Christopher G. Healey

2266 EB-II, 890 Oval Drive #8206
Department of Computer Science, North Carolina State University
Raleigh, North Carolina, 27695-8206

healey@ncsu.edu
http://www.csc.ncsu.edu/faculty/healey
919.513.8112

PROFESSIONAL CAREER

2003–	Associate Professor, Department of Computer Science, North Carolina State University, Raleigh, North Carolina.
2006–	Adjunct Associate Professor, Department of Computer Science, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.
2005–2006	Visiting Associate Professor, Department of Computer Science, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.
1998–2003	Assistant Professor, Department of Computer Science, North Carolina State University, Raleigh, North Carolina.

EDUCATION

1996–1998	Postdoctoral Fellow in computer graphics, University of California at Berkeley, Berkeley, California.
1992–1996	Ph.D. in computer graphics, "Effective Visualization of Large, Multidimensional Datasets," University of British Columbia, Vancouver, Canada.
1990–1992	M.Sc. in computer graphics, "Visualization of Multivariate Data Using Preattentive Processing," University of British Columbia, Vancouver, Canada.
1985–1990	B.Math in computer science, University of Waterloo, Waterloo, Canada.

HONORS

2007	Senior Member, Association of Computing Machinery (ACM).
2007	Senior Member, Institute of Electrical and Electronics Engineers (IEEE).
2007	Member, Sigma Xi Scientific Research Society.
2003	University Outstanding Teacher Award and membership to the Academy of Outstanding Teachers, North Carolina State University.
2001	National Science Foundation CAREER Early Faculty Development Award.
1996–1998	University of California at Berkeley, National Science and Engineering Research Council of Canada (NSERC) Postdoctoral Fellowship.

SPONSORED RESEARCH GRANTS

1. Healey, C. G. 2012. National Security Agency, "Shared Perceptual Visualizations for System Security" ($83,215).
2. Ning, P. and Healey, C. G. 2012–2015. Army Research Office Multidisciplinary University Research Initiative, "Computer Aided Human Centric Cyber Situation Awareness" ($979,463).
3. Healey, C. G. 2011–2012. Army Research Office Secure Open Systems Initiative, "Visualization for Cyber Situational Awareness" ($59,689).
4. Healey, C. G. 2010–2012. Sandia National Laboratory, "Ensemble and Comparative Visualization of Scientific Datasets" ($131,213).
5. Healey, C. G. 2010–2012. Department of Homeland Security NCB-Prepared Collaboration, "Web-Based Visualization for North Carolina Bio-Preparedness" ($64,080).

6. Healey, C. G. 2008–2012. IBM Fellowship, "Analyzing, Mining, and Visualizing Tivoli Common Reporting Data" ($132,000).

7. Watson, B. A., Healey, C. G., Young, R. M., and FitzGerald, P. 2006–2009. CISE-CCF-0552802, "REU Site: Design Tech—Sparking Research in Interactive Visual Design" ($268,783).

8. Healey, C. G. 2006–2008. Center for Advanced Computing and Communication, "Visualizing Network Traffic and Data" ($80,000).

9. Mitchell, T., Cohen, J., Gumpertz, M., Healey, C. G., Keltie, R., and Scroggs, J. 2004–2006. National Science Foundation CISE-DUE-0422454, "Enhancing Transfer Student Graduation Success in Computer Science, Mathematics and Statistics" ($400,000).

10. Healey, C. G. and St. Amant, R. 2004–2005. Department of Defense Army STTR A04-T002, "Human-Computer Visualization" ($29,998).

11. Healey, C. G. 2003–2004. Microsoft Corporation, "Extending Interface and Display in a Low-Capability Environment" ($25,000).

12. Ning, P., Healey, C. G., and St. Amant, R. 2002–2005. National Science Foundation CISE-ANI-0219315, "ITR: Integrating Intrusion Detection with Intelligent Visualization and Interaction Strategies" ($415,099).

13. Healey, C. G. 2001–2006. National Science Foundation CAREER Award CISE-ACI-0092308, "Assisted Navigation in Large Visualization Spaces" ($370,402).

14. Healey, C. G. 2000–2003. National Science Foundation CISE-ACI-0083421, "A Perceptual Visualization Architecture" ($354,029).

15. Healey, C. G., St. Amant, R., and Young, R. M. 2000–2003. National Science Foundation CISE-IIS-9988507, "On the Effective Generation of Text and Graphics for the Exploration of Complex Datasets" ($569,338).

16. St. Amant, R. and Healey, C. G. 1999–2000. angelsstreet, Inc., "Online Financial Investment Via Interactive Search and Visualization" ($209,750).

17. Healey, C. G. 1998. Hewlett-Packard, Inc., University Grants equipment gift: 25 HP Kayak graphics workstations ($117,145).

JOURNAL ARTICLES

1. Healey, C. G. and Dennis, B. M. (2011). "Interest Driven Navigation in Visualization," *IEEE Transactions on Visualization and Computer Graphics*, to appear.

