



What's Hot at LAVA

Laboratory for Advanced Visualization & Applications
Jason Leigh, PhD





Gwen Jacobs
Jason Leigh



HAWAI'I DATA SCIENCE

The Hawai'i Data Science Institute (HI-DSI) is a University of Hawai'i System-wide effort to support data science education, collaborative research and partnerships with industry.

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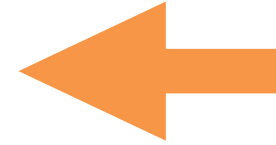
AREAS OF FOCUS

EDUCATION

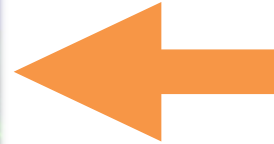
COLLABORATIVE
RESEARCH

INDUSTRY
PARTNERSHIPS

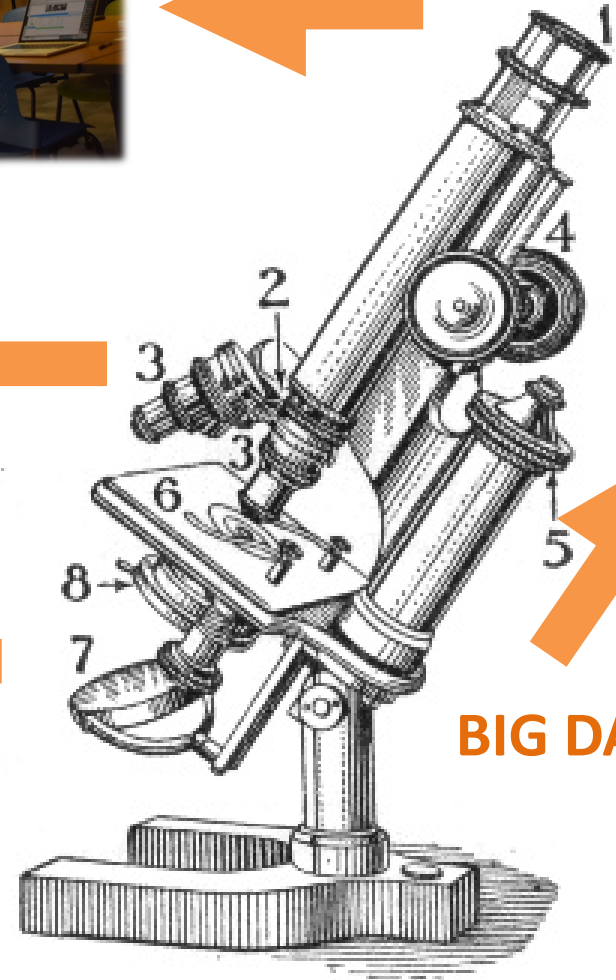
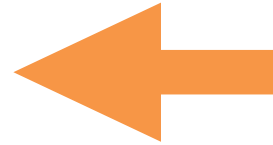
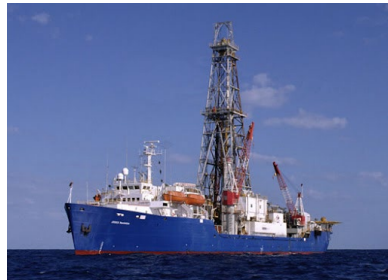
**Advanced
Visualization**



**Data Processing and
Analytics, HPC, Tools**



**Data Capture
Instrumentation**



BIG DATA

Managing Scale & Complexity in Data & Information



The Continuum (2000)



Electronic Visualization Laboratory, University of Illinois at Chicago



CyberCANOE:

Cyber-enabled Collaboration Analysis Navigation & Observation Environment



*Think at the Speed of Imagination
See the Big Picture in your Collaboration*

Powered by SAGE2



SAGE3 - Smart Amplified Group Environment



(sagecommons.org)

<https://youtu.be/Rmg9YnXLBsM>



We Know When Used Correctly, People Come to Better Decisions

Greater Speed, Accuracy, Comprehensiveness & Confidence

- **See detail & context** simultaneously by reducing Window switching [Czerwinski03, Ball05]
- Helps **externalize the working memory of teams** [Andrews10]
- **Increases parallel processing** amongst team members [Park03]
- Improves **location memory** of information [Tan01]
- Helps user **performance keep pace** with increasing data size (perceptual scalability) [Yost07]
- Results in **greater confidence in conclusions** drawn when able to see all info at once [Ball05]
- Users **begin to look for higher level patterns** & relationships (i.e. they start to look for the bigger picture) [Reda12]

