

**ALEX ENDERT**  
ASSOCIATE PROFESSOR

SCHOOL OF INTERACTIVE COMPUTING  
COLLEGE OF COMPUTING  
GEORGIA INSTITUTE OF TECHNOLOGY  
ATLANTA, GA 30332-0760, USA

## I. EARNED DEGREES

**Virginia Polytechnic Institute and State University**, Blacksburg, VA

Ph.D. Computer Science and Applications, July 2012

Dissertation Title: Semantic Interaction for Visual Analytics: Inferring Analytical Reasoning for Model Steering

Advisor: Dr. Chris North

**College of Charleston**, Charleston, SC

Bachelor of Science in Computer Science, May 2008

**Spartanburg Day School**, Spartanburg, SC

High School Diploma, May 2004

## II. EMPLOYMENT HISTORY

**Associate Professor**, Georgia Institute of Technology, Atlanta, GA

August 2020 – present

**Assistant Professor**, Georgia Institute of Technology, Atlanta, GA

August 2014 – August 2020

**Research Scientist**, Pacific Northwest National Laboratory, Richland, WA

July 2012 – July 2014

## III. HONORS AND AWARDS

2020: Outstanding Junior Faculty Research Award, Georgia Tech College of Computing

2015 – present: Member, Science Advisory Guide for Emergencies for the Department of Homeland Security and Technology Directorate

2013: PNNL National Science Directorate Author of the Year Award

2013: IEEE VGTC VPG Doctoral Dissertation Award

2012: TEDxVirginiaTech Presenter

2012-2013: Virginia Tech Computer Science PhD Dissertation of the Year Award

2011: IEEE VisWeek Doctoral Colloquium Conference Scholarship Recipient

2010, 2011: Davenport Fellowship Recipient

2009: Award for Special Contributions, *VAST Challenge, IEEE VAST 2009 Conference*.

2008-current: Upsilon Pi Epsilon Honor Society Member

2008: Departmental Honors, Computer Science, College of Charleston

## IV. RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITIES

### A. PUBLISHED BOOKS, PARTS OF BOOKS, AND EDITED VOLUMES

#### A1. Books

1. A. Endert. Semantic interaction for visual analytics: Inferring analytical reasoning for model steering. Synthesis Lectures on Visualization, Morgan & Claypool, 2016.

## **A2. Refereed Book Chapters**

1. Wall E., Blaha L.M., Paul C.L., Cook K., Endert A. "Four Perspectives on Human Bias in Visual Analytics". In: Ellis G. (eds) *Cognitive Biases in Visualizations*. Springer, 2018.

## **B. REFEREED PUBLICATIONS (CURRENT GOOGLE SCHOLAR H-INDEX: 32)**

### **B1. Published and Accepted Journal Articles**

1. Andrews, C., Endert, A., Yost, B., North, C., "Information Visualization on Large, High-Resolution Displays: Issues, Challenges, and Opportunities", *Information Visualization (IVS)*, 2011.
2. Leman SC, House L, Maiti D, Endert A, North, C., "Visual to Parametric Interaction (V2PI)". PLoS ONE 8(3): e50474, 2013.
3. Endert, A., Fiaux, P., North, C., "Semantic Interaction for Sensemaking: Inferring Analytical Reasoning for Sensemaking", *IEEE Transactions on Visualization and Computer Graphics (TVCG) 18(12)*, pp.2879-2888 – paper presented at VAST'12, 2012. (28% papers accepted)
4. L. Bradel, A. Endert, K. Koch, C. Andrews, C. North, "Large High Resolution Displays for Co-Located Collaborative Intelligence Analysis: Display Usage and Territoriality", *Intl Journal of Human Computer Studies*, pp. 589-604, 2013.
5. Brown, E. T., Ottley, A., Zhao, H., Lin, Q., Souvenir, R., Endert, A., Chang, R., "Waldo Findings: Learning about Users from their Interactions." *IEEE Transactions on Visualization and Computer Graphics (TVCG) 20(12)*, pp.1663-1672 – paper presented at VAST'14, 2014. (24% papers accepted)
6. Esakia, A., Endert, A., North, C., "Large Display Interaction via Multiple Acceleration Curves and Multifinger Pointer Control," *Advances in Human-Computer Interaction*, vol. 2014, Article ID 691507, 2014.
7. Endert, A., Hossain, M. S., Ramakrishnan, N., North, C., Fiaux, P., Andrews, C. "The human is the loop: new directions for visual analytics", *Journal of Intelligent Information Systems*, 43(3), pp.411-435, 2014.
8. Kim, H., Choo, J., Park, H., Endert, A., "InterAxis: Steering Scatterplot Axes via Observation-Level Interaction" *IEEE Transactions on Visualization and Computer Graphics*, 22(1), pp.131-140 (Proc. VAST'15) – paper presented at VAST'15, 2015. (22% papers accepted)
9. Ragan, E., Endert, A., Sanyal, J., Chen, J. "Characterizing Provenance in Visualization and Data Analysis: An Organizational Framework of Provenance Types and Purposes" *IEEE Transactions on Visualization and Computer Graphics*, 22(1), pp.31-40 (Proc. VAST'15) – paper presented at VAST'15, 2015. (22% papers accepted)
10. Saket, B., Kim, H., Brown, E. T., Endert, A., "Visualization by Demonstration: An Interaction Paradigm for Visual Data Exploration" *IEEE Transactions on Visualization and Computer Graphics (Proc. InfoVis'16)* – paper presented at InfoVis'16, 2016. (23% papers accepted)