2. Healey, C. G. and Enns, J. T. (2011). "Attention and Visual Memory in Visualization and Computer Graphics," *IEEE Transactions on Visualization and Computer Graphics*, to appear.

3. Hsiao, J. P.-L. and Healey, C. G. (2011). "Visualizing Combinatorial Auctions," *The Visual Computer 27*, 6–8, 633–643.

4. Healey, C. G., Kocherlakota, S., Rao, V., Mehta, R., and St. Amant, R. (2007). "Visual Perception and Mixed-Initiative Interaction for Assisted Visualization Design," *IEEE Transactions on Visualization and Computer Graphics 14*, 2, 396–411.

5. Hagh-Shenas, H., Kim, S., Interrante, V., and Healey, C. G. (2007). "Weaving Versus Blending: A Quantitative Assessment of the Information Carrying Capacities of Two Alternative Methods for Conveying Multivariate Data with Color," *IEEE Transactions on Visualization and Computer Graphics 13*, 6, 1270–1277.

6. Dennis, B. M., Kocherlakota, S. M., Sawant, A. P., Tateosian, L. G., and Healey, C. G. (2005). "Designing a Visualization Framework for Multidimensional Data," *IEEE Computer Graphics & Applications (Visualization Viewpoints) 25*, 6, 10–15.

7. Healey, C. G., Enns, J. T., Tateosian, L. G., and Remple, M. (2004). "Perceptually-Based Brush Strokes for Nonphotorealistic Visualization," *ACM Transactions on Graphics 23*, 1, 64–96.

8. Liu, G., Healey, C. G., and Enns, J. T. (2003). "Target Detection and Localization in Visual Search: A Dual Systems Perspective," *Perception & Psychophysics 65*, 5, 678–694.

9. Kosara, R., Healey, C. G., Interrante, V., Laidlaw, D. H., and Ware, C. (2003). "Thoughts on User Studies: Why, How, and When," *IEEE Computer Graphics & Applications (Visualization Viewpoints) 23*, 4, 20–25.

10. Healey, C. G. and Enns, J. T. (2002). "Perception and Painting: A Search for Effective, Engaging Visualizations," *IEEE Computer Graphics & Applications (Visualization Viewpoints) 22,* 2, 10–15.

11. Healey, C. G. and Wurman, P. R. (2001). "Visualizing Market Data," *IEEE Internet Computing 5*, 2, 88.

12. Healey, C. G. (2000). "Building a Perceptual Visualisation Architecture," *Journal of Behaviour & Information Technology 19*, 5, 349–366.

13. Healey, C. G. and Enns, J. T. (1999). "Large Datasets at a Glance: Combining Textures and Colors in Scientific Visualization," *IEEE Transaction on Visualization and Computer Graphics 5*, 2, 145–167.

14. Healey, C. G., Booth, K. S., and Enns, J. T. (1996). "High-Speed Visual Estimation Using Preattentive Processing," *ACM Transactions on Computer-Human Interaction 3*, 2, 107–135.

15. Healey, C. G., Booth, K. S., and Enns, J. T. (1995). "Real-Time Multivariate Data Visualization Using Preattentive Processing," *ACM Transactions on Modeling and Computer Simulation 5*, 3, 190–221.

16. Thompson, K. A., Ingraham, W. J., Healey, M. C., LeBlond, P. H., Groot, C., and Healey, C. G. (1994). "Computer Simulations of the Influence of Ocean Currents on Fraser River Sockeye Salmon (*Oncorhynchus nerka*) Return Times," *Canadian Journal of Fisheries and Aquatic Sciences 51*, 2, 441–449.

17. Thompson, K. A., Ingraham, W. J., Healey, M. C., LeBlond, P. H., Groot, C., and Healey, C. G. (1992). "The Influence of Ocean Currents on the Latitude of Landfall and Migration Speed of Sockeye Salmon Returning to the Fraser River," *Fisheries Oceanography 2*, 1, 163–179.

CONFERENCE PAPERS

18. Phadke, M. N., Pinto, L., Alabi, O. S., Harter, J., Taylor II, R. M., Wu, X., Petersen, H., Bass, S. A., and Healey, C. G. "Exploring Ensemble Visualization," *Visualization and Data Analysis (VDA 2012)*, San Francisco, California, vol. 8294, paper 0B, 1–12.

19. Alabi, O. S., Wu, X., Harter, J. M., Phadke, M. N., Pinto, L., Petersen, H., Bass, S. A., Keifer, M., Zhong, S., Healey, C. G., and Taylor II, R. M. "Comparative Visualization of Ensembles Using Ensemble Surface Slicing," *Visualization and Data Analysis (VDA 2012)*, San Francisco, California, vol. 8294, paper 0U, 1–12.

20. Kocherlakota, S. M. and Healey, C. G. (2009). "Interactive Visual Summarization of Multidimensional Data," *Proceedings IEEE International Conference on System, Man, and Cybernetics (SMC 2009)*, San Antonio, Texas, 362–369.

