

Georges Grinstein
Professor - Computer Science Department
Director - Institute for Visualization and Perception Research
Director – Center for Biomolecular and Medical Informatics
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Research interests: visualization (data, information and knowledge), visual analytics, virtual environments, user interfaces, computer human interaction, evaluation of visual analytics systems and tools. The emphasis is on the modeling, analysis, visualization and exploration of complex information systems including many in the biomedical area.

Educational interests: distributed education, bridging high school and university scholars, building conduits between industry and universities, and furthering interdisciplinary undergraduate and graduate studies in bioinformatics and visual analytics.

As an aside, I was inducted into the City College of New York Athletic Hall of Fame in 2009.

Education

Ph.D.	Analytic Number Theory	University of Rochester
M.S.	Applied Mathematics	New York University
B.S.	Mathematics	City College of New York

University Positions

University of Massachusetts Lowell, Director Bioinformatics Program, since 2001
University of Massachusetts Lowell, Co-Director Center for Biomolecular and Medical Informatics, since 2001
University of Massachusetts Lowell, Co-Director Institute for Visualization and Perception Research, since 1991
University of Massachusetts Lowell, Professor Computer Science, since 1988
University of Massachusetts Lowell, Associate Professor Computer Science, 1985-1988
Fitchburg State College, Assistant Professor Computer Science, 1981-1985
Auburn University at Montgomery, Assistant Professor Mathematics, 1977-1981
Temple University, Lawton Fellow in Number Theory, 1976-1977
Cambridge University, UK, Mathematics, 1974

External Position

Co-Founder and Co-Director of the Open Indicators Consortium (OIC)

Professional Activities (1985-2009)

Standards - MIT X Consortium, OSF, US International Standards Organization, Chair ANSI X3H3.6, HL7

Societies - Vice Chair International Federation for Information Processing WG5.10, IEEE Computer Society, ACM SIGGRAPH, SIGKDD and SIGCHI, Eurographics, Society for Information Display, AAAI, AMIA, DIA.

Journals and Book Series – Past member of the Editorial Advisory Board of Computer Graphics Forum, of Computers and Graphics Journal, of the Editorial Advisory Board of the Journal of Data Mining and Knowledge Discovery. Co-editor of IFIP Series on Computer Graphics. Organizing committee for a number of Journal special issues (for example, most recent Special Issue of IEEE Computer Graphics and Applications on Visual Analytics Evaluation 2008).

Co- Chair Conferences and Workshops – IEEE Visualization Conferences (1990-2011) co-chair, program co-chair, panels co-chair, contest/challenge co-chair, workshop organizer; co-chair SPIE'95, 96 and 97 Visual Data Exploration and Analysis Conference; co-chair IFIP Conference on Psychological & Cognitive Issues in Data Visualization; co-chair IEEE 1993 and 1995 Workshops on Database Issues in Visualization; co-chair AAAI and IEEE 1997 Workshops on Integration of Data Mining and Visualization; program committee 1996-98, and 2002 International Conferences on Knowledge Discovery and Data Mining (KDD'96, 97, 98, and 2002), ACM Workshop on Visual Data Mining (2001), Co-chair Workshop in Visualization in Bioinformatics and Cheminformatics (2002). Workshops: ACM SIGGRAPH Workshops on Visualization Education, University of Washington/Microsoft Research First Summer Institute on Data Mining (1997), NATO Experts Workshop Visualization of Massive Military Data Sets (1996, 2003), National Breast Center Conference (2006, 2007). Co-chair VAST 2006-2011 Contests and Challenges, Program committee BELIV 2006-2010, CMV 2006-2008, IV 2007- 2011; Co-chair 2007-2011 Information Visualization in Biomedical Informatics Symposium; Co-chair 2008-2010 Visual Data Mining and Analytics Symposia; Co-chair BIBE07 Bioinformatics Conference; presenter and panelist at numerous other conferences.

Reviewer - ESPRIT, NASA, NSF, NATO, and various IEEE and ACM journals and conferences.

Tutorials – Visualization and Data Mining Tutorials and Workshops given over the last 25 years at most major conferences, including BioIT 2002-09, Drug Discovery Technology 2002-2005, IEEE Visualization 1990-2009, ACM KDD 2002, IV08, IBC

Bioinformatics 2002 Summit, as well as commercial organizations such as CHI (2002-2007), IBC (2002-2004), NCBC (2006-2007) and DIA 2003.

Consortia - Past Member National Visual Analytics Consortium (NVAC)

Consulting Activities 1992 - 2011

Global MedChoices: Advisory Board (since 2009)

State of Louisiana: Development of Northern Louisiana Bioinformatics Research Consortium (2004-2006)

SensAble Technologies, Inc.: Phantom Haptic Device Research (2003-2009)

AnVil, Inc. Founder and Director of Research (2000-2003)

Transform Pharmaceuticals, Inc. Scientific Advisory Board (2000-2002)

SynaPix, Inc. Vision System Architect (2000)

3D Open Motion, LLC. Founder and Director of Research, 3D Motion Specification API (1998-1999)

Spacetec IMC. 3D Motion Control API (1993-1998)

Accrue Software, Inc.: Member of the Technical Advisory Board (1996-1997)

Cognos Inc.: Visualization and Data Mining (1996-1997)

Vermont Microsystems Inc.: Expert Witness in VMI vs. AutoDesk lawsuit.