11. Kwon, B. C., Kim, H., Wall, E., Choo, J., Park, H., Endert, A., “AxiSketcher: Interactive Nonlinear Axis Mapping through User’s Drawing on Visualization” *IEEE Transactions on Visualization and Computer Graphics (Proc. VAST’16)* – paper presented at VAST’16, 2016.  
(21% papers accepted)
12. Crouser, R. J., Franklin, L., Endert, A., Cook, K., “Toward Theoretical Techniques for Measuring the Use of Human Effort in Visual Analytic Systems” *IEEE Transactions on Visualization and Computer Graphics (Proc. VAST’16)* – paper presented at VAST’16, 2016.  
(21% papers accepted)
13. Endert, A., Ribarsky, W., Turkay, C., Wong, B. L., Nabney, I., Blanco, I. D., Rossi, F., “The State of the Art in Integrating Machine Learning into Visual Analytics” *Computer Graphics Forum (Proc. EuroVis’17)* – paper presented at EuroVis’17.
14. Saket, B., Srinivasan, A., Ragan, E. D., Endert, A., “Evaluating Interactive Graphical Encodings for Data Visualization” *IEEE Transactions on Visualization and Computer Graphics (Proc. InfoVis’17)* – paper presented at InfoVis’17.  
(23% papers accepted)
15. Wall, E., Das, S., Chawla, R., Kalidindi, B., Brown, E.T., Endert, A., “Podium: Ranking data using mixed-initiative visual analytics” *IEEE Transactions on Visualization and Computer Graphics (Proc. VAST’17)* – paper presented at VAST’17, 2018.
16. Pienta, R., Hohman, F., Endert, A., Tamersoy, A., Roundy, K., Gates, C., Navathe, S., Chau, D.H. “VIGOR: Interactive Visual Exploration of Graph Query Results” *IEEE Transactions on Visualization and Computer Graphics (Proc. VAST’17)* – paper presented at VAST’17, 2018.
17. Wall, E., Agnihotri, M., Matzen, L., Divis, K., Haass, M., Endert, A. and Stasko, J. “A Heuristic Approach to Value-Driven Evaluation of Visualizations”. *Transactions on Visualization and Computer Graphics (Proc. InfoVis’18)* – paper presented at InfoVis’18, 2019.  
(25% papers accepted)
18. Srinivasan, A., Drucker, S.M., Endert, A. and Stasko, J., “Augmenting visualizations with interactive data facts to facilitate interpretation and communication”. *IEEE Transactions on Visualization and Computer Graphics (Proc. InfoVis’18)* – paper presented at InfoVis’18, 2019.  
(25% papers accepted)
19. Sarvghad, A., Saket, B., Endert, A. and Weibel, N., 2019. “Embedded Merge & Split: Visual Adjustment of Data Grouping”. *IEEE Transactions on Visualization and Computer Graphics (Proc. InfoVis’18)* – paper presented at InfoVis’18, 2019.  
(25% papers accepted)
20. Saket, B., Endert A., “Investigating the Manual View Specification and Visualization by Demonstration Paradigms for Visualization Construction”. *Computer Graphics Forum (Proc. EuroVis’19)*, 2019.  
(31% papers accepted)
21. Cashman, D., Humayoun, S. K., Heimerl, F., Park, K., Das, S., Thompson, J., Saket, B., Mosca, A., Stasko, J., Endert, A., Gleicher, M. Chang, R. “A User-Based Visual Analytics Workflow for Exploratory Model Analysis”. *Computer Graphics Forum (Proc. EuroVis’19)*, 2019.  
(31% papers accepted)

22. Zeng, H., Wang, X., Wu, A., Li, Q., Endert, A., Qu, H., “EmoCo: Visual Analysis of Emotion Coherence in Presentation Videos”. *IEEE Transactions on Visualization and Computer Graphics (Proc. VAST’19)* – paper presented at VAST’19, 2019.  
(29% papers accepted)
23. Saket, B., Huron, S., Perin, C., Endert A., “Investigating direct manipulation of graphical encodings as a method for user interaction”. *IEEE Transactions on Visualization and Computer Graphics (Proc. InfoVis’19)* – paper presented at InfoVis’19, 2019.  
(25% papers accepted)
24. Kim, H., Choi, D., Drake, B., Endert, A., Park, H., “TopicSifter: Interactive Search Space Reduction Through Targeted Topic Modeling”. *IEEE Transactions on Visualization and Computer Graphics (Proc. VAST’19)* – paper presented at VAST’19, 2019.  
(29% papers accepted)
25. Das, S., Xu, S., Gleicher, M., Chang, R., Endert, A., “QUESTO: Interactive Construction of Objective Functions for Classification Tasks”, *Computer Graphics Forum (Proc. EuroVis’20)*, 2020.  
(29% papers accepted)
26. Paul, C. L., Chang, J., Endert, A., Cramer, N., Gillen, D., Hampton, S., Burtner, R., Perko, R., Cook, K., “TexTonic: Interactive visualization for exploration and discovery of very large text collections”, *Information Visualization*, 2019.
27. Kim, H., Drake, B., Endert, A., Park, H. “ArchIText: Interactive Hierarchical Topic Modeling”. *IEEE Transactions on Visualization and Computer Graphics*, 2020.
28. Cashman, D., Xu, S., Das, S., Heimerl, F., Liu, C., Humayoun, S.R., Gleicher, M., Endert, A., Chang, R., “CAVA: A Visual Analytics System for Exploratory Columnar Data Augmentation Using Knowledge Graphs”, *IEEE Transactions on Visualization and Computer Graphics (Proc. VAST’20)*.  
(25% papers accepted)
29. Narechania, A., Qamar, A., Endert, A., “SafetyLens: Visual Data Analysis of Functional Safety of Vehicles”, *IEEE Transactions on Visualization and Computer Graphics (Proc. InfoVis’20)*, 2020.  
(25% papers accepted)
30. Das, S., Saket, B., Kwon, B. C., & Endert, A., “Geono-cluster: Interactive visual cluster analysis for biologists”, *IEEE Transactions on Visualization and Computer Graphics*, 2020.
31. Sperrle, F., Mennatallah E.A., Guo G., Borgo, R., Chau, D.H. , Endert, A., Keim, D., "A Survey of Human-Centered Evaluations in Human-Centered Machine Learning." *Computer Graphics Forum (Proc. EuroVis’21)* – paper presented at EuroVis’21.