21. Sawant, A. P. and Healey, C. G. (2008). "Visualizing Multidimensional Query Results Using Animation," *Visualization and Data Analysis (VDA 2008)*, San Jose, California, vol. 6809, paper 04, 1–12.

22. Sawant, A. P., Raina, R., and Healey, C. G. (2007). "ChipViz: Visualizing Memory Chip Test Data," *Third International Symposium on Visual Computing (ISVC 2007)*, Lake Tahoe, Nevada, 711–720.

23. Tateosian, L. G., Healey, C. G., and Enns, J. T. (2007). "Engaging Viewers Through Nonphotorealistic Visualizations," *Proceedings Fifth International Symposium on Non-Photorealistic Animation and Rendering (NPAR 2007)*, San Diego, California, 93–102.

24. Sawant, A. P., Vanninen, M., and Healey, C. G. "*PerfViz:* A Visualization Tool for Analyzing, Exploring, and Comparing Storage Controller Performance Data," *Proceedings Visualization and Data Analysis (VDA 2007)*, San Jose, California, vol. 6495, paper 07, 1–11.

25. Tateosian, L. G., Dennis, B. M., and Healey, C. G. (2006). "Stevens Dot Patterns for 2D Flow Visualization," *Proceedings ACM Symposium on Applied Perception in Graphics and Visualization (APGV 2006)*, Boston, Massachusetts, 93–100.

26. Qi, W., Taylor II, R. M., Healey, C. G., and Martens, J-B. (2006). "A Comparison of Immersive HMD, Fish Tank VR and Fish Tank with Haptics Displays for Volume Visualization," *Proceedings ACM Symposium on Applied Perception in Graphics and Visualization (APGV 2006)*, Boston, Massachusetts, 51–58.

27. Healey, C. G. and Snoeyink, J. (2006). "VisTRE: A Visualization Tool to Evaluate Errors in Terrain Representation,"

Proceedings Symposium on 3D Data Processing, Visualization, and Transmission (3DPVT 06), Chapel Hill, North Carolina.

28. Huber, D. E. and Healey, C. G. (2005). "Visualizing Data with Motion," *Proceedings IEEE Visualization 2005*, Minneapolis, Minnesota, 527–534.
29. Zaientz, J. D., Holt, L. S., Wood, S. D., Healey, C. G., and St. Amant, R. (2005). "Enhancing Decision-Making by Explicitly Training Battlefield Visualization Skills," *Proceedings Interservice/Industry Training, Simulation & Education Conference (IITSEC 2005)*, Orlando, Florida.
30. Ning, P., Dingbang, X., Healey, C. G., and St. Amant, R. (2004). "Building Attack Scenarios Through Integrating Complementary Alert Correlation Methods," *Proceedings 10th Annual Network and Distributed Security Systems Symposium (NDSS 2004)*, San Diego, California, 97–111.
31. Dennis, B. M. and Healey, C. G. (2002). "Assisted Navigation of Large Information Spaces," *Proceedings IEEE Visualization 2002*, Boston, Massachusetts, 419–426.
32. Walter, J. D. and Healey, C. G. (2001). "Attribute Preserving Dataset Simplification," *Proceedings IEEE Visualization 2001*, San Diego, California, 113–120.
33. Healey, C. G. (2001). "Formalizing Artistic Techniques and Scientific Visualization for Painted Renditions of Complex Information Spaces," *Proceedings International Joint Conference on Artificial Intelligence (IJCAI 2001)*, Seattle, Washington, 371–376.
34. St. Amant, R. and Healey, C. G. (2001). "Usability Guidelines for Interactive Search in Direct Manipulation Systems," *Proceedings International Joint Conference on Artificial Intelligence (IJCAI 2001)*, Seattle, Washington, 1179–1184.
35. Healey, C. G., St. Amant, R., and Chang, J. (2001). "Assisted Visualization of E-Commerce Auction Agents," *Proceedings Graphics Interface 2001*, Ottawa, Canada, 201–208.
36. St. Amant, R., Healey C. G., Riedl, M., Kocherlakota, S., Pegram, D. A., and Torhola, M. (2001). "Intelligent Visualization in a Planning Simulation," *Proceedings Intelligent User Interfaces 2001*, Santa Fe, New Mexico, 153–160.
37. Weigle, C., Emigh, W. G., Liu, G., Taylor II, R. M., Enns, J. T., and Healey, C. G. (2000). "Oriented Texture Slivers: A Technique for Local Value Estimation of Multiple Scalar Fields," *Proceedings Graphics Interface 2000*, Montréal, Canada, 163–170.
38. Healey, C. G. and St. Amant, R. (1999). "ViA: A Perceptual Visualization Assistant," *Proceedings 28th Workshop on Advanced Imagery Pattern Recognition (AIPR-99): 3D Visualization for Data Exploration and Decision Making*, Washington, DC, 2–11.
39. Healey, C. G. and Enns, J. T. (1998). "Building Perceptual Textures to Visualize Multidimensional Datasets," *Proceedings IEEE Visualization '98*, Research Triangle Park, North Carolina, 111–118.
40. Healey, C. G. (1998). "On the Use of Perceptual Cues and Data Mining for Effective Visualization of Scientific Datasets," *Proceedings Graphics Interface '98*, Vancouver, Canada, 177–184.
41. Tam, R. Healey, C. G., Flak, B., and Cahoon, P. (1997). "Volume Visualization of Aortic Aneurysms," *Proceedings IEEE Visualization '97*, Phoenix, Arizona, 43–50.
42. Healey, C. G. (1996). "Choosing Effective Colours for Data Visualization," *Proceedings IEEE Visualization '96*, San Francisco, California, 263–270.
43. Healey, C. G., Booth, K. S., and Enns, J. T. (1993). "Harnessing Preattentive Processes for Multivariate Data Visualization," *Proceedings Graphics Interface '93*, Toronto, Canada, 107–117.