Homework



- [Andrews 10] Andrews, C., Endert, A., & North, C. (2010, April). [Space to think: large high-resolution displays for sensemaking](#). In Proceedings of the 28th international conference on Human factors in computing systems (pp. 55-64). ACM.
- [Ball 05] Ball, R., & North, C. (2005). [Analysis of user behavior on high-resolution tiled displays](#). In Human-Computer Interaction-INTERACT 2005 (pp. 350-363). Springer Berlin Heidelberg.
- [Ball 07] Ball, R., North, C., & Bowman, D. A. (2007, April). [Move to improve: promoting physical navigation to increase user performance with large displays](#). In Proceedings of the SIGCHI conference on Human factors in computing systems (pp. 191-200). ACM.
- [Bradel 11] Bradel, L., Andrews, C., Endert, A., Koch, K., Vogt, K., Hutchings, D., & North, C. (2011). [Large High Resolution Displays for Co-Located Collaborative Intelligence Analysis](#). Technical Report, Virginia Tech
- [Czerwinski 03] Czerwinski, M., Smith, G., Regan, T., Meyers, B., Robertson, G., & Starkweather, G. (2003). [Toward characterizing the productivity benefits of very large displays](#). In Proc. Interact (Vol. 3, pp. 9-16).
- [Endert 12] Endert, A., Fiaux, P., & North, C. (2012, May). [Semantic interaction for visual text analytics](#). In Proceedings of the 2012 ACM annual conference on Human Factors in Computing Systems (pp. 473-482). ACM.
- [Endert 13] A. Endert, L. Bradel, C. North (2013). [Beyond Control Panels: Direct Manipulation for Visual Analytics](#). Computer Graphics and Applications 33(4)
- [Fisher 12] K. Fisher, S. Counts, A. Kittur. [Distributed sensemaking: improving sensemaking by leveraging the efforts of previous users](#). CHI '12
- [Park03] Park, K., Renambot, L., Leigh, J. and Johnson, A., [The Impact of Display-rich Environments for Enhancing Task Parallelism and Group Awareness in Advanced Collaborative Environments](#) , In Workshop on Advanced Collaboration Environments, June 22-24, 2003, Seattle, WA.
- [Reda12] Reda, K., Johnson, A., Mateevitsi, V., Offord, C., & Leigh, J. (2012). [Scalable Visual Queries for Data Exploration on Large, High-Resolution 3D Displays](#). 7th Ultrascale Visualization Workshop. In Proc. of the 2012 SC Companion. IEEE
- [Tan 01] Tan, D. S., Stefanucci, J. K., Proffitt, D. R., & Pausch, R. (2001, November). [The Infocockpit: Providing location and place to aid human memory](#). In Proceedings of the 2001 workshop on Perceptive user interfaces (PUI) (pp. 1-4). ACM.
- [Tan 03] Tan, D. S., Czerwinski, M., & Robertson, G. (2003, April). [Women go with the \(optical\) flow](#). In Proceedings of the SIGCHI conference on Human factors in computing systems (pp. 209-215). ACM.
- [Yost 07] Yost, B., Haciahetoglu, Y., & North, C. (2007, April). [Beyond visual acuity: the perceptual scalability of information visualizations for large displays](#). In Proceedings of the SIGCHI conference on Human factors in computing systems (pp. 101-110). ACM.

Classic Single Projector Meeting Room vs SAGE2 vs Zoom

Using this technology:	Co-located With SAGE2 (n=12)							Co-located Without SAGE2 (using a projector) (n=12)							Remote With Zoom (n=11)									
	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	M	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	M	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	M
I maintain focus on the meeting	0	0	0	0	1	9	2	6.1	1	0	4	0	5	2	0	4.2	1	3	2	1	2	2	0	3.5
I contribute content to the meeting	0	0	0	0	0	7	5	6.4	1	4	5	1	1	0	0	2.75	0	2	2	2	3	2	0	4.1
I find it easy to contribute content	0	0	0	0	0	3	9	6.75	6	3	3	0	0	0	0	1.75	0	1	3	3	4	0	0	3.9
I actively participated in the meeting	0	0	0	0	0	6	6	6.5	1	2	3	2	3	1	0	3.6	0	1	5	1	3	1	0	3.8
I get sufficient feedback	0	0	0	1	4	2	5	5.9	1	2	2	3	3	1	0	3.7	0	1	2	3	4	1	0	4.2
I find it easy to make suggestions	0	0	0	1	1	4	6	6.25	2	0	6	3	1	0	0	3.1	0	0	4	4	2	0	1	4.1
I enjoy using this technology in meetings	0	0	0	0	0	1	11	6.9	4	4	2	2	0	0	0	2.2	3	2	2	3	1	0	0	2.7
most participants contribute content to the meeting	0	0	0	0	2	8	2	6	2	6	3	1	0	0	0	2.25	0	5	2	0	2	0	1	3
most participants listened to each other	0	0	0	1	4	6	1	5.6	0	2	3	2	4	1	0	3.9	0	0	1	1	5	2	2	5.3
most participants contribute content at appropriate times	0	0	0	2	1	7	2	5.75	0	4	3	2	3	0	0	3.3	0	0	3	1	3	3	1	4.8
most participants avoided interruptions	0	0	1	4	4	2	1	4.8	0	1	1	3	4	3	0	4.6	0	1	2	2	2	2	2	4.7
most participants were attentive	0	0	0	1	2	8	1	5.75	0	1	5	3	2	1	0	3.75	0	2	2	3	2	2	0	4
most participants displayed attentive non-verbal body language	0	0	2	3	3	2	2	4.9	0	3	4	3	1	1	0	3.4	0	2	3	2	3	1	0	3.8
when applicable, a consensus is reached	0	0	0	3	6	2	1	5	0	0	4	6	2	0	0	3.8	0	0	2	3	4	2	0	4.6

