, *enRoute: Dynamic Path Extraction from Biological Pathway Maps for Exploring Heterogeneous Experimental Datasets.* BMC Bioinformatics, vol. 14, no. Suppl 19, p. S3, 2013.

23. **Alexander Lex**, Marc Streit, Hans-Jörg Schulz, Christian Partl, Dieter Schmalstieg, Peter J. Park and Nils Gehlenborg, *StratomeX: Visual Analysis of Large-Scale Heterogeneous Genomics Data for Cancer Subtype Characterization.* Computer Graphics Forum (EuroVis), pp. 1175-1184, 31(3), 2012. **3rd Best Paper Award.** ◆

24. Marc Streit, Hans-Jörg Schulz, **Alexander Lex**, Dieter Schmalstieg, Heidrun Schumann, *Model-Driven Design for the Visual Analysis of Heterogeneous Data.* IEEE Transactions on Visualization and Computer Graphics, pp.998-1010, 18(6), 2012.

25. **Alexander Lex**, Hans-Jörg Schulz, Marc Streit, Christian Partl and Dieter Schmalstieg, *VisBricks: Multiform Visualization of Large, Inhomogeneous Data.* IEEE Transactions on Visualization and Computer Graphics (InfoVis), pp. 2291-2300, 17(12), 2011.

26. Markus Steinberger, Manuela Waldner, Marc Streit, **Alexander Lex** and Dieter Schmalstieg, *Context-Preserving Visual Links.* IEEE Transactions on Visualization and Computer Graphics (InfoVis), pp. 2249-2258, 17(12), 2011. **Best Paper Award.**

27. **Alexander Lex**, Marc Streit, Christian Partl, Karl Kashofer, Dieter Schmalstieg, *Comparative Analysis of Multidimensional, Quantitative Data.* IEEE Transactions on Visualization and Computer Graphics (InfoVis), 16(6), pp. 1027-1035, 2010. ♦

28. Marc Streit, **Alexander Lex**, Michael Kalkusch, Kurt Zatloukal, Dieter Schmalstieg, *Caleydo: Connecting Pathways with Gene Expression.* Bioinformatics, Oxford Journals, 25(20), pp. 2760-2761, 2009.

## Papers in Rigorously Reviewed Conferences

1. Carolina Nobre, Dylan Wootton, Lane Harrison, **Alexander Lex**, *Evaluating Multivariate Network Visualization Techniques Using a Validated Design and Crowdsourcing Approach*, Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI), pp. 1–12 2020. ♦

2. *Alex Bigelow*, Carolina Nobre, Miriah Meyer, **Alexander Lex**, *Origraph: Interactive Network Wrangling*, Proceedings of IEEE VAST, pp. 81-92, 2019. ♦

3. *Yan Zheng, Yi Ou,* **Alexander Lex**, and Jeff M. Phillips, *Visualization of Big Spatial Data using Coresets for Kernel Density Estimates.* Symposium on Visualization in Data Science (VDS) at IEEE VIS, 2017.

4. Thomas Geymayer, Markus Steinberger, Marc Streit, **Alexander Lex**, and Dieter Schmalstieg, *Show me the Invisible: Visualizing Hidden Content.* In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI), pp. 3705–3714, 2014. **Honorable Mention Award.**

5. John D. Mercer, Balaji Pandian, **Alexander Lex***, Nicolas Bonneel, and Hanspeter Pfister, *Mu-8: visualizing differences between proteins and their families.* BMC Proceedings, vol. 8, no. Suppl 2, p. S5, 2014. **corresponding author*

6. Christian Partl, **Alexander Lex**, Marc Streit, Denis Kalkofen, Karl Kashofer, and Dieter Schmalstieg, *enRoute: Dynamic Path Extraction from Biological Pathway Maps for In-Depth Experimental Data Analysis.* Proceedings of the IEEE Symposium on Biological Data Visualization (BioVis), 2012, pp. 107—114, 2012. **Best Paper Award.**

7. Clemens Holzhüter, **Alexander Lex**, Dieter Schmalstieg, Hans-Jörg Schulz, Heidrun Schumann and Marc Streit, *Visualizing Uncertainty in Biological Expression Data.* Proceedings of the SPIE Conference on Visualization and Data Analysis (VDA), pp. 82940O, 2012.

8. Thomas Geymayer, **Alexander Lex**, Marc Streit, Dieter Schmalstieg, *Visualizing the Effects of Logically Combined Filters.* Proceedings of the Conference on Information Visualisation (IV), pp. 47–52, 2011.