The MITRE Corporation - Virtual Reality Application Research and Information Architecture Research

Consulting Activities 1990 - 1992

Intel Corporation - i860 Software Development Management

Kendall Square Research Corporation - Integration of Supercomputing, Animation and Graphics Software

IBM Corporation - Tools Development

Consulting Activities Prior 1990

China Science and Technology Commission - Evaluate PRC Graphics and Imaging Research Labs.

Lexidata Corporation- Engineering R&D in Diagnostics and Development.

Montachusetts Opportunity Council - Computerization of State and Federal Agencies.

Alabama Reference Laboratories - Interactive Real-Time Laboratory Blood Analysis Software

United States Geological Survey - Software development for Water Resources Division.

Commercial Course Development

Courses in Visual Analytics, Visualization, User Interfaces, X/Motif/Windows Software Development, UML, Computer Graphics, Computer Languages, Virtual Reality, Bioinformatics and Data Mining to IBM, DEC, OSF, NIST, and others.

Invited Talks, Lectures, and Panelist

Many invited lectures and colloquia to industry, university and government organizations including GTE, GE, DEC, DG, IBM, TMI, BBN, Amoco; Iowa State, University of New Hampshire, MIT, Harvard, WPI, Franklin and Marshall, LSU, University of Arkansas; NASA, Roland Institute, Pfizer, Millennium Pharmaceuticals, Genetics Institute, NIH. Panelist and speaker on Data Exploration and Visual Analytics at numerous IEEE, ACM and many others conferences (SIGGRAPH, SIGCHI, KDD, AAAI).

Opening keynotes at GI'89 (Germany), GIS'94 (Canada), KDD'96 (US), IV'08 (London), SPIE'11 (US)

Grants and Contracts - 1986-2011

Many pending.

Open Indicators Consortium: Continued support for research, development and deployment of Weave (see www.openindicators.org for details) (2011-2014)

Wright Patterson Air Force Base: \$100,000; Visualization Theory research to include predicting measurements for the perception, cognition and insight of data in visualizations (2011)

Pacific Northwest National Laboratories: \$36,000; Generation of a synthetic data set representing data from hospitals and public health centers handling a pandemic caused by a rapidly mutating virus. Goal is to discover the virulent mutations and their origin for the IEEE VAST 2010 Challenge (2010)

Massachusetts Department of Early Education and Care: \$75,000; Develop and evaluate educational assessment indicators using UMass Lowell's data visualization and analysis platform (2009-2011)

Knight Foundation: \$120,000; Community-Based Data Visualization using Weave, a Web-based Analysis and Visualization Environment developed at UMass Lowell (2010)

NSF Eager \$75,000; Metrics for Visual Analytics Evaluation (2009-2011)

Command Control and Interoperability Advanced Data Analysis Center: \$25,000 per year base; Member of New Department of Homeland Security center to collaborate with the Purdue Center on Visualization, both together focusing on advanced visual analytics. Rutgers is lead institution (2009-2014)

Open Indicators Consortium: \$1,000,000; Support for research and development of a web-based collaborative visualization systems for measures and indicators (members include Atlanta, Boston, Chicago, Columbus, Arizona, Connecticut, Rhode Island) (2009-2011)

MGH Avon Breast Center: \$270,000 Patient Risk Model Analyses, HL7 interoperability, Natural Language Processing, Visualizations, Computer Human Interaction (2007-2012)

NSF: \$25,000; Support for the VAST Evaluation Workshop at the 2009 IEEE Visualization Conference (2009)

NSF: \$16,000; Undergraduate Student Visual Analytics Research Support (2009)

NSF: \$5,000; Support for the VAST Evaluation Workshop at the 2008 IEEE Visualization Conference

NSF: \$14,000; Undergraduate Student Visual Analytics Research Support

NIST: \$20,000 VAST Contest Management and Automated Social Network Scoring Metrics

Pfizer: \$75,000 per year for 2 years, High Dimensional Visualization Research for Drug Discovery

NSF (with UMD and PNNL): \$408,689 Collaborative Research: Scientific Evaluation Methods for Visual Analytics Science and Technology (SEMVAST)

National Academy of Sciences (with William Mass): \$11,000 NE Measures & Indicators Prototype

The Boston Foundation (with William Mass): \$5,000 NE Measures & Indicators: Regional System Tools to Advance a National Model

NIST: \$25,000 VAST Contest Management and Automated Scoring Metrics

NIST: \$25,000 VAST Contest Management and Metrics Development

BBN/ARDA (GI2Viz): \$38,000 Haptics and Sonification with Kinetic Displays

MGH Avon Breast Center: \$25,000 Patient Database and Risk Model Analyses, Tablet Patient Data Entry

DERC (Diabetes and Endocrinology Research Center) : \$65,000 Microarray and Pathway Visualization