BOOK CHAPTERS

44. Qi, W., Taylor, R. M., Healey, C. G., and Martens, J.-B. "3D Interaction With Scientific Data Through Virtual Reality and Tangible Interfacing," in *User Centered Design for Medical Visualization*, F. Dong, G. Ghinea and S. Y. Chen, Eds. Hershey, Pennsylvania: IGI Global Press, 2008, pp. 136–173.

WORKSHOPS, COURSES, PANELS, AND POSTERS

45. Ramaswamy, S. S. and Healey, C. G. (2011). "Visualization of the Sentiment of Tweets," *SAS Analytics 2011 Conference*, Orlando, Florida, 2011 (Best Student Poster winner).

46. McNamara, A., Mania, K., Banks, M., and Healey, C. G. (2010). "Perceptually Motivated Visualization," *SIGGRAPH 2010 Course: Perceptually-Motivated Graphics, Visualization, and 3D Displays*, Los Angeles, California, 37–45.

47. Sawant, A. and Healey, C. G. (2006). "Visualizing Abstract Data Using Animation," *IEEE Visualization 2006 Poster Session*, Baltimore, Maryland, 2006.

48. Hagh-Shenas, H., Interrante, V., Healey, C. G., and Kim, S. (2006). "Weaving Versus Blending: A Quantitative Assessment of the Information Carrying Capacity of Two Alternative Methods for Conveying Multivariate Data with Color," *Proceedings ACM Symposium on Applied Perception in Graphics and Visualization (APGV 06)* and *SIGGRAPH 2006 Poster Session*, Boston, Massachusetts, 164.

49. St. Amant, R., Blair, J. E., Barry, P., Bentor, Y., and Healey, C. G. (2002). "A Visual Interface to a Music Database," *Proceedings 6th International Working Conference on Advanced Visual Interfaces (AVI 2002)*, Trento, Italy, 85–88.

50. Rhyne, T-M., Duke, D., Healey, C. G., Interrante, V., and Laidlaw, D. (2001). "Realism, Expressionism, and Abstractionism: Applying Art Techniques to Visualization," *IEEE Visualization 2001 Panel Session*, San Diego, California, 523–526.

51. Liu, G., Enns, J. T., Healey, C. G., and Spetch, M. L. (2001). "An Advantage of Direct Action in Localization," *Psychonomic Society 42nd Annual Meeting, Poster 447*, Orlando, Florida.

52. Healey, C. G., Interrante, V., Kremers, D., Laidlaw, D., and Rheingans, P. (2001). "Combining Perception and Impressionist Techniques for Nonphotorealistic Rendering of Multidimensional Data," *SIGGRAPH 2001 Course 32: Nonphotorealistic Rendering in Scientific Visualization*, Los Angeles, California, 20–52.

53. Liu, G., Enns, J. T., and Healey, C. G. (2000). "Sensitivity to 3D Orientation in Textured Surfaces," *Psychonomic Society 41st Annual Meeting, Poster 599*, New Orleans, Louisiana.

54. Healey, C. G., Interrante, V., and Rheingans, P. (1999). "Perceptual Techniques for Scientific Visualization," *SIGGRAPH 99 Course 6: Issues of Visual Perception for Effective Image Generation*, Los Angeles, California, 1–42.

55. Interrante, V., Ferwerda, J., Gossweiler, R., Healey, C. G., and Rheingans, P. (1998). "Low-Level Human Vision and its Impact on Information Display," *SIGGRAPH 98 Course 32: Applications of Visual Perception in Computer Graphics*, Orlando, Florida, 205–241.

OTHER PUBLICATIONS

56. Dennis, B. M. and Healey, C. G. (2005). "A Survey of Preference Elicitation," *Technical Report TR-2005-41*, Department of Computer Science, North Carolina State University.

57. Kocherlakota, S. M. and Healey, C. G. (2005). "Summarization Techniques for Visualization of Large, Multidimensional Datasets," *Technical Report TR-2005-35*, Department of Computer Science, North Carolina State University.

58. Sawant, A. P. and Healey, C. G. (2005). "A Survey of Display Device Properties and Visual Acuity for Visualization," *Technical Report TR-2005-32*, Department of Computer Science, North Carolina State University.