9. Manuela Waldner, Werner Puff, **Alexander Lex**, Marc Streit, Dieter Schmalstieg, *Visual Links across Applications.* Proceedings of the Graphics Interface (GI), 2010. **Best Student Paper Award.**

10. **Alexander Lex**, Marc Streit, Ernst Kruijff, Dieter Schmalstieg, *Caleydo: Design and Evaluation of a Visual Analysis Framework for Gene Expression Data in its Biological Context* Proceedings of the IEEE Pacific Visualization Symposium, pp. 57–64, 2010.

11. Heimo Müller, Robert Reihs, Stefan Sauer, Kurt Zatloukal, Marc Streit, **Alexander Lex**, Bernhard Schlegl, Dieter Schmalstieg *Connecting Genes with Diseases.* Symposium on Information Visualization in Biomedical Informatics, Conference on Information Visualization, 2009.

12. Marc Streit, **Alexander Lex**, Heimo Müller, Dieter Schmalstieg *Gaze-Based Focus Adaption in an Information Visualization System.* Computer Graphics and Visualization and Image Processing Conference (CGVCVIP), 2009.

## Peer-Reviewed Workshop Publications and Conference Short Papers

1. Haihan Lin, Ryan A. Metcalf, Jack Wilburn, **Alexander Lex**, *Sanguine: Visual Analysis for Patient Blood Management*, Workshop on Visual Analytics in Healthcare at AMIA (VAHC), 2020.

2. Zach Cutler, Kiran Gadhave, **Alexander Lex**, *Trrack: A Library for Provenance-Tracking in Web-Based Visualizations*, IEEE Visualization Short Papers (to appear), 2020.

3. Jen Rogers, Nicholas Spina, Ashley Neese, Rachel Hess, Darrel Brodke, **Alexander Lex**, *Composer: Visual Cohort Analysis of Patient Outcomes*, Workshop on Visual Analytics in Healthcare at AMIA (VAHC), 2018.
4. *Sean McKenna*, **Alexander Lex**, Miriah Meyer, *Worksheets for Guiding Novices through the Visualization Design Process*, Workshop on Pedagogy of Data Visualization at IEEE VIS, 2017.
5. Thomas Geymayer, Manuela Waldner, **Alexander Lex**, Dieter Schmalstieg, *How Sensemaking Tools Influence Display Space Usage.* EuroVis Workshop on Visual Analytics (EuroVA), 2017.
6. Carolina Nobre and **Alexander Lex**, *OceanPaths: Visualizing Multivariate Oceanography Data.* Proceedings of the Eurographics Conference on Visualization (EuroVis), Short Papers, 2015.
7. Manuela Waldner, **Alexander Lex**, Marc Streit, Dieter Schmalstieg, *Design Considerations for Collaborative Information Workspaces in Multi-Display Environments.* Proceedings of the CoVIS 2009 Workshop on Collaborative Visualization on Interactive Surfaces (IEEE VisWeek), 2009.