Evident Software Inc.: \$140,000 Interactive Visualization of Large and Massive Transaction Data Sets

SensAble Technologies, Inc.: \$49,000 Haptic Sound Software and API Development Research

BBN, Inc. \$30,000 Research in Motion Parameters for Icon Visualizations

Anvil, Inc. \$125,000 Research in Data Exploration for Bioinformatics Data Sets

Genetics Institute \$154,000 Data Visualization Research

Millennium Pharmaceuticals \$10,000 Data Mining and Visualization Experiments

EPA \$300,000 to explore the impact of Science Modeling on High School Students (Judy Boccia PI, Center for Field Studies)

Pfizer \$75,000 to explore Data Mining and Visualization applied to Drug Success Prediction

NIST \$95,000 to explore standardization and evaluation strategies for data mining algorithms and systems

Spacetec \$63,000 to explore APIs for highly interactive motion control

Pfizer National Grant \$95,000 with Ken Marx - Data Mining and Visualization for DNA analysis

NIST \$70,000 to explore visualization and data mining

ARPA \$25,000 to explore interactive design issues for the MEDFAST Mobile Surgical Room (through MITRE)

ARPA \$25,000 to explore interactive design issues for the Surgical Room of the Future Project (through MITRE)

NASA \$66,000 to explore the integration of databases and visualization

Department of Health and Welfare (SBIR) \$5,000 research integrating Exvis into BBN's Prophet

IDA - Supercomputer Research Center \$100,000 explore visualization /supercomputing integration

DEC \$60,000 to develop inter-language execution tools

XTechnology Corp. \$12,000 to port the X windows system to a RISC platform

DEC \$80,000 for support of Digital's next generation X Terminals

Kendall Square Research \$98,000 to develop a new supercomputing visualization environment

Intel Corp. \$75,000 to benchmark iGL for the Intel i860 chip and design the mapping of iGL to PEX

Litton/Itek Imaging \$15,000 explore Exvis for the classification of military reconnaissance imagery

DEC \$40,000 to support the automatic integration of C applications in other language environments

Amoco Research Production, Inc \$75,000 for research in exploratory visualization environments

Mercury Computer, Inc. \$10,000 to design an interactive distributed high performance visual API

Mercury Computer, Inc. \$25,000 for research in exploratory visualization environments

DEC \$75,000 for research in exploratory visualization environments

Veteran's Administration \$25,000 develop the Mumps X Windows C language interface mechanism

Century Computing and NASA \$26,340 extend NASA's Transportable Application Environment (TAE)

Veteran's Administration \$50,000 to port X Windows/Motif to MUMPS and provide training support

Sanders/Lockheed \$40,000 to evaluate parallel architectures and real-time operating systems

BGS \$26,000 develop a statistical graphics library for the visualization of system performance data

Eaton Corporation \$45,000 to develop dynamic and highly interactive widgets for manufacturing

Veteran's Administration \$36,000 to port UMASS Lowell's GKS to the MUMPS environment

DEC \$5,000 to explore RISC versions of Exvis

DEC and IBM \$45,000 for support of the ANSI X3H3.6 X Window System document editor

Data General \$30,000 to develop tools for high performance demos for the AViiON 88K workstations

Computer Based Systems, Inc. \$4,889 for GKS support to JNGG

Intel Corp. \$346,500 to develop a high-performance graphics library for the Intel i860

Open Software Foundation \$211,000 for C++ Motif and to explore dynamic and migratable objects

UML \$38,900 to create a Database for Graphics Standards

Alliant Computer Systems Corp. \$ 6,750 for Quality Assurance for CA's Port of DISSPLA to the FX-8

Sanders/Lockheed \$85,000 for evaluation of the Behavioral Model of a Graphics Processor

Williamson Petroleum Consultants, Inc \$10,000 to port GKS to the IBM PS/2 Model 80 under OS/2

Sanders/Lockheed \$ 73,000 to explore B-Spline Algorithms

Sanders/Lockheed \$360,000 for Software Engineering of a Graphics Environment

Sanders/Lockheed \$12,225 to develop Anti-aliasing algorithms for RRGB LCDs

Texet, Inc. \$25,000 to develop a CGM Interpreter

Calcomp/Lockheed \$136,700 for CGI language interfaces

NEC \$12,000 for software and tools development

DEC \$143,740 for research in the Visualization of Scientific Data

Visual Technology \$16,000 to develop software test suites

Datacube \$14,000 to develop a device-independent image processing environment

Sky Computer \$5,000 for research on computational graphics engines

UML \$48,200 to develop the ANSI Graphical Kernel System

Equipment and Software Donations

SUN Microsystems \$7,500 –Server system and software

SensAble Technologies \$7.500 – Five Omni Haptics Systems

ATI (AMD) \$2,500 – Five ATI state of the art Graphics Card for the new Computer Gaming Course

Synergix Ltd. \$3,000 - Lab license for Molecular Conceptor Cheminformatics Training Software (2004)

BioMed. \$5,000 - Lab license for document management system (2004)