## **B2. Conference Presentation with Proceedings (Refereed)**

1. Whiting, M., North, C., Endert, A., Scholtz, J., Haack, J., Varley, C., Thomas, J., “VAST Contest Dataset Use in Education”. *IEEE Visual Analytics Science & Technology (VAST)*, pp. 115-122, 2009.  
(38% papers accepted)
2. Fink, G. A., North, C. L., Endert, A., Rose, S., “Visualizing Cyber Security: Usable Workspaces”. *ACM VizSec*, pp. 45-56, 2009.  
(44% papers accepted)
3. Hui, P., Bruce, J., Endert, A., Fink, G. A., Gregory, M., Best, D. M., McGrath, L. “Towards Efficient Collaboration in Cyber Security”. *IEEE ColSec*, pp. 489-498, 2010.

4. Singh, A., Bradel, L., Endert, A., Kincaid, R., Andrews, C., North, C. Supporting the cyber analytic process using visual history on large displays. *ACM VizSec*, pp. 3-8, 2011. (55% papers accepted)
5. Ragan, E. D., Endert, A., Bowman, D. A., Quek, F., "The Effects of Spatial Layout and View Control on Cognitive Processing". *ACM CHI Works in Progress*, pp. 2005-2010, 2011. (42% papers accepted)
6. Endert, A., Han, C., Maiti, D., House, L., Leman, S. C., North, C., "Observation-Level Interaction with Statistical Models for Visual Analytics", *IEEE Visual Analytics Science & Technology (VAST)*, pp. 121-130, 2011. (32% papers accepted)
7. Endert, A., Andrews, C., North, C., "Visual Encodings that Support Physical Navigation on Large Displays". *Graphics Interface*, pp. 103-110, 2011. (40% papers accepted)
8. Endert, A., Fiaux, P., Chung, H., Stewart, M., Andrews, C., North, C., "ChairMouse: Leveraging Natural Chair Rotation for Cursor Movement on Large, High-Resolution Displays". *ACM alt.CHI*, pp. 571-58, 2011. (42% papers accepted)
9. Andrews, C., Endert, A., North, C., "Space to Think: Large, High-Resolution Displays for Sensemaking". *ACM Human Factors in Computing Systems (CHI)*, pp. 55-64, 2010. (22% papers accepted, Best Paper Honorable Mention)
10. Vogt, K., Bradel, L., Andrews, C., North, C., Endert, A., Hutchings, D., "Co-located Collaborative Sensemaking on a Large High-Resolution Display with Multiple Input Devices". *ACM INTERACT*, pp. 589-604, 2011. (27% papers accepted)
11. Bradel, L., Zeitz, J., Endert, A., Hossain, M. S., Ramakrishnan, N., North, C., How analysts cognitively "connect the dots", *IEEE Intelligence and Security Informatics (ISI)*, 2013.
12. Endert, A., Fox, S., Maiti, D., Leman, S., North, C., "The Semantics of Clustering: Analysis of User-Generated Spatializations of Text Documents", *ACM Advanced Visual Interfaces (AVI)*, pp. 24-26, 2012. (28% papers accepted)
13. Endert, A., Andrews, C., Bradel, L., Zeitz, J., North, C., "Designing Large High-Resolution Display Workspaces", *ACM Advanced Visual Interfaces (AVI)*, pp. 58-65, 2012. (28% papers accepted)
14. Ragan, E. D., Endert, A., Bowman, D. A., Quek, F., "How Spatial Layout, Interactivity, and Persistent Visibility Affect Learning with Large Displays", *ACM Advanced Visual Interfaces (AVI)*, 2012. (28% papers accepted)
15. Endert, A., Fiaux, P., North, C., "Semantic Interaction for Visual Text Analytics", *ACM Human Factors in Computing Systems (CHI)*, pp. 473-482, 2012. (23% papers accepted)
16. Chu, S., Quek, F., Endert, A., Chung, H., Sawyer, B., "The Physicality of Technological Devices in Education: Building a digital experience for learning", *IEEE ICALT*, pp. 579-581, 2012. (19% papers accepted)
17. Henry, M.J., Hampton, S., Endert, A., Roberts, I., Payne, D. "MultiFacet: A Faceted Interface for Browsing Large Multimedia Collections" *IEEE International Symposium on*