## Selected Abstracts and Commentaries

1. Kiran Gadhave, Hendrik Strobelt, Nils Gehlenborg, **Alexander Lex**, *UpSet 2: From Prototype to Tool.* Posters Proceedings of the IEEE Information Visualization Conference (InfoVis), 2019.
2. Ilkin Safarli, **Alexander Lex**, *TaMax: Visualizing Dense Multivariate Networks with Adjacency Matrices.* Posters Proceedings of the IEEE Information Visualization Conference (InfoVis), 2019.
3. Haihan Lin, Carolina Nobre, Amanda Bakian, **Alexander Lex**, *Clipped Graphs: A Compact Time-Series Encoding.* Posters Proceedings of the IEEE Information Visualization Conference (InfoVis), 2019.
4. Dylan Wootton, Ethan Ransom, **Alexander Lex**, *Arctic Explorer: Visualization of Sea-Ice Concentration along Arctic Shipping Routes.* Posters Proceedings of the IEEE Information Visualization Conference (InfoVis), 2019.
5. *Alex Bigelow*, Carolina Nobre, **Alexander** Lex, Miriah Meyer, *Mure.js: Toward Flexible Authoring and Reshaping of Networks.* Posters Proceedings of the IEEE Information Visualization Conference (InfoVis), 2018.
6. Jen Rogers, Nicholas Spina, Ashley Neese, Rachel Hess, Darrel Brodke, **Alexander Lex**, *Composer: Visual Cohort Analysis of Patient Outcomes.* Posters Proceedings of the IEEE Information Visualization Conference (InfoVis), 2018.
7. Carolina Nobre, Nils Gehlenborg, Hilary Coon, **Alexander Lex**, *Lineage: Visualizing Multivariate Clinical Data in Genealogy Graphs.* Posters Proceedings of the IEEE Information Visualization Conference (InfoVis), 2017.
8. Katarína Furmanová, Miroslava Jarešová, Bikram Kawan, Holger Stitz, Martin Ennemoser, Samuel Gratzl, **Alexander Lex**, Marc Streit, *Taggle: Scaling Table Visualization through Aggregation.* Posters Proceedings of the IEEE Information Visualization Conference (InfoVis), 2017.
9. Hendrik Strobelt, Bilal Alsallakh, Joseph Botros, Brant Peterson, Mark Borowsky, Hanspeter Pfister, and **Alexander Lex**: *A Novel Tool for Isoform Visualization.* Poster Proceedings of the 5th Symposium on Biological Data Visualization (BioVis), ISMB, Dublin, Ireland, USA, 2015.
10. **Alexander Lex**, Nils Gehlenborg: *Points of view: Sets and intersections.* Nature Methods, vol. 11, no. 8, pp. 779, 2014.
11. **Alexander Lex**, Nils Gehlenborg, Hendrik Strobelt, Romain Vuillemot, Hanspeter Pfister: *UpSet for Visualizing Intersecting Sets in Biology.* Poster Proceedings of the 4th Symposium on Biological Data Visualization (BioVis), ISMB, Boston, MA, USA, 2014.
12. **Alexander Lex**, Marc Streit, Hans-Jörg Schulz, Christian Partl, Dieter Schmalstieg, Peter J. Park and Nils Gehlenborg: *StratomeX: Enabling Visualization-Driven Cancer Subtype Analysis.* Poster Proceedings of the IEEE Symposium on Biological Data Visualization (BioVis), 2012.

13. Marc Streit, **Alexander Lex**, Hans-Jörg Schulz, Christian Partl, Dieter Schmalstieg, Peter J. Park, Nils Gehlenborg: *Guided Visual Analysis for the Identification of Cancer Subtypes.* The Cancer Genome Atlas' Semi-Annual Steering Committee Meeting, Houston, TX, US, 25-27 April 2012.

14. **Alexander Lex**, Marc Streit, Hans-Joerg Schulz, Christian Partl, Dieter Schmalstieg, Peter J. Park, Nils Gehlenborg: *StratomeX – Integrative Visualization of Tumor Subtypes in Cancer Genomics Data Sets.* EMBO Workshop on Visualizing Biological Data (VizBi), Heidelberg, Germany, 6-8 March 2012.

15. **Alexander Lex**, Peter J. Park and Nils Gehlenborg: *Supporting Subtype Characterization through Integrative Visualization of Cancer Genomics Data Sets.* The Cancer Genome Atlas' 1st Annual Scientific Symposium: Enabling Cancer Research Through TCGA, November 17-18, 2011, Washington, D.C., USA

16. Marc Streit, **Alexander Lex**, Helmut Doleisch, Dieter Schmalstieg: *Does software engineering pay off for research? Lessons learned from the Caleydo project.* Poster at the Eurographics Workshop on Visual Computing for Biomedicine 2010, Leipzig, Germany, July 2010.

17. Gudrun Schmidt-Gann, Katharina Schmid, Monika Uehlein, Joachim Struck, Andreas Bergmann, Dieter Schmalstieg, Marc Streit, **Alexander Lex**, Douw G. van der Nest, Martijn van Griensven and Heinz Redl: *Gene- and Protein Expression Profiling in Liver in a Sepsis-Baboon Model.* 32nd Annual Meeting on Shock, San Antonio, Texas, USA June 6-9, 2009.

## Thesis Papers

**Doctoral Thesis:** Visualization of Multidimensional Data with Applications in Molecular Biology
Advisor: Prof. Dieter Schmalstieg
Co-Advisor: Dr. Nils Gehlenborg, Harvard Medical School
Referee: Prof. Robert Kosara, University of North Carolina at Charlotte
Publication date: March 2012
**Best Dissertation Award**, Graz University of Technology

**Master's Thesis:** Exploration of Gene Expression Data in a Visually Linked Environment
Mentor: Prof. Dieter Schmalstieg
Publication date: June 2008

**Bachelor's Thesis:** Evaluation of Medical Image Viewers and
Architectural Software Design for a Medical Image Viewer
Mentors: Prof. Horst Bischof, Dr. Martin Urschler
Publication date: June 2005

## TALKS

For slides, see `http://vdl.sci.utah.edu/team/lex/#talks`.