59. Tateosian, L. G. and Healey, C. G. (2004). "NPR: Art Enhancing Computer Graphics," *Technical Report TR-2004-17*, Department of Computer Science, North Carolina State University.

60. St. Amant, R., Blair, J. E., Healey, C. G., Park, S, Barry, P., and Rogers, D. (2001). "Visualization and Selection in a Music Database: A Case Study," *Technical Report TR-2001-04*, Department of Computer Science, North Carolina State University.

61. Healey, C. G. (1996). "Effective Visualization of Large, Multidimensional Datasets," Ph.D. Thesis, Department of Computer Science, University of British Columbia.

62. Healey, C. G. and Enns, J. T. (1996). "A Perceptual Colour Segmentation Algorithm," *Technical Report TR-96-09*, Department of Computer Science, University of British Columbia.

63. Healey, C. G. (1992). "Visualization of Multivariate Data Using Preattentive Processing," M.Sc. Thesis, Department of Computer Science, University of British Columbia.

SELECTED INVITED PRESENTATIONS

2011	Department of Physics, Michigan State University (East Lansing, Michigan).
2010	Scalable Analysis and Visualization Department, Sandia National Laboratory (Albuquerque, New Mexico).
2008	Computational Sciences and Engineering Division, Oak Ridge National Laboratory (Oak Ridge, Tennessee). Center for Critical Inquiry, University of North Carolina at Greensboro (Greensboro, North Carolina).
2007	Renaissance Computing Institute (RENCI) (Chapel Hill, North Carolina).
2006	Département d'Informatique et de Recherche Opérationnelle, Université de Montréal (Montréal, Canada). Business Intelligence Group, Cisco Systems (Raleigh, North Carolina).
2005	Department of Computer Science and Engineering, University of Minnesota (Minneapolis, Minnesota). Department of Computer Science, University of North Carolina at Chapel Hill (Chapel Hill, North Carolina).
2002	Department of Computer Science, Virginia Polytechnic Institute and State University (Blacksburg, Virginia). Business Intelligence Usability Research Group, SAS Institute (Cary, North Carolina).
2000	Department of Psychology, University of Arizona (Tucson, Arizona).
1998	NASA Ames Research Laboratory (Mountain View, California). Center for Cognitive Science, Rutgers University (New Brunswick, New Jersey). Department of Computer Science, Columbia University (New York, New York). EECS Department, University of California at Berkeley, (Berkeley, California).
1997	Department of Computer Science, University of Alberta (Edmonton, Canada). Department of Computer Science, Simon Fraser University (Vancouver, Canada). Department of Computer Science, Queen's University (Kingston, Canada).
1996	Department of Computer Science, University of Washington (Seattle, Washington). Department of Computer Science, York University (Toronto, Canada). Department of Computer Science, University of Ottawa (Ottawa, Canada).

STUDENT SUPERVISION

CURRENT

2012–	Terry Rogers, PhD
2011–	Lihua Hao, PhD
2011–	Hilay Khatri, MS
2011–	Venkata Manda, MS
2011–	Hsuan-Ya Yu, PhD

PHD

2006–2010	Ping-Lin Hsiao, "Visualizing Large Document Collections" (Research scientist, Department of Computer Science and Department of Physics & Astronomy, UNC Chapel Hill).
2002–2007	Amit Sawant, "Perceptual Display Hierarchies for Visualization" (Network Appliance).
2002–2006	Brent Dennis, "Integrating Preference Elicitation into Visualization" (MIT Lincoln Laboratory).
2002–2006	Laura Tateosian, "Investigating Aesthetic Visualizations" (Research assistant professor, Geographic Information Systems program, North Carolina State University).
2002–2006	Sarat Kocherlakota, "Interactive Visual Summarization for Visualizing Large Multidimensional Datasets" (PlotWatt).

MS

2009–2011	Lifford Pinto, "Visualizing Ensembles Using Screen Door Tinting."

2009–2011 Geoffrey Rogers, "Combining Glyph Based and Topographical Techniques to Visualize United States Congressional Earmarks."

2009–2011 Siddarth Ramaswamy, "Visualization of the Sentiment of Tweets" (Railinc Corporation).

2009–2011 Madhura Phadke, "Combining Ensembles for Effective Data Visualization" (Microsoft Corporation).

2009–2011 Sriprabha Gopalan, "Visualizing Performance and Usage Patterns for Large Distributed Environments" (Deutsche Bank).

2009–2010 Jayashree Venkatesh, "Pairwise Document Similarity Using an Incremental Approach to TF-IDF" (Intel Corporation).

2009–2010 Nazli Dokuzoglu, graduated with MS without thesis. (Intel Corporation).

2008–2009 Karthik Ramachandran, "Visualizing and Comparing Multivariate Scalar Data Over a Geographic Map" (Sabre Design & Analysis).

2006–2007 Andrew Whitehorne, "Telescope: A Multidimensional Visualization Framework in Support of the Development of a Perceptual Display Hierarchy" (Werum Software and Systems).

