CS 6900 – Seminar
Research Introduction

Isaac Cho, Ph.D.

Isaac.cho@usu.edu

Assistant Professor, Computer Science, Utah State University

Adjunct Professor, Computer Science, University of North Carolina at Charlotte

About me

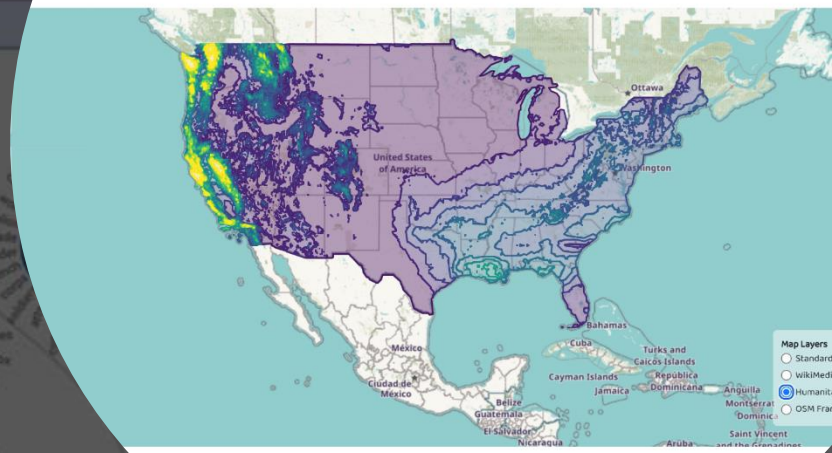
- **Assistant Professor,** Computer Science Department, Utah State University
- **Adjunct Professor,** Computer Science Department, University of North Carolina at Charlotte
- **Director,** VizUS (Visualization lab at Utah State), Utah State University

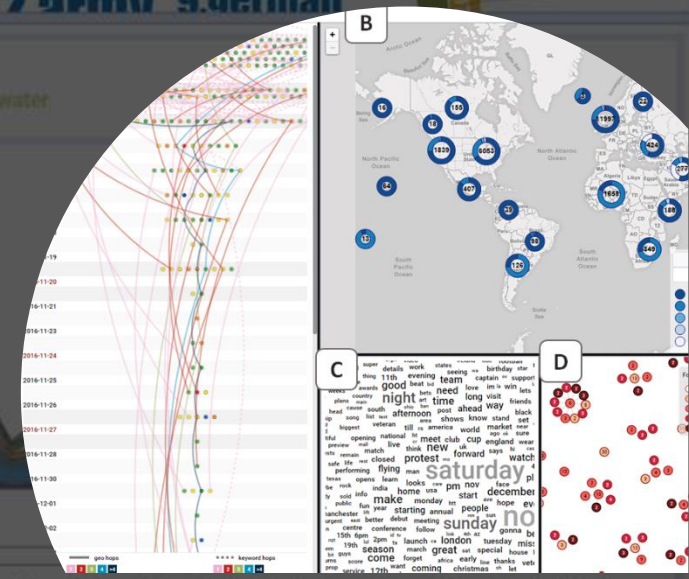
- **Faculty Member:**
  - Ribarsky Center for Visual Analytics (Charlotte Visualization Center), Data Science Initiative, Cognitive Science Program at UNC Charlotte

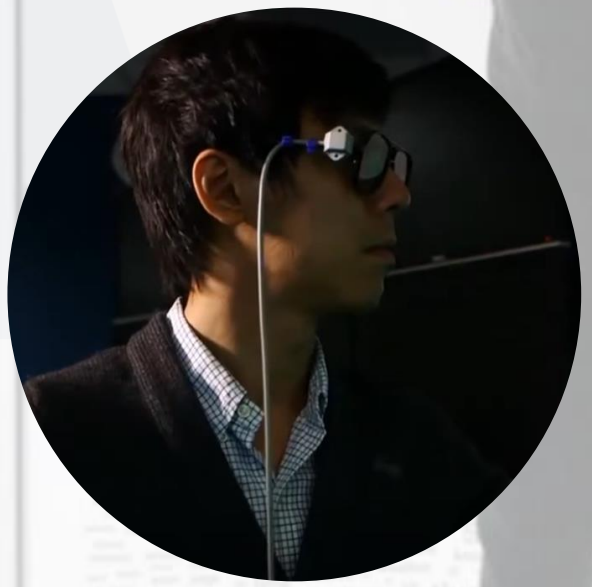
- **Education:**
  - **Ph.D**, University North Carolina at Charlotte, 2013
  - **B.S.** Hallym University, 2007