## Keynote Talks

**What is Data Visualization and Why Do We Care About it for Biomedical Applications?**
May Institute, Computation and statistics for mass spectrometry and proteomics, Northeastern University, Boston, MA, USA, 2019-05-06.

## Invited Talks

**Literate Visualization: Making Visual Analysis Sessions Reproducible and Reusable.**
Department of Computer Science, City University London, London, UK (virtual), 2020-11-17.
Goldman Sachs Tech Expo, Salt Lake City, UT, USA, 2020-07-24.
Utah Center for Data Science Seminar, 2020-01-06.

**Driving Scientific Discovery with Interactive Visual Data Analysis.**
Institute for Science and Technology (IST) Austria, Klosterneuburg, Austria, 2020-02-25.

**A Framework for Creative Visualization-Opportunities Workshops.**
NIH-NCI Workshop on Accelerating Cancer Research through User-Centered Software Design, Washington, DC, USA, 2019-01-07.

**Enabling Scientific Discovery through Interactive Visual Data Analysis**
Adobe, Lehi, UT, USA, 2019-04-10.
Lucid Software, Salt Lake City, UT, USA, 2019-03-12.

**Visualizing Biological Data: Pathway Graphs, Genealogies, and Alternative Splicing**
Helmholtz Diabetes Center, Munich, Germany, 2018-10-29.
Translational Genomics Research Institute (TGen), Phoenix, AZ, 2018-08-14.
Association for Molecular Pathology (AMP) Annual Meeting, Salt Lake City, UT, 2017-11-17.
Merck Research Laboratories, Boston, MA, 2017-06-15.
Department Of Biomedical Informatics, Harvard Medical School, Boston, MA, 2017-06-14.

**Lineage: Visualizing Multivariate Clinical Data in Genealogy Graphs**
NIH-NCI Workshop on Accelerating Cancer Research through User-Centered Software Design, Washington, DC, USA, 2019-01-07.
Genome Rounds, University of Utah, SLC, UT, USA, 2018-08-24.
Department of Psychiatry, University of Utah, SLC, UT, USA, 2018-06-05.
BioIT World Conference & Expo, Boston, MA, USA, 2018-05-17.
Harvard John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, USA, 2018-05-16.

**Layout Adaption Strategies for Visualizing Multivariate Network**
University of Calgary, Calgary, AB, Canada, 2018-06-18.

**Enabling Scientific Discovery through Interactive Visual Data Analysis**
Goldman Sachs Tech Expo, Salt Lake City, UT, 2017-06-28.
Department Of Biomedical Informatics, University of Utah, Salt Lake City, UT, 2017-04-06.
Walmart, Tech Tuesday, Bentonville, AK, 2017-02-07.
Marth Lab, Department of Human Genetics, University of Utah, Salt Lake City, UT, 2016-08-25.
Pacific Northwest National Laboratory, Richland, WA, 2016-07-01.
Huntsman Cancer Institute, Salt Lake City, UT, 2016-03-30.
Camp Lab, Huntsman Cancer Institute, University of Utah, Salt Lake City, UT, 2015-11-23.

**Enabling Scientific Discovery through Interactive Visual Data Analysis**
University of Vienna, Vienna, Austria, 2015-08-07.
Adobe Research, San Francisco, CA, USA, 2015-04-06.
EPFL, Lausanne, Switzerland, 2015-03-26.
University of Utah, Salt Lake City, UT, USA, 2014-12-03.
University of St. Andrews, St. Andrews, Scotland, 2014-11-03.

**UpSet: Visualization of Intersecting Sets**
Data Ventures, Harvard University, Cambridge, MA, USA, 2015-04-23.
BioIT World Conference & Expo, Boston, MA, USA, 2015-04-22.
Tufts University, Sommerville, MA, USA, 2014-10-29.

**Visual Data Analysis for Biology and Pharmacology**
PerkinElmer, Boston, MA, USA, 2014-11-05.
Novartis Institutes for BioMedical Research, Cambridge, MA, USA, 2014-07-09.

**Visualizing Relationships between Biological Pathways**
Drug Discovery on Target Conference, Boston, MA, USA, 2014-10-08.
BioIT World Conference & Expo, Boston, MA, USA, 2014-05-01.
DBMI, Harvard Medical School, Boston, MA, USA, 2014-04-17.

**Visualization Approaches for Biomolecular Data**
Georgia Tech, School of Interactive Computing, Atlanta, GA, USA, 2014-04-08.
University of Calgary, Department of Computer Science, Calgary, AB, Canada, 2014-02-13.