Kirshenbaum et al 2021, **Traces of Time through Space: Advantages of Creating Complex Canvases in Collaborative Meetings**. Proc. ACM Hum.-Comput. Interact., Vol. 5, No. ISS, Article 502. Publication date: November 2021.

Tiled Display Walls Around the World

AUSTRALIA

- Monash University
- RMIT, (VX)Lab
- University of Sunshine Coast, Mechanical Engineering (3)
- University Southern Queensland
- University of Technology, Sydney

BRAZIL

- Bahia School of Medicine and Public Health
- Catholic University of Salvador (UCSal)
- Federal University Paraiba, LAViD
- Federal University of Rio Grande do Sul, PRAV
- Mackenzie University, LabCine
- National Institute of Space Research
- RNP, Rio de Janeiro (2)
- University of Campinas, Cinema
- University of Sao Paulo, LARC
- University of Sao Paulo, LASSU (2)

CANADA

- Ciena Research Labs
- Simon Fraser University, IRMACS

CHINA

- Chinese Academy of Forestry (2)
- Tianjin University of Technology

CZECH REPUBLIC

- CESNET and Czech Technical University, SAGElab
- CESNET, Mobile SAGE
- Masaryk University, Cyber Exercise & Research Platform Project
- Masaryk University, Laboratory of Adv. Networking Technologies (2)
- Mavenir, Network Operations Center

FRANCE

- INRIA, ILDA

ITALY and SWITZERLAND

- University Urbino and ETH Zürich

JAPAN

- National Institute of Advanced Industrial Science and Technology (AIST) (2)
- NTT Network Innovation Laboratories, Yokosuka
- Osaka University, Cyber Media Center

KOREA

- Gwangju Institute of Science & Technology, Networked Computing Systems Lab
- KISTI, KREONET Center

NETHERLANDS

- Air France-KLM, CIO Group Technology Office
- SURFsara, Scientific Vis Group, Collaboratorium
- University of Amsterdam, SNE

NEW ZEALAND

- REANNZ

SOUTH AFRICA

- University of Cape Town, Informatics and Visualisation Laboratory

TAIWAN

- National Center for High-performance Computing
- National Chung Hsing University
- National Museum of Marine Science and Technology

THAILAND

- Mahidol University, Faculty of ICT

UNITED KINGDOM

- Imperial College London, Data Science Institute

UNITED STATES

- Adler Planetarium
- Argonne National Laboratory, ALCF
- Caterpillar Inc.
- Catherine Cook School
- Chaminade University of Honolulu (2)
- Digital Manufacturing and Design Innovation Institute
- Hawaii Community College–Palamanui
- Hawaii State Energy Office

- Honolulu Community College
- Jackson State University, ECE
- Kamehameha Schools
- NASA Marshall Space Flight Center, SPoRT
- NOAA, National Weather Service, OPG
- Northern Illinois University, Computer Science
- Northwestern University, iCAIR
- Stanford University, HIVE
- University of Alaska Fairbanks, DTN
- University of California, Merced, Library
- University of California, San Diego, Calit2-QI
- University of California, Santa Cruz, CITRIS/Banatao Institute
- University of Chicago, RRC
- University of Florida Gainesville, ACIS
- University of Hawai‘i at Hilo (3)
- University of Hawai‘i at Mānoa, Applied Rsrch Lab
- University of Hawai‘i at Mānoa, Data Science Inst
- University of Hawai‘i Mānoa, HIGP
- University of Hawai‘i at Mānoa, Information Technology Center
- University of Hawai‘i Mānoa, i-LAB
- University of Hawai‘i at Mānoa, LAVA (3)
- University of Hawai‘i at West Oahu, Academy for Creative Media
- University of Illinois at Chicago, ACM/LUG
- University of Illinois at Chicago, Communications
- University of Illinois at Chicago, EVL (5)
- University of Illinois at Chicago, Maker Space
- University of Illinois at Chicago, Innovation Center
- University of Illinois at Chicago, Learning Sciences
- University of Illinois at Chicago, Ophthalmology
- University of Illinois at Chicago, Pathology (2)
- University of Illinois Urbana-Champaign, NCSA
- University of Maryland, Baltimore County, ARC
- University of Oregon, Library
- University of Pennsylvania, Idea Factory
- University of St. Thomas
- University of Texas, Austin, TACC