Tom Sawyer Software. \$200,000 - Lab license for graph analysis environment (2003)

Clementine, Inc. \$200,000 - Lab License for data analysis environment (2002)

SpotFire, Inc. \$100,000 - complete visualization environment (1999)

AVS, Inc. \$100,000 - complete Open Viz Visualization software (1999)

Thinking Machines Incorporated \$100,000 - complete Darwin Data Mining Software Suite (1998)

Silicon Graphics \$50,000 - complete MineSet Data Mining and Visualization Software Suite (1997)

Silicon Graphics \$50,000 - complete SGI systems (1996)

AVS, Inc. \$100,000 - complete AVS Visualization software with campus support (1995)

DEC \$100,000 - a variety of equipment / support from Digital Equipment Corporation

Spacetec. \$5,000 - 3 Spaceballs and software

Verdix \$20,000 - complete ADA compiler environment for DEC systems

VI \$34,000 - complete Dataviews software exploration environments

Datatreer \$20,000 - MUMPS software development environments

Pixar Computer \$10,000 - multiple copies of RenderMan

Sun Microsystems \$149,000 - RISC Server with 1 Gigabyte disk storage

Apple \$38,000 - 4 complete systems, 2 with extra displays

Intel \$50,000 - fully configured Intel i860-based workstations

Intel \$25,000 - for X/i860 research

CIS \$5,000 - 2 geometry/space balls for 3D interface explorations

DEC \$200,000 - 4 DECStations with central server for work on the experimental visualization of data

Intel \$50,000 - 2 fully configured Intel i860-based workstations

Data General \$15,000 - 2 high resolution 88K-based AViiON workstations

Calcomp/Lockheed \$870,000 - 18 Unix based high-resolution workstations for research in graphics

Univision \$8,000 - 1 high resolution board for research and development in CG standards

Pixelworks \$9,050 - 2 graphics board subsystems for R&D

Microsoft \$1,200 - 4 Windows packages for investigating graphical and image processing applications

DEC \$110,000 - 3 workstations and supporting software for research in visualization

Lexidata \$75,000 - 3 Lex 90 systems with peripherals for development of a Virtual Device Interface

Academic and Professional Publications

Books and Edited Proceedings (Published)

Ward M., G. Grinstein and D. Keim (2010). Interactive Data Visualization, A.K. Peters Publishers.

Fayyad U., G. Grinstein and A. Wierse (2001), Editors. Information Visualization in Data Mining and Knowledge Discovery, Morgan-Kaufmann Publishers.

Banissi E., L. Stuart L., T. Wyeld T., M. Jern, G. Andrienko, N. Memon, R. Alhadj, R. Burkhard, G. Grinstein, D. Groth, A. Ursyn, J. Johansson, C. Forsell, U. Cvek, M. Trutschl, F. Marchese, C. Maple, A. Cowell, and A. Vande (2009), Editors, Information Visualization, 13th International Conference, Barcelona, July 14-17, IEEE Computer Society.

Banissi E., L. Stuart, M. Jern, G. Andrienko, F. Marchese, N. Memon, R. Alhaji, T. Wyeld, R. Burkhard, G. Grinstein, D. Groth, A. Ursyn, C. Maple, A. Faiola and B. Craft (2008), Editors, Information Visualization, 12th International Conference, London, July 9-11, IEEE Computer Society.

E. Banissi, R. Burkhard, G. Grinstein, U. Cvek, M. Trutschl, L. Stuart, T. Wyeld, G. Andrienko, J. Dykes, M. Jern, D. Groth and A. Ursyn (2007), Editors, Information Visualization, 11th International Conference, Zurich, July 4-6, IEEE Computer Society.

Grinstein, G. and R. Erbacher. (1997). Editors. Proceedings of the Third Visual Data Exploration and Analysis Conference, SPIE'97, The International Society for Optical Engineering Publishers.

Grinstein, G., A. Wierse and U. Lang. (1996). Editors. Proceedings of the Second IEEE Workshop on Issues on the Integration of Databases and Visualization, Lecture Notes in Computer Science, Vol. 1183, Springer-Verlag Publishers.

Grinstein, G. and R. Erbacher. (1995). Editors. Proceedings of the Second Visual Data Exploration and Analysis Conference, Volume 2410, SPIE, The International Society for Optical Engineering Publishers.

Grinstein, G. and H. Levkowitz. (1995). Editors. Perceptual Issues in Visualization, Springer-Verlag Publishers.

Lee, J. P. and G. Grinstein. (1994). Editors. Proceedings of the IEEE Workshop on Issues on the Integration of Databases and Visualization, Lecture Notes in Computer Science, Vol. 871, Springer-Verlag Publishers.

Grinstein, G., P. T. Breen and K. Seetharaman. (1993), A tutorial: Interactive Data Visualization and Virtual Environments, International Conference on Computer Graphics, Bombay, India.

Grinstein, G. and J. Encarnacao. (1990). Editors. Workstations for Experiments. IFIP Computer Graphics Series, Volume 1, Springer-Verlag Publishers.