MIT CSAIL, Cambridge, MA, USA. 2013-04-12.
UMass Lowell, Lowell, MA, USA, 2013-11-06.

**Visualizing Multi-Attribute Rankings & A Very Short Visualization Introduction**
Harvard Graduate School of Education, Strategic Data Project, Cambridge, MA, USA, 2014-03-07.

**Data Visualization in Molecular Biology**
Novartis Institutes for BioMedical Research, Cambridge, MA, USA, 2013-07-29

**enRoute: Dynamic Path Extraction from Biological Pathway Maps for Exploring Heterogeneous Experimental Datasets**
BioIT World Conference & Expo, Boston, MA, USA, 2013-04-10.
Visualizing Biological Data (VIZBI) 2013, Cambridge, MA, USA, 2013-03-20.
Symposium on Understanding Cancer Genomics through Information Visualization at Tokyo University, Tokyo, Japan, 2013-02-22.

**Visualizing Biomolecular Data with the Caleydo Framework**
CBMI, Harvard Medical School, Boston, MA, USA, 2011-08-12.
MRC Laboratory of Molecular Biology (LMB), Cambridge, UK, 2010-09-21.
European BioInformatics Institute (EBI), Cambridge, UK, 2010-09-20

**Caleydo: Visual Analysis of Biomolecular Data**
VCBM 2010 Leipzig, Germany, 2010-07-02.
Caleydo and Visual Links.
VRVis Research Company, Vienna, Austria, 2010-03-11.

**Caleydo: Visualization of Gene Expression Data in the Context of Biological Processes**
AUVA Research Center for Traumatology, Vienna, Austria, 2009-02-26.

**Novel InfoVis Techniques Applied to Pathways and Gene Expression Data**
Institute for Genomics and Bioinformatics, Graz University of Technology, Austria, 2008-07-10.

## Paper/Poster Talks

**Pathfinder: Visualizing Paths in Graphs (Poster)**
BioVis @ ISMB, Orlando, FL, USA, 2016-07-08.

**UpSet: Visualization of Intersecting Sets**
IEEE InfoVis, Paris, France, 2014-11-03.

**StratomeX: Visual Analysis of Large-Scale Heterogeneous Genomics Data for Cancer Subtype Characterization**
IEEE BioVis 2012, Seattle, Washington, USA, 2012-10-14. (Poster)
EuroVis 2012, Vienna, Austria, 2012-06-07.

**VisBricks: Multiform Visualization of Large, Inhomogeneous Data**
IEEE InfoVis 2011, Providence, Rhode Island, USA, 2011-10-26.

**Visualizing the Effects of Logically Combined Filters**
Information Visualization 2011, London, UK. 2011-07-14.

**Comparative Analysis of Multidimensional, Quantitative Data**
IEEE InfoVis 2010, Salt Lake City, Utah, USA. Paper presentation, 2010-10-28.

**Caleydo: Design and Evaluation of a Visual Analysis Framework for Gene Expression Data in its Biological Context**
PacificVis 2010, Taipei, Taiwan. 2010-03-03.

## Panels

**Visualization Response in a Time of Pandemic**, at VisGuides: 3rd Workshop on the Creation, Curation, Critique and Conditioning of Principles and Guidelines in Visualization, IEEE VIS, 2020-10-25.

## SELECTED SOFTWARE

Usable software systems are a major part of my research output. To ensure software quality and to free up students to work on research project, I currently employ two staff software engineers (1.5 FTE) at SCI. I have released a wide range of biomedical visualization tools under permissive open source license. Here is a list of the most recent and popular tools.

**UpSet**, a Set Visualization Technique. UpSet has been accessed by more than 16,000 users.
`http://vcg.github.com/upset/`

**UpSetR**, an R version of UpSet. UpSetR has been downloaded more than 200,000 times.
`https://github.com/hms-dbmi/UpSetR`

The **Caleydo Visualization Framework**.
`http://caleydo.org/`

The **LineUp** Ranking Visualization Tool. LineUp has been integrated into Microsoft Power BI and is the basis of the product of datavisyn, a spin-off company I co-founded.
`https://caleydo.org/tools/lineup/`

The **Lineage** Visualization Tool for Clinical Genealogies.
`https://lineage.caleydoapp.org/`

The **Taggle** Tabular Visualization Tool.
`https://taggle.caleydoapp.org/`

The **Juniper** Multivariate Network Visualization Tool.
`http://juniper.sci.utah.edu/`

The **Pathfinder** Network Visualization Tool.
`https://pathfinder.caleydoapp.org/`

The **Vistories** Provenance Tracking and Storytelling Tool.
`http://vistories.org/`

The **Vials** Tool for Visualizing Alternative Splicing.
`http://vials.io/`

Various other libraries and tools are accessible at `http://github.com/Caleydo/` and `http://github.com/visdesignlab/`.