- Multimedia (ISM)*, pp. 347-350, 2013.  
(26% papers accepted)
18. Paul, C.L., Argenta, C., Elm, W., Endert, A., "Future directions of humans in Big Data Research: Summary of the 1st workshop on Human-Centered Big Data Research," 2014 *IEEE International Conference on Big Data (BigData)*, pp.903-904, 2014.  
(20% papers accepted)
  19. Scholtz, J. and Endert, A. "User-centered design guidelines for collaborative software for intelligence analysis" *International Conference on Collaboration Technologies and Systems (CTS)*, pp. 478-482, 2014.  
(39% papers accepted)
  20. Jolaoso, S., Burtner, R., Endert, A. (2015). "Toward a Deeper Understanding of Data Analysis, Sensemaking, and Signature Discovery". *INTERACT*, pp. 463-478, 2015.  
(29% papers accepted)
  21. Cook, K., Cramer, N., Isreal, D., Wolverton, M., Bruce, J., Burtner, R., Endert, A. "Mixed-Initiative Visual Analytics using Task-Driven Recommendations". *IEEE Visual Analytics Science and Technology (VAST)*, pp. 9-16, 2015.  
(31% papers accepted)
  22. Pienta, R., Tamersoy, A., Endert, A., Chau, D. H., "VISAGE: Interactive Visual Graph Querying". *ACM Advanced Visual Interfaces (AVI)*, pp. 272-279, 2016.  
(21% papers accepted)
  23. Pienta, R., Hohman, F., Tamersoy, A., Endert, A., Navathe, S., Tong, H., Chau, D. H., "Visual Graph Query Construction and Refinement". *ACM International Conference on Management of Data (SIGMOD)* (pp. 1587-1590), 2017.  
(20% papers accepted)
  24. Badam, S.K., Zeng, Z., Wall, E., Endert, A., Elmqvist, N., "Supporting team-first visual analytics through group activity representations". *Graphics Interface*, 2017.  
(50% papers accepted)
  25. Wall, E., Blaha, L. Franklin, L. and Endert, A, "Warning, Bias May Occur: A Proposed Approach to Detecting Cognitive Bias in Interactive Visual Analytics", *IEEE Visual Analytics Science and Technology (VAST)*, 2017.  
(33% papers accepted)
  26. Cramer, N., Nakamura, G., Endert, A., "The Impact of Streaming Data on Sensemaking with Mixed-Initiative Visual Analytics". *Human-Computer Interaction International*, 2017.
  27. Das, S., Cashman, D., Chang, R., Endert, A. "BEAMES: Interactive Multi-Model Steering, Selection, and Inspection for Regression Tasks". *IEEE VIS Visualization in Data Science Symposium (VDS'18)*, 2018. Best Paper Award.  
(30% papers accepted)
  28. Deeb-Swihart, J., Endert, A., Bruckman, A., "Understanding Law Enforcement Strategies and Needs for Combating Human Trafficking". *ACM CHI*, 2019.  
(24% papers accepted)
  29. Wall, E., Blaha, L., Paul, C., Endert, A., "A Formative Study of Interactive Bias Metrics in Visual Analytics Using Anchoring Bias". *INTERACT*, 2019.  
(29% papers accepted)
  30. Wall, E., Stasko, J., Endert, A., "Toward a Design Space for Mitigating Cognitive Bias in Vis", *IEEE VIS (short paper)*, 2019.  
(32% papers accepted)

31. Das, S., Cashman, D., Chang, R., Endert, A., "Gaggle: Visual Analytics for Model Space Navigation", *Graphics Interface*, 2020.  
(% papers accepted)
32. Law, P. M., Endert, A., Stasko, J., "What are Data Insights to Professional Visualization Users?", *IEEE VIS (short paper)*, 2020.  
(% papers accepted)
33. Law, P. M., Endert, A., Stasko, J., "Characterizing automated data insights", *IEEE VIS (short paper)*, 2020.  
(% papers accepted)
34. Das, S. and Endert, A., "LEGION: Visually compare modeling techniques for regression", *Visualization in Data Science (VDS)*, 2020.  
(% papers accepted)
35. Das, S., Xu, P., Dai, Z., Endert, A., Ren, L., "Interpreting Deep Neural Networks through Prototype Factorization", *International Conference on Data Mining Workshops (ICDMW)*, 2020.  
(% papers accepted)
36. Law, P. M., Lo, L. Y. H., Endert, A., Stasko, J., Qu, H., "Causal Perception in Question-Answering Systems", *ACM Conference on Human Factors in Computing Systems (CHI)*, 2021.  
(25% papers accepted)

### **B3. Magazine Articles (Refereed)**

1. Fiaux, P., Sun, M., Bradel, L., North, C., Ramakrishnan, N., Endert, A., "Bixplorer: Visual Analytics with Biclusters", *IEEE Computer*, vol. 46, no. 8, Aug. 2013.
2. Endert, A., Bradel, L., North C., "Visualization Viewpoints -- Beyond Control Panels: Direct Manipulation for Visual Analytics", *IEEE Computer Graphics & Applications (CG&A)*, July/August 2013.
3. Endert A., "Semantic Interaction for Visual Analytics: Towards Coupling Cognition and Computation" *IEEE Computer Graphics & Applications*, 35.4: pp.94-99, 2015.
4. Saket, B., Endert, A., "Demonstrational Interaction for Data Visualization". *IEEE Computer Graphics & Applications (CG&A)*, 2019.
5. Lee, B., Isaacs, K., Szafir, D. A., Marai, G. E., Turkay, C., Tory, M., Carpendale, S., Endert, A. "Broadening Intellectual Diversity of Visualization Research Papers". *IEEE Computer Graphics & Applications (CG&A)*, 2019.
6. Boukhelifa, N., Bezerianos, A., Chang R., Collins, C., Drucker, S., Endert, A., Hullman, J., North, C., Sedlmair, M. "Challenges in Evaluating Interactive Visual Machine Learning Systems." *IEEE Computer Graphics and Applications*, 2020.
7. Wenskovitch, J., Zhou, M., Collins, C., Chang, R., Dowling, M., Endert, A., Xu, K. "Putting the "I" in Interaction: Interactive Interfaces Personalized to Individuals", *IEEE Computer Graphics and Applications*, 2020.