Grinstein, G. (1987). A Short Course in C (with video series)

Grinstein, G. (1987). A Short Course in Modula 2 (with video series)

Grinstein, G. (1987). A Short Course in Scientific Basic (with video series)

All with the University of Massachusetts Office of Extended Engineering Press, Amherst, MA.

Book Chapters

Kevin S. Hughes, Mahmoud El-Tamer, Sherwood Hughes, Brian Drohan, John Sharko, Christine Lawrence, Andrea Loberg, and Georges Grinstein (2010). The Potential of the Electronic Health Record in the Breast Center, in Breast Surgery, Eds. Dr. Dirbas and Dr. Scott-Conners, Springer US.

Damon Berry and G. Grinstein (2009), Iconic Displays, in the Encyclopedia of Database Systems, Eds. Liu Ling and Özsu Tamer, Springer-Verlag Publishers.

Georges Grinstein, B. Jessee, P. Hoffman, A. Gee, and P. Oneil (2001), High Dimensional Visualization Support for Data Mining Gene Expression Data, in DNA Arrays: Technologies and Experimental Strategies, CRC Press LLC, Florida.

Georges Grinstein and M. Trutschl (1998). Input Devices, Chapter in The Encyclopedia of Electrical and Electronics Engineering”, John Webster, Ed., John Wiley & Sons Publishers, New York.

Stuart Smith, R. Daniel Bergeron, and Georges Grinstein (1992). Stereophonic and surface sound generation for exploratory data analysis, in M. Blattner and R. Dannenberg, Eds. Multimedia and Multimodal Interface Design. New York: ACM Press.

Computer Science Publications (Journals, Proceedings and Articles)

Publications in progress: a modern theory of visualization, visualization and collaboration, a web-based visualization architecture, the role of session history in visualization systems, recommendation in visualization, visualization of health indicators, the crisis in town: a policy assessment and longitudinal geospatial analysis of notices of default and foreclosure in Lowell Massachusetts, high-tech industries 1995-2009: Massachusetts and the nation through booms and busts, indicators across boundaries, issues in the presentation of educational indicators, the Weave data interface standard, the National Data Commons: A national resource, The Weave architecture, pandemics from rapidly mutating viruses, and national demographics of breast cancer (many with William Mass).

Patterson R., Liggett K., Blaha L., Grinstein G., Havig P., Lebo T., Kosara R., Kaveney D., Moore J. and K. Sheldon, A Theory and Model of Visualization, submitted to the IEEE Information Visualization Conference, Providence RI, October 2011

Daniels, K. Grinstein, Russell A. and M. Glidden, Properties of Normalized Radial Visualizations, submitted to the Journal of Information Visualization, 2011.

Kelleher C. and G. Grinstein, Fractal Perspective - a Node's Point of View, submitted to the Information Visualization Conference, Biomedical Symposium, London, July 2011

Purushe S., Anbalagan S. K. and G. Grinstein, Development of an Interactive Ramachandran Plot in Weave, submitted to the Information Visualization Conference, Biomedical Symposium, London, 2011

Baumann A., Dufilie A., G. Grinstein and W. Mass, The power and flexibility of session-state driven applications, submitted to the IEEE Information Visualization Conference, Providence RI, October 2011

Kelleher C., Drohan B., Hughes K. and G. Grinstein, Self Organizing Interactive Pedigree Diagrams, submitted to the IEEE Information Visualization Conference, Providence RI, October 2011

Dufilie A.S., Baumann A., Kolman S., Kota S. and G. Grinstein, Design Decisions for a Real-Time Web-based Collaborative Visualization Framework, submitted to the IEEE Information Visualization Conference, Providence RI, October 2011

Baumann A., Shams S., Ross M., Mass W. and G. Grinstein G., Enhancing STEM classes using Weave: a Collaborative Web-base Visualization Environment, to appear in the Proceedings of the First IEEE Integrated STEM Education Conference, New Jersey, April 2, 2011.

Konecni S., Grinstein G., Costello L. and H. Byrne, Scenario Design for Evaluation of Visual Analytics Tools to Support Pandemic Preparedness and Response, Proceedings of the IEEE VAST Conference, Salt Lake City, October 2010.

Drohan, B., Grinstein G., Sharko, J., Lawrence C. and K. Hughes, Oncology Lifeline – A Timeline Tool for the Interdisciplinary Management of Breast Cancer Patients in a Surgical Clinic, Proceedings of the Information Visualization in Biomedical Informatics Symposium held in conjunction with the 14th International Conference on Information Visualization, London, July 2010.

Morrissey, S.P., Grinstein G. and B. Keyes, Developing Multidimensional Firewall Configuration Visualizations, Proceedings of the 2010 International Conference on Information Security and Privacy, Orlando, FL, July 2010.

Chen D., Gourishankar V., Rawley C. and G. Grinstein, The QuickHaptics microAPI: Enabling Haptic Mashups, Proceedings of the Haptics Symposium, Waltham, MA, March 2010.