## MEDIA EXPOSURE

Inside Science, 2017
How Math Can Help Geologists Discover New Minerals

The OpenHelix Blog, 2016
Video Tip of the Week: Pathfinder, for exploring paths through data sets

The OpenHelix Blog, 2014
Video Tip of the Week: UpSet about genomics Venn Diagrams?

The Harvard Crimson, 2014
Painting by the Numbers: Data Visualization

The Harvard Crimson, 2014
New Tool Makes Cancer Analysis More Accessible

Harvard Medical School News, 2014
Pattern Recognition: New visualization software uncovers cancer subtypes

GenomeWeb, 2014
Harvard TCGA Data Visualization Software Adds Tools to Better Characterize Disease Subtypes

The OpenHelix Blog, 2014
StratomeX for genomic stratification of diseases

Harvard SEAS News & Harvard Gazette, 2014
What's behind a #1 ranking?

Forbes, 2014
Harvard And DARPA Develop Software For Deconstructing Top 100 Rankings

Der Standard, 2014
Heimische Forscher machen die Dynamik hinter Rankings sichtbar

The OpenHelix Blog, 2014
Video Tip of the Week: Entourage and enRoute from the Caleydo team

Nature Methods, 2013
Data visualization: ambiguity as a fellow traveler

GEN - Genetic Engineering & Biotechnology News, 2013
Pathway Analysis to Decipher Data

Harvard SEAS News, 2013
Celebrating minds dedicated to discovery

The OpenHelix Blog, 2010
Tip of the Week: Caleydo for gene expression and pathway visualization

For links to the articles, see `http://vdl.sci.utah.edu/team/lex/#press`.

## TEACHING AND MENTORSHIP

### Courses Taught

**COMP 5360/MATH 4100 — Introduction to Data Science**, University of Utah, Spring 2018, 2019, 2020. Instructor. Undergraduate course on data science. `http://datasciencecourse.net`

**CS 5630/CS 6630 — Visualization for Data Science**, University of Utah, Fall 2017, 2018, 2019, 2020. Instructor. Graduate/undergraduate course on visualization covering visualization fundamentals, information visualization, and the development of web-based visualization tools. `http://dataviscourse.net`

**CS 5963/Math 3900 — Introduction to Data Science**, University of Utah, Fall 2016
Instructor. Undergraduate course on the fundamentals of data science. `http://datasciencecourse.net`

**CS 5630/CS 6630 — Visualization**, University of Utah, Fall 2015, 2016
Instructor. Graduate/undergraduate course on visualization covering fundamentals, information visualization and scientific visualization. `http://dataviscourse.net`

**CS 7942 — Visualization Seminar**, University of Utah, Fall 2016, Spring 2017, Fall 2017, Spring 2018

**CS 171 — Visualization**, Harvard University, Spring 2015
Instructor. Undergraduate level lecture on visualization. `http://cs171.org/2015/`

**CS 171 — Visualization**, Harvard University, 2013, 2014
Head teaching fellow. Instructor: Hanspeter Pfister.
Responsibilities: co-developed class, taught multiple lectures and supervised 15 teaching fellows.

**BioVis — Visualization in Molecular Biology**, Johannes Kepler University Linz, 2013
Instructor. Lecture series sponsored by an "Excellence in Teaching" scholarship, state of Upper Austria. Graduate lecture on visualization for molecular biology.

**CS 109 / AC 209 / Stat 121 / E-109 — Data Science**, Harvard University, 2013
Teaching fellow. Instructors: Hanspeter Pfister and Joe Blitzstein. Undergraduate and graduate lecture on data analysis using statistics, machine learning and visualization.

**Selected Topics Computer Graphics**, Graz University of Technology, 2010, 2011, 2012
Co-Instructor. Graduate level lectures on perception, color, information visualization, visual analytics, flow visualization.

**Distributed Systems**, Graz University of Technology, 2009, 2010, 2011
Teaching assistant. Undergraduate level. Development and supervision of lab assignments.

**Introduction to Scientific Work**, Graz University of Technology, 2010, 2011
Teaching assistant. Undergraduate level. Supervision of focus groups.