2004–2006 Ping-Lin Hsiao, "Visualization for Combinatorial Auctions" (also graduated with PhD 2010).

2003–2005 Jyron Baxter, graduated with MCS (Department Chair, Information Technology Department, York Technical College).

2002–2004 Reshma Mehta, "Visualization Search Strategies" (Microsoft Corporation).

2002–2004 Dan Huber, "Simple Motion in Glyph-Based Visualization" (Northrop Grumman).

2001–2003 Amit Sawant, "Dynamic Visualization of the Relationship Between Multiple Representations of an Abstract Information Space" (also graduated with PhD 2007).

2001–2003 Vivek Rao, "Mixed-Initiative Techniques for Assisted Visualization" (Google).

2000–2003 Mike Romeo, "Multi-Dimensional Dataset Visualization for Portable Computing Environments."

2000–2002 Brent Dennis, "Assisted Navigation of Large Information Spaces" (also graduated with PhD 2006).

2000–2002 Laura Tateosian, "Nonphotorealistic Visualization of Multidimensional Datasets" (also graduated with PhD 2006).

1999–2002 Sarat Kocherlakota, "Perception Driven Search Strategies for Effective Multidimensional Visualization" (also graduated with PhD 2006).

1999–2001 Jiae Chang, "A Perceptual Visualization Assistant for Multidimensional Data Visualization."

1999–2001 Jason Walter, "Appearance Preserving Dataset Simplification" (Alias/Wavefront).

TEACHING EXPERIENCE

- CSC 210, Data Structures in C++
- CSC 216, Data Structures in Java
- CSC 246, Operating Systems
- CSC 431, File Structures
- CSC 461, Computer Graphics
- CSC 462, Game Engine Design
- CSC 463, Visual Interfaces for Mobile Apps
- CSC 541, Graduate File Structures
- CSC 550, Advanced Topics in Computer Graphics
- CSC 561, Graduate Computer Graphics
- CSC 562, Graduate Game Engine Design
- CSC 563, Graduate Visual Interfaces for Mobile Apps
- CSC 591, Data and Visual Analytics
- CSC 600, Introduction to Graduate Research
- CSC 761, Readings in Computer Graphics

PROFESSIONAL SERVICE

- Conference co-chair, Visualization and Data Analysis 2013 (San Francisco, California).
- Program co-chair, Graphics Interface 2007 (Montréal, Canada).
- Associate editor, ACM Transactions on Applied Perception.
- Program committee, IEEE Information Visualization (2006, Baltimore, Maryland; 2007, Sacramento, California; 2008, Columbus, Ohio; 2011, Providence, Rhode Island; 2012, Seattle, Washington).
- Program committee, ACM Symposium on Applied Perception in Graphics and Visualization (2004, Los Angeles, California; 2005, A Coruña, Spain; 2006, Boston, Massachusetts; 2007, Tübingen, Germany; 2008, Los Angeles, CA; 2009, Crete, Greece; 2010, Los Angeles, California).
- Program committee, SIBGRAPI: Brazilian Symposium on Computer Graphics and Image Processing (2000, Gramado, Brazil; 2008, Campo Grande, Brazil; 2009, Rio de Janeiro, Brazil; 2011, Marceió, Brazil).
- Program committee, EuroVis (2008, Eindhoven, Netherlands; 2009, Berlin, Germany; 2010, Bordeaux, France).
- Program committee, IEEE Visualization (2004, Austin, Texas; 2005, Minneapolis, Minnesota; 2006, Baltimore, Maryland; 2009, Atlantic City, New Jersey; 2010, Salt Lake City, Utah).
- Program committee, Graphics Interface (2000, Montréal, Canada; 2002, Calgary, Canada; 2006, Quebec City, Canada; 2009, Kelowna, Canada).
- Conference committee, IEEE Visualization (2000, Salt Lake City, Utah; 2001, San Diego, California; 2012, Seattle, Washington).
- Member, National Science Foundation proposal review panel (2000; 2001 $\times 2$; 2002; 2003; 2007 $\times 2$; 2008; 2011).
- Member, Department of Energy proposal review panel (2010).
- Reviewer, National Science Foundation, National Research Council.
- Reviewer, ACM TOG, ACM TAP, ACM TOIS, IEEE TVCG, IEEE CG&A, Information Visualization Journal, Data & Knowledge Engineering, Psychological Science, Perception
- Reviewer, ACM APGV; Eurographics; EuroVis; Graphics Interface; IEEE Visualization; IEEE InfoVis Symposium; ACM SIGCHI; ACM SIGGRAPH; PacificVis; SIBGRAPI; UIST; VDA; VR
- Member, Sigma Xi Scientific Research Society
- Senior Member, Association of Computing Machinery (ACM)
- Senior Member, Institute of Electrical and Electronics Engineers (IEEE)