Yang, F., Baumann, A., Goodell, H., Drury, J.L., Levkowitz, H. and G. Grinstein, A History Model and Framework for Collaborative Visualization Sessions, Proceedings of 11th International Conference on Computer Graphics and Imaging Innsbruck, Austria, February, 2010

Zhou, J., Grinstein G. and K. Marx, A Heuristic for Gene Selection and Visual Prediction of Sample Type, to appear in the International Journal of Data Mining and Bioinformatics, 2010.

Zhou J., S. Konecni, K. Marx and G. Grinstein, A Visual Approach to Improve Clustering Based on Cluster Ensembles, Proceedings of SPIE, Visualization and Data Analysis 2010 Conference, Electronic Imaging Press, San Jose, January 2010.

Morrissey, S. and G. Grinstein, Visualizing Firewall Configurations Using Created Voids, Proceedings of the IEEE 2009 Visualization Conference, VizSec Symposium, Atlantic City, New Jersey, October 2009

Baumann, A., Smrtic, M.B., Dufilie, A., Mass, W. and Georges Grinstein, Proceedings of the IEEE 2009 Visualization Conference, Experiences in the Development of a Measure and Indicator Web-Based Visualization System, Atlantic City, New Jersey, October 2009.

Drohan, B., Grinstein G. and Kevin Hughes, Proceedings of the IEEE 2009 Visualization Conference, Visualizing Hereditary Cancer Risk, Atlantic City, New Jersey, October 2009.

Costello L., G. Grinstein, C. Plaisant and J Scholtz, Advancing User-Centered Evaluation of Visual Analytic Environments through Contests, The Information Visualization Journal, Palgrave-Macmillan Publishers, 2009.

Drohan B. and G. Grinstein, Integrated Visualizations and Analysis for Hereditary Breast and Ovarian Cancer, Proceedings of the MediViz09: 6th International Conference BioMedical Visualization, Barcelona, July 2009.

Konecni, S, J. Zhou and G. Grinstein, A Visual Analytics Model Applied to Lead Generation Library Design in Drug Discovery, Proceedings 13th International Conference on Information Visualization, Barcelona, July 2009.

Sharko, J. and G. Grinstein, Visualization Fuzzy Clusters Using RadViz, Proceedings of the Information Visualization in Biomedical Informatics Symposium held in conjunction with the 13th International Conference on Information Visualization, Barcelona, July 2009.

Grinstein, G., C. Plaisant and J. Scholtz, Visual Analytics Evaluation, Guest Editors, Special Issue IEEE Computer Graphics and Applications, 2009.

Li, H. and G. Grinstein, A Visual Canonical Matrix for Graphs, IEEE Pacific Visualization Symposium, Beijing, April 2009.

Costello L., G. Grinstein, C. Plaisant and J. Scholtz, Advancing Evaluation of Visual Analytic Environments through Contests: Lessons Learned, Special Issue Computer Graphics and Applications, March 2009.

Zhou, J. S. Konecni and G. Grinstein, Visually Comparing Multiple Partitions of Data with Applications to Clustering, Proceedings of SPIE, Visualization and Data Analysis 2009 Conference, Electronic Imaging Press, San Jose, January 2009, Vol 7243.

Ozanne, E. M., Sharko J., Drohan B., Grinstein G., and K. S. Hughes, Identification of High-Risk Lesions through Automated Natural Language Processing (NLP) of Pathology Reports, San Antonio Breast Cancer Symposium, December 2008.

Ozanne, E. M., Loberg, A., Hughes S., Lawrence C., Drohan B., Semine A., Jellinek M., Cronin C., Milham F., Dowd D., Block C., Lockhart D., Sharko J., Grinstein G., and K. S. Hughes, Identification and Management of Women at High Risk for Hereditary Breast/Ovarian Cancer Syndrome, The Breast Journal (2008).

Sharko, J., Grinstein G., and K. Marx, Vectorized RadViz and Its Application to Multiple Cluster Datasets, Proceedings of the IEEE 2008 Visualization Conference, Columbus Ohio, October 2008.

Grinstein G., T. Muntzner and D. Keim, Grand Challenges in Information Visualization, Proceedings of the IEEE 2008 Visualization Conference, Columbus Ohio, October 2008.

Drohan B., Lawrence C., Euhus D., Gadd, M. Grinstein G., Hughes, K., Hughes, S., Javid, S. Sharko S., Kopans, D.; Lee, J., Moore, R., Rafferty, E., Roche, C., Smith, B., and M. Specht, The American Cancer Society Guidelines for Breast Screening with MRI: An Argument for Genetic Testing, Journal of Cancer (2008)

Plaisant C., G. Grinstein, J. Scholtz, M. Whiting, T. O'Connell, S. Laskowski, L. Chien, A. Tat, W. Wright, C. Görg, Z. Liu, N. Parekh, K. Singhal, and J. Stasko, Evaluating Visual Analytics: Lessons learned from the 2007 Visual Analytics Science and Technology Symposium Contest, IEEE Computer Graphics and Applications, 2, March-April, Vol 14, pp 12-21 (2008).