**Computer Graphics 1**, Graz University of Technology, 2011, 2012
Teaching assistant. Undergraduate level. Development and supervision of lab assignments.

**Computer Graphics 2**, Graz University of Technology, 2011, 2012
Teaching assistant. Undergraduate level. Development and supervision of lab assignments.

## Tutorials

Carolina Nobre, Marc Streit, **Alexander Lex**:
*Visualizing Multivariate Networks*
IEEE VIS, Vancouver, Canada, 2019

Nils Gehlenborg and **Alexander Lex**:
*StratomeX & enRoute: Integrative Visualization with Caleydo.*
Visualizing Biological Data (VizBi) 2013, Cambridge, MA, USA, 2013

**Alexander Lex** and Marc Streit:
*Cancer Data Analysis with Caleydo StratomeX and enRoute.*
Symposium on Understanding Cancer Genomics through Information Visualization at Tokyo University, Tokyo, Japan, 2013

Marc Streit, Hans-Jörg Schulz and **Alexander Lex**:
*Connecting the Dots — Showing Relationships in Data and Beyond.*
VisWeek'12, Seattle, WA, USA, 2012.

## Graduated Ph.D. Students

**Carolina Nobre**, 2016-2020

**Christian Partl** (TU Graz), 2013-2018, co-advised with Dieter Schmalstieg

## Ph.D. Students Advised

**Devin Lange**, 2019-2024

**Haihan Lin**, 2018-2023

**Kiran Gadhave**, 2018-2023

**Jennifer Rogers**, 2017-2022, co-advised with Miriah Meyer since 2019

## M.S. Students Advised at Utah

Shaurya Sahai, independent study, MS '21

Sai Varun, independent study, MS '20

Sreekanth Reddy Konda, independent study, MS '19

Ram Seethamraju, independent study, MS '19

Sheetal Krishna, independent study, MS '19

Pranav Dommata, independent study, MS ’18

Sunny Hardasani, independent study, MS ’16

Anirudh Narasimhamurthy, independent study, M.S. ’16

Murali Krishna Teja Kilari, independent study, M.S. ’17

Sateesh Tata, independent study, MS ’16

Shreya Singh, independent study, MS ’15

Varsha Alangar, independent study, MS ’15

I have worked on at least a semester-long project with each of the MS students listed above. I have funded four of these students as RAs. I am not listing committee chairing or membership for course-only students.

### Undergraduate Students Advised at Utah

Hannah Burns, NSF REU, BS ’21

Pranav Rajan, NSF REU, BS ’21

Zachary Cutler, UROP Student / RA, BS ‘20, MS ’21

Dylan Wooton, Independent Research, BS ’19

Roy Bastien, BS Thesis, BS ’16

Priyanka Parekh, BS Thesis, BS ’16

I have supervised the BS thesis of two students, and worked with two others for at least a semester. I have published a poster with Dylan Wootton, and he is a co-author on a CHI submission.

### PhD Committees at Utah

Trang Tran, 2016-2021, Chair: Might

Saeed Taheri, 2015-2020, Chair: Gopalakrishnan

Jimmy Moore, 2015-2020, Chair: Meyer

P. Samuel Quinan III, 2013-2019, Chair: Meyer

Nina McCurdy, 2014-2019, Chair: Meyer

Alex Bigelow, 2013-2019, Chair: Meyer

Ethan Kerzner, 2013-2018, Chair: Meyer

Sean McKenna, 2012-2017, Chair: Meyer

### Other Mentored Students at Utah

Max Marno, PhD fellowship rotation ’20

Ilkin Safarli, PhD student, 2018-2020

Jochen Görtler, visiting PhD Student, ’19

Cameron Waller, PhD student, 2016-2018, co-supervised with Jared Rutter

Sahar Mehrpour, PhD fellowship rotation ’17

Mengjiao Han, PhD fellowship rotation ’17

Asmaa Aljuhani, PhD fellowship rotation ’17

Annie Cherkaev, PhD fellowship rotation ’17

Michael Kern, visiting MS student ’16

### Mentored Students at Harvard

Rasvan Iliescu, master’s thesis, MS ’14

Alain Ibrahim, master’s thesis, MS ’14

Tamar Rucham, master’s thesis, MS ’14

Gabriel Hase, master’s thesis, MS ’14

Conor Myhrvold, MS ’14

Ran Sofia Hou, undergraduate thesis, BS ’13 (co-advised with Joe Blitzstein)

### Mentored Students at Graz University of Technology

Thomas Geymayer, MS ’12, BS ’11 (with D. Schmalstieg)