### **B4. Other refereed material**

1. Endert, A., Andrews, C., Fink, G. A., North, C., "Professional Analysts using a Large, High-Resolution Display". *IEEE VAST (Contest Entry)*. *Awarded Special Contributions to the VAST Challenge Contest*, 2009.
2. Andrews, C., Endert, A., North, C., "VAST 2010 Challenge: Analyst's Workspace", *IEEE VAST Challenge Contest*, 2010.
3. Endert, A., Fiaux, P., North, C., "Semantic Interaction for Sensemaking", *HCIC*, 2011.



4. Endert, A., Fiaux, P., North, C., "Unifying the Sensemaking Loop with Semantic Interaction", *IEEE Workshop on Interactive Visual Text Analytics for Decision Making at IEEE VisWeek*, 2011.
5. North, C., Chang, R., Endert, A., Dou, W., May, R., Pike, B., Fink, G., "Analytic Provenance: Process+Interaction+Insight", *ACM Human Factors in Computing (CHI) Extended Abstracts*, 2011.
6. Endert, A., North, C., "Interaction Junk: User Interaction-Based Evaluation of Visual Analytic Systems", *Beyond Time and Errors: Novel Evaluation Methods for Visualization (BELIV) at IEEE VisWeek*, 2012.
7. Cao, Y., Moore, R., Mi, P., Endert, A., North, C., Marchany, R., "Dynamic Analysis of Large Datasets with Animated and Correlated Views", *IEEE VAST (Contest Entry) (Honorable Mention)*.
8. Endert, A., Fiaux, P., North, C., "Unifying the Sensemaking Process with Semantic Interaction", *NSF Science of Interaction for Data and Visual Analytics Workshop*, 2012.
9. Endert, A., Burtner, R., Cramer, N., Perko, R., Hampton, S., Cook, K., "Typograph: Multiscale Spatial Exploration of Text Documents", *IEEE Workshop on Big Data Visualization at IEEE BigData*, 2013.
10. Rooney, C., Endert, A., Fekete, J., Hornbæk, K., North, C., "POWERWALL: 1<sup>st</sup> International Workshop on Interactive, Ultra-High Resolution Displays". *ACM Human Factors in Computing (CHI) Extended Abstracts*, 2013.
11. Burtner, R., Mar, R., Scarberry, R., LaMothe, R., Endert, A., "Affinity+: Semi-Structured Brainstorming on Large Displays". *ACM CHI Workshop POWERWALL: 1<sup>st</sup> International Workshop on Interactive, Ultra-High Resolution Displays*, 2013.
12. Best, D. M., Endert, A., Kidwell, D., "7 key challenges for visualization in cyber network defense". *In Proceedings of the Eleventh Workshop on Visualization for Cyber Security (VizSec '14)*.
13. Endert, A., Szymczak, S., Gunning, D., Gersh, J., "Modeling in Big Data Environments." *ACM Human Centered Big Data Research (HCBDR)*, 2014.
14. Endert A., Pike, W.A., Cook, K., "From Streaming Data to Streaming Insights: The Impact of Data Velocities on Mental Models." *ACM Workshop on Human-Centered Big Data Research (HCBDR)*, 2014.
15. Endert, A., North, C., Chang, R., Zhou, M., "Toward Usable Interactive Analytics: Coupling Cognition and Computation.", *ACM KDD Interactive Data Exploration and Analysis workshop (IDEA)*, 2014.
16. Saket, B., Endert, A., Stasko, J., "Beyond Usability and Performance: A Review of User Experience-focused Evaluations in Visualization", *Beyond Time and Errors: Novel Evaluation Methods for Visualization (BELIV) at IEEE VIS*, 2016.
17. Pienta, R., Navathe, S., Endert, A., Chau, D. H., "Making Sense of Graph Query Results: Interactive Summarization and Exploration", *IEEE VAST (poster)*, 2016.
18. Hodas, N., Endert, A., "Adding Semantic Information into Data Models by Learning Domain Expertise from User Interaction", *IEEE VAST (poster)*, 2016.
19. Brown, E.T., Chang, R., Endert, A., "Human-Machine-Learner Interaction: The Best of Both Worlds", *ACM CHI, Workshop on Human-Centered Machine Learning*, 2016.
20. Wall, E., Blaha, L. M., Paul, C. L., Cook, K., Endert, A., "Four perspectives on human bias in visual analytics", *DECISIVE: Workshop on Dealing with Cognitive Biases in Visualizations at IEEE VIS*, 2017.