DEPARTMENT SERVICE

- Chair, Department graduate admissions committee
- Member, Department Head review committee
- Chair, Department strategic planning committee
- Chair, Computer Graphics faculty search committee
- Chair, Operating Systems faculty search committee
- Member, Department Head search committee
- Chair, graduate student recruiting program
- Co-chair, Accelerated Undergraduate Research in Computer Science program.
- Chair, Computer Science undergraduate scholarship committee
- Course curriculum additions: CSC 462, Game Engine Design; CSC 463, Visual Interfaces for Mobile Apps; CSC 550, Advanced Topics in Computer Graphics; CSC 561, Graduate Computer Graphics; CSC 562, Graduate Game Engine Design; CSC 563, Graduate Visual Interfaces for Mobile Apps; CSC 591, Data and Visual Analytics; CSC 600, Introduction to Graduate Research in Computer Science; CSC 761, Readings in Computer Graphics

REFERENCES

- Dr. Jon Doyle, SAS Institute Professor of Computer Science
  Department of Computer Science, North Carolina State University

2298 EB-II, 890 Oval Drive #8206, Raleigh, NC, 27695-8206

doyle@csc.ncsu.edu
919-515-7896

– Dr. Kellogg S. Booth, Professor
Department of Computer Science, University of British Columbia
2366 Main Mall, Vancouver, British Columbia
Canada, V6T 1Z4

ksbooth@cs.ubc.ca
604.822.8193

– Dr. Pierre Poulin, Professor
DIRO, Université de Montréal
C.P. 6128, Succ. Centre-Ville, Montréal, Quebec
Canada, H3C 3J7

poulin@iro.umontreal.ca
514.343.6780

– Dr. Victoria Interrante, Associate Professor
CSE Department, University of Minnesota
6-185 EE/CS Building, Minneapolis, MN, 55455

interran@cs.umn.edu
612.625.3543

– Dr. James T. Enns, Professor
Department of Psychology, University of British Columbia
2136 West Mall, Vancouver, British Columbia
Canada, V6T 1Z4

jenns@psych.ubc.ca
604.822.6634

STATEMENT OF RESEARCH

My primary research area is computer graphics, specifically the development of methods for visualizing large, multidimensional datasets in ways that allow viewers to rapidly and accurately *explore, analyze, validate,* and *discover*. The need to address the *size* and *dimensionality* of these types of datasets is an important area of current research in computer graphics. My investigations focus on issues at the forefront of scientific visualization. In particular, the application of perception and artificial intelligence to improve the effectiveness of visualization techniques was explicitly cited by the recent DOE/NSF panel discussing focus areas for funding. My past and current work on human vision, assisted visualization, and intelligent data management targets exactly these areas.

My research is built on a fundamental investigation of how our visual system perceives the world around us. Understanding what we see and how we see it is critical to any attempt to harness, enhance, predict, or simulate human vision. Datasets are collections of strings and numbers, usually representing measurements or results. Visualization converts this information into a picture that a viewer can use to "see" values, relationships, and structure inherent in the dataset. Common examples of large, multidimensional datasets include CT and MRI volumes from medical scanners, complex airflow patterns around aircraft bodies, satellite reconnaissance data, and information generated by real-time control systems. The overwhelming amount of information stored in these datasets makes them difficult to analyze using traditional mathematical or statistical algorithms. Moreover, the possibility of real-time data generation (*e.g.,* in environments like air-traffic control, military command and control, or interactive simulation systems) introduces the need for rapid and accurate visualization techniques. Active research projects include:

- *Perceptual Visualization:* A critical visualization goal is presentation of data in a way that is informative and meaningful, one the one hand, yet intuitive and accessible on the other. This project investigates how the low-level human visual system directs attention during image acquisition and analysis, in an effort to design visualization tools that allow *rapid*, *accurate*, and *effortless* visual exploration. *(Funded 2000–2003: National Science Foundation 0083421, ACIR/ACR + IIS/HCI)*
- *Visualization Assistant:* This project studies the use of perceptual guidelines from psychophysical experiments to support ViA, an automated "visualization assistant." Perceptual rules are integrated into evaluation engines that critique a visualization, and offer hints on how it might be improved. ViA begins by asking viewers a set of simple, application-independent queries about their dataset and the analysis tasks they want to perform. This information is used in combination with the evaluation engines and mixed-initiative search algorithms from artificial intelligence to identify and pursue promising results. ViA returns a collection of visualizations identified as most appropriate for the dataset and task at hand. *(Funded 2000–2003: National Science Foundation 9988507, IIS/IDM)*
- *Nonphotorealistic Visualization:* In a manner similar to nonphotorealistic rendering in computer graphics, this project investigates the use of artistic techniques for visualizing large, complex, multidimensional datasets. Many painterly styles have a close correspondence to perceptual features that are detected by the low-level human visual system. Results from research on the use of perception in visualization offer valuable insights on how to harness, measure, control, and apply painterly techniques to represent a high-density information space. The result is an image that looks like a painting; brush stroke properties in the painting are varied to capture changes in values stored in an underlying dataset. *(Funded 2000–2003: National Science Foundation 0083421, ACIR/ACR + IIS/HCI)*
- *Assisted Navigation:* The size of a typical multidimensional dataset will often overwhelm our ability to visualize it in a single display. This project studies methods to assist with the navigation of large, complex information spaces. A detailed local display is combined with a high-level global overview of the locations of areas of interest within the dataset. The local display uses perceptual cues to harness the abilities of the low-level human visual system. The global overview is built in two separate stages. First, elements of interest (EOIs) are identified using a combination of: (1) explicit rules provided by the viewer, and (2) implicit rules built by watching what viewers select, where they move, and what they examine. Next, the EOIs are clustered into one or more areas of interest. Graph construction techniques are used to link the EOIs together. The resulting graph: (1) supports efficient navigation via the application of graph traversal and camera planning algorithms, and (2) provides an effective global overview to visualize areas of interest and their relationships to one another. *(Funded 2001–2006: National Science Foundation CAREER Award 0092308: ACIR/ACR)*
- *Real-Time Visualization of Network Intrusions:* This project focuses on a hybrid solution for mixed-initiative intrusion detection. We hope to overcome current limitations of intrusion detection systems (IDSs), which are often unable to fully detect unknown attacks without generating a large number of false alarms. We will accomplish this by combining new