Christian Partl, MS ’12 (with D. Schmalstieg)

Michael Lafer, BS ’10 (with D. Schmalstieg)

Hannes Plank, BS ’11 (with D. Schmalstieg)

Jürgen Pillhofer, MS ’10 (with D. Schmalstieg)

Michael Wittmayer, BS ’09 (with D. Schmalstieg)

Helmut Pichlhöfer, BS ’10 (with D. Schmalstieg)

Oliver Pimas, BS ’10 (with D. Schmalstieg)

Bernhard Schlegl, MS ’09 (with D. Schmalstieg)

Werner Puff, MS ’10 (with D. Schmalstieg)

Christian Partl, BS ’09 (with D. Schmalstieg)

Stefan Sauer, BS ’09 (with D. Schmalstieg)

## SERVICE

### Department Service

AI Search Committee, 2021.

Curriculum Committee, Since 2020.

Software Development Degree Curriculum Committee, Since 2019.

Data Science Degree Curriculum Committee, Since 2019.

Associate Director for Graduate Studies, Since 2018.

Leading Restructuring of Software Engineering at SCI, 2019.

Programming Languages Search Committee, 2018.

Database Search Committee, 2017.

Graduate Student Advisory Council Faculty Liaison, 2017-2019.

Graduate Students Admissions Committee, 2016, 2017, 2018.

## Organized Conferences and Workshops

Co-chair of Symposium on Visualization in Data Science (VDS) at IEEE VIS 2017.

Co-chair of Workshop on Visualization in Data Science (VDS) at IEEE VIS 2016.

## Paper Chair Roles at Conferences

Area papers chair at IEEE VIS, 2021.

Short-papers co-chair at IEEE VIS, 2020.

Papers co-chair of Symposium on Biological Data Visualization (BioVis), ISMB, 2017, 2019.

Papers and program co-chair of Symposium on Visualization in Data Science (VDS) at IEEE VIS 2015.

## Other Leadership Roles at Conferences

Member of reVISe, a committee designated to develop proposals to restructure IEEE VIS, 2019, 2020.

Steering committee member of Symposium on Visualization in Data Science (VDS) 2018, 2019, 2020. 2021.

Supporters chair of IEEE VIS 2018, 2019.

Publications chair of BioVis 2016.

Publicity co-chair of IEEE VIS 2016, 2017.

Poster co-chair of Symposium on Biological Data Visualization (BioVis) 2014, 2015.

Website co-chair of Symposium on Biological Data Visualization (BioVis) 2014, 2015.

## Program Committees

EuroVis 2021.

IEEE InfoVis 2014, 2015, 2016, 2019, 2020.

ACM CHI, 2018, 2019.

IEEE VAST, 2017, 2018.

Visual Analytics in Health Care, 2019.

Visualization in Data Science (VDS), 2018.

PacificVis, 2016, 2017.

International Symposium on Big Data Visual Analytics (BDVA), 2016.

BioVis, 2014, 2015, 2016.

EuroVis Short Papers, 2014, 2015, 2016, 2017.

Conference on Human-Computer Interaction & Knowledge Discovery (HCI-KDD), 2012.

International Conference on Information Visualisation (IV), 2010, 2011.

## Reviewing

Oxford Bioinformatics.

BMC Bioinformatics.

BMC Genomics.

Nucleic Acids Research.

PLOS One.

IEEE TVCG.

IEEE CG&A.

SAGE Information Visualization.

IEEE Information Visualization (InfoVis) 2010-2016, 2018.

IEEE Visual Analytics (VAST) 2010-2016.

ACM CHI 2014-2017, 2020.

EuroVis 2010-2019.

BioVis 2012-2016.

IEEE PacificVis 2010, 2011, 2013, 2015, 2016.

IV 2009-2011.

F1000Research.

Various others.

## Grant Review Panels

National Cancer Institute, National Institutes of Health, 2020.

National Science Foundation (NSF), 2018 (three times).

## OUTREACH ACTIVITIES

I offer educational opportunities about data visualization to the general public and to other scientists outside of computer science. This is achieved by teaching visualization seminars to interested parties. I recently developed a short course on visualization, together with my colleague Miriah Meyer, and taught it to life science and medical students at the University of Utah, and at a non-profit laboratory in Salt Lake City. A version of this course is also targeted at professionals of various vocations who are interested in learning about data visualization.

Is also offering self-study material on developing web-based visualizations at `http://dataviscourse.net/tutorials/`.

November 28, 2020