Tagne, J.B. Kakumanu S., Konecni S., Workman C., Gupta S., Love J., Ortiz D., Grinstein G., Shea T., Volkert T., Young R. A., and R. J. Nicolosi, Molecular Mechanisms of the Chemopreventive Effect of the Nano-emulsion Anti-Cancer Drug Tamoxifen on Human HTB-20 Breast Cancer Cells, submitted to Cancer Research 2008.

Plaisant C., Fekete JD, and G. Grinstein, Promoting Insight Based Evaluation of Visualizations: From Contest to Benchmark Repository, in IEEE Transactions on Visualization and Computer Graphics, Vol 14, No 1, 2008.

Martin F., Grinstein G., and S. Kuhn, A Radical Design Course: Leveraging APIs for Creativity and Innovation in Software, Proceedings of the 11th IASTED International Conference on Software Engineering and Applications, 2007 Cambridge, MA, November 2007

Scholtz J., Grinstein G., and C. Plaisant, Metrics for the Evaluation of Visual Analytics, Proceedings of the IEEE Information Visualization Conference, Baltimore, October 2007

Grinstein G., T. O'Connell, S. Laskowski, C. Plaisant, J. Scholtz and M. Whiting, The VAST 2007 Contest – Blue Iguanodon, Proceedings of the IEEE Visual Analytics Systems and Technology Symposium, Baltimore, October 2007

Marx, K., Sharko, J., Grinstein, G., Odelberg, S., Simon, H., Evidence for Proximal to Distal Appendage Amputation Site Effects from Global Gene Expression Correlations Found in Newt Microarrays, Proceedings of the IEEE 7th International Symposium on BioInformatics and BioEngineering, Harvard Medical School, Boston MA, pp 131-136, October 2007

Sharko, J., Grinstein, G., Marx, K. A., Zhou, J., Cheng, C., Odelberg, S., and H. Simon, Heat Map Visualizations Allow Comparison of Multiple Clustering Results and Evaluation of Dataset Quality: Application to Microarray Data, Proceedings of the 11th international Conference Information Visualization, IEEE Computer Society, Washington, DC, July 2007

Grinstein G., C. Plaisant, S. Laskowski, T. O'Connell, J. Scholtz and M. Whiting, VAST 2006 Contest – A Tale of Alderwood, Proceedings of the IEEE Visual Analytics Systems and Technology Symposium, Baltimore, October 2006

Goodell H., C-H. Chiang, C. Kelleher., A. Baumann , and G. Grinstein (2006), Collecting and Harnessing Rich Session Histories, International Conference on Information Visualization (IV06), London, July 2006, pp 117-123.

Yang F, H. Goodell, R. Pickett., R. Bobrow, A. Baumann, A. Gee, and G. Grinstein (2006), Data Exploration Combining Kinetic and Static Visualization Displays, International Conference on Coordinated Multiple Views in Exploratory Visualization, London, July 2006.

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Grinstein, G. (1987). A Short Course in Scientific Basic. Video Course Series (6 tapes). University of Massachusetts Office of Extended Engineering Press, Amherst, MA.

Past Commercial and Publicly Available Products Developed

Graphical Kernel System - In use over 50 sites in the world.

Computer Graphics Metafile - In use in national labs and in commercial products.

Plot Library - In a few commercial products.

Exploratory Visualization Environment - License available product.

C++ Motif Binding - Publicly available. In many sites. Distributed by OSF as well.

Intel Graphics Library (iGL-860) - In many sites.

MIVAC - Licensed to AnVil, Inc.

X and Motif Course - Used commercially by several groups.

Computer Graphics and Visualization Courses - Used commercially by many companies

Current Commercial and Publicly Available Products Developed

Weave - Open source collaborative interactive visualization software; basis for The Open Indicators Consortium

Health Level 7 Translators - freely available

Several Visualization, Analysis, Haptics and Sonification Patents - licensable from the University

Community Service

Odyssey of the Mind (coach 1993-97), and Youth Sports (Soccer and Basketball Coach 1989-date), North Middlesex Regional High School (Assistant soccer coach 1997-2002, Freshman coach 2005), Hawthorne Brook Middle School Improvement

Council and the Parent Teacher’s Council. Televideo graphics, visualization, and virtual reality courses to Chelmsford High School art students.

Instruction Related Activity

Undergraduate Teaching Experience

Calculus	Ordinary Differential Equations	Number Theory
Partial Differential Equations	Complex Variables	Numerical Methods in Computers
Modern Geometry	Linear Algebra	Foundations and Logic
Real Analysis	Topology	Engineering Mathematics
Discrete Structures	Probability and Statistics	Algorithms
Modeling and Simulation	Numerical Methods in Computers	Operating Systems
Computer Graphics (I and II)	The Internet and the Web	Introduction to Programming
Computer Gaming	Software Engineering 2	

Graduate Teaching Experience

Analytic Number Theory	Modern Geometry	Modern Algebra
Complex Variables	Computer Graphics (I and II)	Algorithms
Scientific Data Visualization (I and II)	Operating Systems	Image Processing
Data Structures and Algorithms	Visual Languages	Data Mining
Computational Geometry	Solids Modeling	Structural Morphology
Computer Animation	High-performance Graphics Systems	Virtual Reality
Computer Game Development	Chemoinformatics	Computer Gaming
Radical Design	Visual Analytics	Computational Methods in Molecular Biology
Visual Analytics of Massive Graphs	Graph Layout Algorithms	

Masters and Doctoral Students

Elaine Lupien (Masters) May 1989
 Cost Analysis for computer graphics software systems.