intrusion correlation algorithms with scientific visualization and human-computer interaction techniques. The intrusion correlation algorithms will monitor the alerts generated by the IDS and identify possibly missed attacks. A visualization engine will convert the alerts and the underlying events into on-screen displays that show "at a glance" what is happening within the system. An intelligent interaction manager will assist users in organizing the displays to highlight evidence of potential attack scenarios. *(Funded 2002–2005: National Science Foundation ITR Award 0219315: ANIR/ANI)*

– *Data Management in Visualization:* An important problem in data visualization is management of an underlying dataset. Rapid display and analysis techniques may never fully address the problem of datasets that are simply too large to visualize in their entirety. This project investigates two methods of compressing and focusing a dataset using: (1) feature-preserving mesh simplification, and (2) knowledge discovery (or data mining, as it is sometimes called). Modified feature-preserving mesh simplification algorithms are used to compress a high-dimensional dataset based on attribute variation. Enhanced knowledge discovery algorithms are used to reduce the dataset's size and dimensionality, to identify errors, and to estimate missing values.

– *Extending Interface and Display:* A new class of limited-capability compute devices (*e.g.,* PDAs, video game consoles, and cell phones) are becoming commonplace in our day-to-day lives. This poses an interesting question: "Can a device like a Palm Pilot, a cell phone, or a Color Gameboy be used for tasks outside its original problem domain?" If so, this would allow us to offer sophisticated computational tools to a much broader audience of users. In order to answer this question, we are studying innovative methods to extend the limited input, display, and graphical processing capabilities typically found on these devices. The resulting techniques will then be analyzed in the context of a new application environment: the visualization and exploration of large, complex, multidimensional datasets.

STATEMENT OF TEACHING

One of my primary motivations for pursuing a position at an academic institution was the chance to teach. I enjoy the challenge of trying to impart my knowledge in a manner that is both effective and enjoyable for the undergraduate and graduate students I instruct. My personal belief is that students will best understand and retain material if a clear path is defined from the basic fundamentals to more complex, abstract concepts. This allows students to start by solidifying knowledge with which they are most comfortable. They use this knowledge to attack new problems as they arise. Rarely will I say "I can't explain this fully now, because you don't have the background you need yet," rather, I am careful to schedule material in a manner that flows smoothly. In cases where multiple topics depend on one another, I present each in its entirety; I have found it is better to explain everything, including information that might not be immediately obvious, rather than breaking the discussion into disconnected vignettes that jump back and forth.

I do not expect students to completely master the fundamentals in a single session. Rather, I make a concerted effort to refer back to this material during the course, since this will: (1) reinforce important ideas and refresh a student's memory; (2) demonstrate a practical application of an idea through its relationship to more advanced problems, and (3) hopefully convince the students that there is value in fully understanding certain ideas, or at least in having the ability to recall and reexamine the ideas if necessary.

This general framework has extended well to many types of courses (*e.g.,* undergraduate and graduate level material). The difference lies only in what constitutes the fundamentals, which itself depends on prerequisite courses, and on the instructional goals the course is designed to meet. Student evaluations and personal contact suggest that this style of teaching works well for most of the students I have instructed. I use student feedback to continually refine my techniques and experiment with promising new ideas that might improve the effectiveness of my lectures.

My teaching has been recognized as outstanding, both at different institutions, and at different levels of instruction. I received eight Department Teaching Awards for outstanding evaluations while I was a graduate teaching assistant at the University of British Columbia. I received a Department Outstanding New Teacher Award following my first year of instructing at North Carolina State University. In 2003 I received the University Outstanding Teacher Award and membership to the North Carolina State University Academy of Outstanding Teachers, one of the highest teaching honors awarded by the university. This feedback encourages me to continue to refine my basic methodology in ways that will further improve the level of instruction I can provide to my students.