21. Brown, E. T., Yarlagadda, S., Chang, R., Endert, A. "ModelSpace: Visualizing the Trails of Data Models in Visual Analytics Systems" IEEE VIS Workshop on Machine Learning from User Interaction for Visualization and Analytics, 2018.
22. Coscia, A., Chau, D. H., Endert, A., "Toward a Bias-Aware Future for Mixed-Initiative Visual Analytics." *IEEE VIS Workshop on Trust and Expertise in Visual Analytics (TREX)*, 2020.
23. Wright, A. P., Wang, Z. J., Park, H., Guo, G., Sperrle, F., El-Assady, M., Endert, A., Keim, D., Chau, D. H., "A Comparative Analysis of Industry Human-AI Interaction Guidelines", *IEEE VIS Workshop on Trust and Expertise in Visual Analytics (TREX)*, 2020.
24. Sperrle, F., El-Assady, M., Guo, G., Chau, D.H., Endert, A., Keim, D., 2020. "Should We Trust (X) AI? Design Dimensions for Structured Experimental Evaluations", arXiv preprint arXiv:2009.06433.

#### **C. OTHER PUBLICATIONS AND CREATIVE PRODUCTS**

1. Endert, A., North, C., Andrews, C., Fink, G. "The Visualization Pipeline is Broken", Pacific Northwest National Laboratories report number PNNL-SA-65619, 2009.
2. Vogt, K., North, C., Andrews, C., Endert, A., "Co-located Collaboration on a Large, High-Resolution Display". Poster at Virginia Tech Computer Science REU Symposium, 2010.
3. Singh, A., Endert, A., North, C., Kincaid, R., "Keeping History Current: Using Large Displays to Preserve Process in Bioinformatics Data Analysis". Poster at Agilent Technologies Research Symposium, 2011.
4. Bradel, L., Endert, A., North, C. "Benefits of Co-located Collaboration on Large, High-Resolution Displays." Poster at Grace Hopper Conference. Portland, Oregon. November, 2011.
5. "Method and System for Information Retrieval and Aggregation from Inferred User Reasoning" Patent Filed, May 2015

#### **D. PRESENTATIONS**

##### **Conference Presentations**

(listed under conference proceedings)

##### **Invited Seminars**

1. CHCI-CHI Seminar Series. Virginia Tech. July, 2009. Blacksburg, VA  
"Interacting with a Curved Large Display using Chair Rotation"
2. College of Charleston Alumni Symposium. March, 2010. Charleston, SC  
"Let's Make Large Displays Usable!"
3. Kitware, Inc. 2012  
"Semantic Interaction for Visual Text Analytics"
4. TEDxVirginiaTech, 2012, Blacksburg, VA  
"Semantic Interaction for Sensemaking"
5. NSF Science of Interaction Workshop, 2015, Banff, CA  
"User Interaction and Model Steering"
6. Pacific Northwest National Laboratories, 2016, Richland, WA  
"Toward Interactive Visual Affordances"

7. Oak Ridge National Laboratory CISML seminar series, 2016, Oak Ridge, TN  
"Putting User Interaction First: Interactive Visual Affordances for Visual Analytics"
8. University of Tennessee Invited Speaker, 2016, Knoxville, TN  
"Putting User Interaction First: Interactive Visual Affordances for Visual Analytics"
9. IBM Research, 2016, New York, NY  
"Visual Analytics by Demonstration for Interactive Data Analysis"
10. Intelligence Community Academic Research Symposium, 2016 Washington, D.C.  
"Visual Analytics by Demonstration: Supporting Sensemaking with Interactive Visual Analytics"
11. Service Academies Faculty Training Workshop on Visual Analytics, US Air Force Academy, Colorado Springs, CO, 2016  
"Incorporating User Feedback and Machine Learning for Human-in-the-loop Visual Analytics"
12. DHS Visual Analytics Education Outreach Workshop, Texas Prairie View A&M University, Prairie View, TX, 2016  
"The Role of Human Feedback for Visual Analytics"
13. Smart Travel Data Summit  
Atlanta, GA, 2016  
"Visual Analytics: Towards Data-Driven Conversations"
14. PNNL Faculty Summit, Pacific Northwest National Laboratory  
Richland, WA, 2017  
"Towards Usable ML+Vis"
15. IEEE VIS Early Career Workshop  
Park City, UT, 2017  
"Visual Analytics by Demonstration"
16. DHS 2018 Data Literacy for a STEAM Curriculum Workshop at Arizona State University  
Phoenix, TX, 2018  
"Visual Analytics: Research Topics and Classroom Curricula"
17. TRIPODS 2<sup>nd</sup> Southwest Summer Conference  
Tuscon, AZ, 2019  
"Considering Cognitive Bias in Visual Data Analysis"
18. Keynote, Visual Analytics Summer School (VASS)  
Galway, Ireland, 2019  
"Visual Analytics"
19. Regions Bank Knowledge Café Speaker Series  
Birmingham, AL, 2021 (virtual)  
"Human-in-the-Loop Visual Analytics: Opportunities and Challenges for Helping People Make Sense of Data"
20. Oak Ridge National Laboratory Division Seminar Series  
Oak Ridge, TN, 2021 (virtual)  
"Human-in-the-Loop Visual Analytics: Opportunities and Challenges for Helping People Make Sense of Data"

## **V. RESEARCH GRANTS AND CONTRACTS (AS PI OR CO-PI)**

Visualizing Functional Vehicle Safety

Agency/Company: Ford Motor Company  
Total Dollar Amount: \$315,000  
Period of Contract: 5/2018 – 5/2021

REVOLT: Revolutionary Data Presentation and Manipulation

Agency/Company: DOD/MDA STTR  
Total Dollar Amount: \$36,000  
Period of Contract: 6/2019 – 5/2020

CAREER: Visual Analytics by Demonstration for Interactive Data Analysis

Agency/Company: NSF  
Total Dollar Amount: \$499,695  
Period of Contract: 5/2018 – 5/2023

CHS: Small: Enhancing Data Analysis Strategies with Mixed Initiative Visual Analytics