SAGE3 Plans



- 5 year effort (started in 2020)
- Main foci:
 - **Re-architect** SAGE2 from the ground up using modern and emerging Web frameworks
 - Re-design user-interface for a **post pandemic reality**
 - Incorporate **emerging AI capabilities** to:
 - Make it easier for non-AI experts to use AI for data processing, analysis, visualization and collaboration
 - Enhance user-interface for organizing content on large display walls easier- make AI a collaborator in your meetings

Articulate

Roderick Tabalba

Natural Language Translation to Visualization
Focusing on **Overhearing** Conversations Between Collaborators



Sun, Y., Leigh, J., Johnson, A. E., Chau, D., **Articulate: a Conversational Interface for Visual Analytics**, Proceedings of the IEEE Symposium on Visual Analytics Science and Technology, 2009

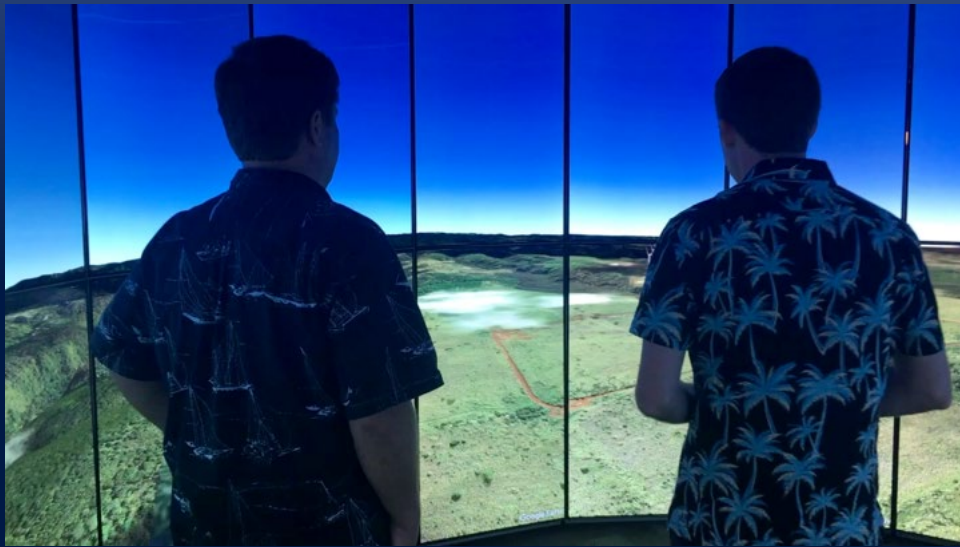
Data Visualization & Analytics is Not Enough

- 2017 OECD (Organisation for Economic Co-operation and Development) Program for the International Assessment of Adult Competencies (PIAAC) report ranks the US at 28 out of 38 countries surveyed in numeracy.
- Findings suggest that only 6 in 10 in the US “...can interpret and perform basic analyses of data and statistics in texts, tables and graphs.”

#1. Japan
#2. Finland
#3. Sweden
#4. Netherlands
#5. Norway
#6. Denmark
#7. Slovak Republic
#8. Flanders (Belgium)
#9. Czech Republic
#10. Austria
#11. Hungary
#12. Germany
#13. Estonia
#14. New Zealand
#15. Russian Federation
#16. Australia
#17. Canada
#18. Singapore
#19. Lithuania
#20. Korea
#21. England (UK)
#22. Slovenia
#23. Poland
#24. Northern Ireland (UK)
#25. France
#26. Ireland
#27. Israel
#28. United States
#29. Cyprus
#30. Greece
#31. Italy
#32. Spain
#33. Kazakhstan
#34. Turkey
#35. Chile
#36. Mexico
#37. Peru
#38. Ecuador

Hawai'i Advanced Visualization Energy Nexus

Ryan Theriot, James Hutchinson, Nurit Kirshenbaum, Eva Morales



Hawaii Advanced Visualization Environment Nexus





Create(x)

A New Creative Computational Media Space
at UH West Oahu

Kari Noe



UNIVERSITY
of HAWAII®
WEST O'AHU

CREATIVE MEDIA FACILITY

ACM
Academy for Creative Media
SYSTEM



Aloha!



lava.hawaii.edu