Karen Daniels (Masters) May 1990
 Spline curve drawing algorithms.

Rudiger Strack (Masters Technical Uni. Darmstadt, co-advisor Dr. Encarnaçao) June 1990
 Data acquisition for, structuring of, and data retrieval from a computer graphics requirements database.

Doctoral Students (23 finished; 13 in progress)

About ½ the students are at Universities or Research Centers (LSU, Utah State, UMass, Mass General Hospital, Dana Farber, Catholic University Chile, INRIA) and the others are in industry (Novartis, Pfizer, MITRE, Oracle, Draper, United Devices, Yahoo, Google and startups)

Hugh Masterman (Doctorate) May 1992
 Modeling and exploiting k-sequential data reference behavior in graphics and image processing algorithms.

Weidong Wang (Doctorate) May 1992
 On the automatic reconstruction of a 3D object's constructive solid geometry representation from its 2D projection line drawing.

Krishnan Seetharaman (Doctorate) July 1994
 Interaction models for multi-sensory data visualization

David Southard (Doctorate) June 1995
 Vector quantization and nearest neighbor clustering with application to image compression and data visualization.

John Peter Lee (Doctorate) May 1998
 A systems and process model for database exploration.

Robert Erbacher (Doctorate) May 1998

Visual Assistance for Concurrent Processing

David Pinkney (Doctorate) A framework for iconographics: a formal model of icons, interactions and interpolations	Dec 1999
Patrick Hoffman (Doctorate) Table Visualizations: A Formal Model and its Applications	Dec 1999
Claudio Meneses (Doctorate) Visual and Analytic Data Mining of Massive Data Sets	May 2002
Marjan Trutschl (Doctorate) SOMn – Constrained Self-Organizing Maps for Data Exploration and Feature Extraction	May 2002
Urska Cvek (Doctorate) Visual and Analytic Tools for Record Level Cluster Analysis	May 2004
Ivan Galkin (Doctorate) A Pre-Attentive Vision Model for Automated Data Exploration Applied to Space Plasma Remote Sensing Data	May 2004
Alex Gee (Doctorate) A Universal Visualization Platform	Aug 2004
Howie Goodell (Doctorate) An Architecture to Support the Co-Exploration of Data and History	May 2006
Chih-Hung Chiang (Doctorate) Probability Models for user session analysis in a visualization system: using previous sessions advantageously	Dec 2006
Jianping Zhou (Doctorate) Visual Analytics for Partition Comparison and Evaluation	May 2007
Hongli Li (Doctorate) A Unique Canonical Matrix Representation for Graphs and Networks	July 2009
Shaun Morrissey (Doctorate) Real-time Visual Representation of Firewall/Security Rules Sets	Dec 2009
John Sharko (Doctorate) Vectorized RadViz Theory and Applications to Newt & Mouse Microarrays*	Dec 2009
Brian Drohan (Doctorate) Visual Analytics for Breast Cancer Risk Assessment **	May 2010
Fanhai Yang (Doctorate) A New Architecture for Collaborative Session History and Interactions *	May 2010
Sean Konecni (Doctorate) Scenario Design for Evaluation of Visual Analytics Tools to Support Biomedical Research **	May 2011
Alex Baumann (Doctorate) The Design and Implementation of Weave: A Session State-Driven, Web-based Visualization Framework	June 2011

Doctorates in Progress (13 - *= CS Bioinformatics Option and **= Biomedical Engineering)

Mary Beth Smrtic– Highly Interactive Web-based Visualization of Health Data **	May 2012
Kareem Abu-Zahra – Visual Analytics Evaluation and Gaming	May 2012
Andy Dufilie – Session State and History, and Web-based Visualization Systems	May 2013
Curran Kelleher – The Semantic Web and High Performance Visual Analytics *	May 2013
Swheta Purushe – Visual Analytics for Demographics of Breast Cancer **	May 2014
Sebastin Kolman – Information Maps and Intelligent Visualizations	May 2014
Kathleen Sheldon – Visualization Theory	May 2015

Andrew Wilkinson – Collaborative Visualizations

May 2015

Topics TBD

Sanjay Anbalagan *, Edward Luo, Baochen Sun, Philip Kovac, Ekaterina Galkina **

References available on request

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1. Massachusetts General Hospital, Boston, MA
2. INRIA, Paris, France
3. Louisiana State University, Shreveport, LA
4. University of Maryland, Baltimore, MD
5. Pacific Northwest National Laboratories, WA
6. BBN, Cambridge, MA
7. SensAble Technologies Inc., Woburn, MA
8. MITRE, Bedford, MA
9. Pfizer, Cambridge, MA
10. The Boston Foundation