Agency/Company: NSF  
Total Dollar Amount: \$491,371  
Period of Contract: 8/2018 – 8/2021

User-Driven Model Steering and Curation via Inference from Interaction and Model-Space Sampling

Agency/Company: DARPA  
Total Dollar Amount: \$2,700,000  
Collaborators: John Stasko, Mike Gleicher, Remco Chang  
Period of Contract: 3/2017 – 5/2021

Streaming Visual Analytics and Cognitive Bias Research

Agency/Company: DOD / Pacific Northwest National Laboratory  
Total Dollar Amount: \$93,943  
Period of Contract: 8/2016-8/2017

Touch Interaction for Information Visualization

Agency/Company: Pacific Northwest National Laboratory  
Total Dollar Amount: \$50,079  
Period of Contract: 6/2015-9/2015

Visual Analytics for Streaming Data

Agency/Company: Pacific Northwest National Laboratory / DOE  
Total Dollar Amount: \$182,497  
Period of Contract: 9/2015 – 9/2017

Analytic Provenance for File Management (Research Gift)

Agency/Company: Keysight Inc.  
Total Dollar Amount: \$60,000  
Period of Contract: 2/2016

Data-Driven Decision-Making via Visual Analytics on the Microsoft Surface Hub

Agency/Company: Microsoft

Total Dollar Amount: \$25,000 & Microsoft Surface Hub  
 Collaborators: John Stasko, Rahul C. Basole, Polo Chau  
 Period of Contract: 6/2015-9/2016

VACCINE: Visual Analytics for Command, Control, and Interoperability  
 Agency/Company: Department of Homeland Security & Purdue University  
 Total Dollar Amount: \$332,512.49  
 Collaborators: John Stasko  
 Period of Contract: 1/2015 – 7/2017

Dotlink/GT: Visualizing Georgia Tech’s Innovation Ecosystem  
 Agency/Company: Georgia Tech SPAG  
 Total Dollar Amount: \$189,028  
 Collaborators: Rahul C. Basole  
 Period of Contract: 8/2016 – 8/2018

High Performance Hybrid Visual Data Triage for Rapid Knowledge Discovery  
 Agency/Company: Department of Defense  
 Total Dollar Amount: \$300,000  
 Collaborators: Haesun Park  
 Period of Contract: 5/2018 – 9/2019

**VI. TEACHING**

**A. COURSES TAUGHT**

<i>Semester, Year</i>	<i>Course Number</i>	<i>Course Title</i>	<i>Number of Students</i>
Spring 2021	CS 4460	Introduction to Information Visualization	143
Fall 2020	CS 7450	Information Visualization	66
Spring 2020	CS 8803	Visual Data Analysis	35
Fall 2019	CS 4460	Introduction to Information Visualization	127
Spring 2019	CS 4460	Introduction to Information Visualization	143
Fall 2018	CS 4460	Introduction to Information Visualization	139
Spring 2018	CS 8803	Visual Data Analysis	21
Fall 2017	CS 7450	Information Visualization	74
Spring 2017	CS 4460	Introduction to Information Visualization	95
Fall 2016	CS 7001	Introduction to Graduate Studies	47
Fall 2015	CS 7001	Introduction to Graduate Studies	48
Spring 2015	CS 8803	Visual Data Analysis ( <i>new course</i> )	16
Fall 2014	CS 7450	Information Visualization	49

**B. INDIVIDUAL STUDENT GUIDANCE**

**B1. Ph.D. Students**

Bahador Saket

Defended: Spring 2020  
Dissertation title: *Visualization by Demonstration*

Emily Wall

Defended: Summer 2020  
Dissertation title: *Detecting Cognitive Bias from User Interactions during Visual Data Analysis*  
*Graduate Fellowship for STEM Diversity Fellow*  
*Siemens FutureMaker Fellow*  
*GVU Foley Scholar*  
*D.E. Shaw Exploration Fellow*

Subhajit Das

Advisement began: Fall 2016  
Working dissertation title: *Machine Teaching for Visual Analytics*

Hannah Kim (co-advise with Haesun Park)

Defended: Fall 2020  
Dissertation title: *Interactive Hierarchical Topic Modeling*

Fred Hohman (co-advise with Polo Chao)

Defended: Fall 2020  
Dissertation title: *Interpretable Deep Learning using Visualization*  
*NASA Space Technology Research Fellow*

Julia Deeb-Swihart (co-advise with Amy Bruckman)

Co-Advisement began: Spring 2018  
Working dissertation title: *Helping Combat Human Trafficking*

Po Ming "Terrance" Law (co-advise with John Stasko)

Co-Advisement began: Summer 2019  
Working dissertation title: *Interactive Visualization for Comparison*

Arpit Narechania

Advisement began: Fall 2019  
Working dissertation title: *Visual Analytics for Functional Vehicle Safety*

Grace Guo

Advisement began: Fall 2019  
Working dissertation title: *A Learning Sciences Approach to Explainable AI*

Shenyu Xu

Advisement began: Fall 2019  
Working dissertation title: *Visual Analytics for Functional Vehicle Safety*

Adam Coscia

Advisement began: Fall 2020

## **B2. M.S. Students**

Aishwarya Rajagopal, MS-CS, 2015  
Hannah Kim, MS-CS, 2015  
Arjun Srinivasan, MS-CS, 2015  
Pranav Ram, MS-CS, 2015  
Bhargav Rajendra, MS-HCI, 2015  
Sakshi Pratap, MS-CS, 2018  
Ravish Chawala, MS-CS, 2018  
Pradeep Vairamani, MS-CS, 2018  
Steve Jones, MS-HCI, 2018  
Rachel Chen, MS-HCI, 2019  
Matt Britton, MS-CS, 2019  
Meghan Galanif, MS-HCI, 2019

## **B3. Undergraduate Students**

Damilola Faisal Animashaun, 2015  
Bharath Kalidindi, 2017  
Austin Bayon, 2019  
Jamal Paden, 2020

## **B4. Service on thesis or dissertation committees**

Chad Stolper  
Advisors: John Stasko, Polo Chau  
Defense date: July, 2016  
“Graph-Level Operations: A High-Level Interface for Graph Visualization Technique Specification”

Robert Pienta  
Advisor: Polo Chau  
Defense date: June, 2017  
“Adaptive Network Exploration and Querying”

Yi Han  
Advisor: John Stasko, Gregory Abowd  
Defense date: November, 2016  
“Discovering Visual Analysis Approaches from User Interactions”

Ramik Sadana  
Advisor: John Stasko  
Defense Date: Jan, 2017  
“Data Visualization on Tablet Devices”

Alex Godwin  
Advisor: John Stasko  
Defense Date: June, 2018

“Sketch-based Spatiotemporal Data visualization”

Valentino Di Donato

Advisor: Giuseppe Di Battista (Roma Tre University)

Defense date: June, 2018

“Visual and Algorithmic Approaches to the Analysis of Internet Routing and Bitcoin”

Karan P. Jani

Advisor: Deirdre Shoemaker

Defense date: June, 2018

“In Search of Binary Black Holes in the Universe”

Mia Feng

Advisor: Lane Harrison (Worcester Polytechnic Institute)

Defense date: June, 2019

“Quantifying and Modeling Open-Ended Explorations of Web Visualizations”

Brian Kahng

Advisor: Polo Chau

Defense date: October, 2019

“Human-Centered AI through Scalable Visual Data Analytics”

Jiali Liu

Advisor: James Eagan

Defense date: September, 2021

“Understanding and Supporting Alternatives in Data Analysis Processes”

### **C. OTHER TEACHING ACTIVITIES**

Co-taught an education outreach workshop at Arizona State University to help faculty at minority-serving institutions integrate visual analytics and data science into their curricula, 2018.

Developed new course titled “Visual Data Analysis”, taught in Spring 2015, Spring 2018, Spring 2020.

Co-taught an education outreach workshop at minority-serving institution Bethune-Cookman focused on helping instructors integrate visual analytics modules into their courses, 2015

Co-taught an education outreach workshop at the United States Air Force Academy focused on helping instructors at the US service academies integrate visual analytics into the training and education of cadets, 2016.

## **VII. SERVICE**

### **A. PROFESSIONAL CONTRIBUTIONS**



*Membership and Activities in Professional Societies*

Member, Association for Computing Machinery, 2006-present  
Member, Upsilon Pi Epsilon Honor Society Member, 2008-present  
Member, IEEE Computer Society, 2006-present

*Conference Organizational Activities*

Co-General Chair, IEEE VIS, 2019  
Organizing Committee, IEEE VIS 2013-2018  
Organizing Committee, IEEE VisWeek, 2012  
Member, IEEE VIS reVISE Committee, 2019, 2020  
Chair, IEEE VIS Area Curation Committee (ACC), 2021  
Workshop Co-Organizer:  
IEEE VIS Workshop: EVIVA-ML: Evaluation of Interactive Visual Machine Learning Systems, 2019  
IEEE VIS Workshop: MLUI: Machine Learning from User Interactions for Visualization and Analytics, 2019  
IEEE VIS Workshop on Machine Learning from User Interaction for Visualization and Analytics, 2018  
IEEE VIS Workshop on Immersive Analytics, 2017  
IEEE VIS Workshop on Dealing with Cognitive Biases in Visualizations, 2017  
ACM IUI Workshop on Visual Text Analytics, 2015  
Workshop on Semantic Interaction: Towards Coupling Cognition and Computation through Usable Interactive Interfaces at PNNL, 2014  
ACM CHI POWERWALL: International Workshop on Interactive, Ultra-High-Resolution Displays, 2013  
ACM CHI Workshop on Analytic Provenance, 2011

*Journal Editorial Committee Activities*

Associate Editor, IEEE Transactions on Visualization and Computer Graphics (TVCG), 2021-present

*Conference Publication Committee Activities*

Program Committee, ACM CHI, 2019  
Program Committee, IEEE VAST, 2013-2015, 2017-2018, 2020, 2021  
Program Committee, IEEE InfoVis, 2020  
Program Committee, EuroVis, 2020, 2021  
Program Committee, ACM VizSec, 2010-2015  
Program Committee, IEEE Large Data Analysis and Visualization, 2013-2015

*Reviewing Activities (past reviewer for)*

National Science Foundation  
IEEE Computer  
Graphics Interface Conference  
CHI Conference  
UIST Conference  
IEEE Computer Graphics and Applications  
IEEE Transactions on Visualization and Computer Graphics  
Journal of Intelligent Information Systems

Information Visualization  
EuroVis Conference  
Advanced Visual Interfaces Conference

**B. INSTITUTE CONTRIBUTIONS**

Visual Analytics Area Chair, 2021

Ph.D. Recruit Visit Weekend, Co-Organizer 2015, 2016

IC Faculty Hiring Committee, 2017, 2018, 2019 (chair), 2020 (chair), 2021