Research Expertise & Activities

- Big Data Visualization and Analytics
  - Text and Social Media Analysis
  - Event and Anomaly Detection
  - Human Cognitions in Decision Making
  - User Interaction Analysis
  - User Experience
- Information Visualization
- Scientific Visualization







Research Expertise & Activities

- Virtual and Augmented Reality
  - Multimodal Interactions
  - 3D User Interfaces
  - Multi-Scale Virtual Environments
  - Immersive Analytics
  - Human factors in Immersive Environments

ACM SUI

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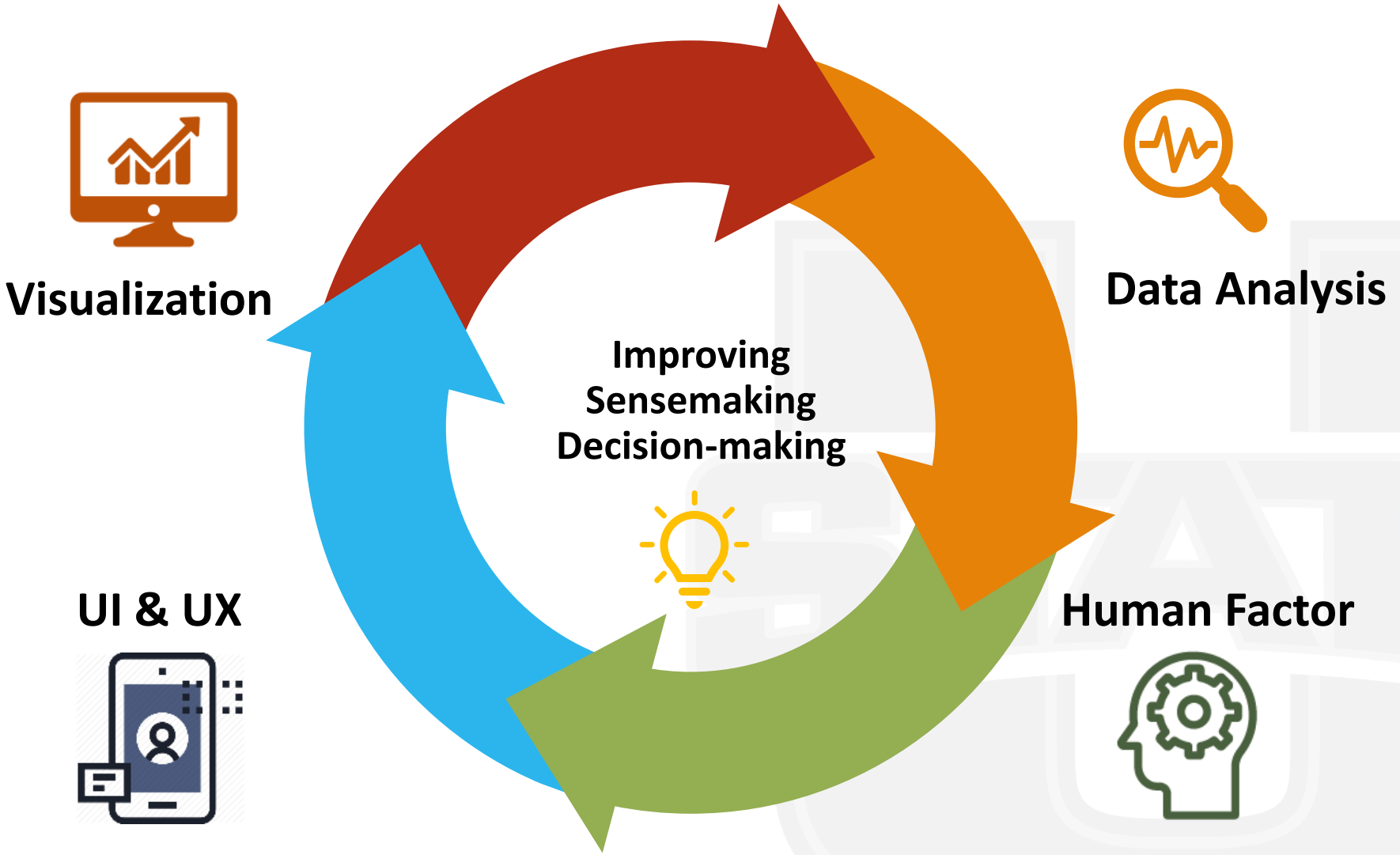
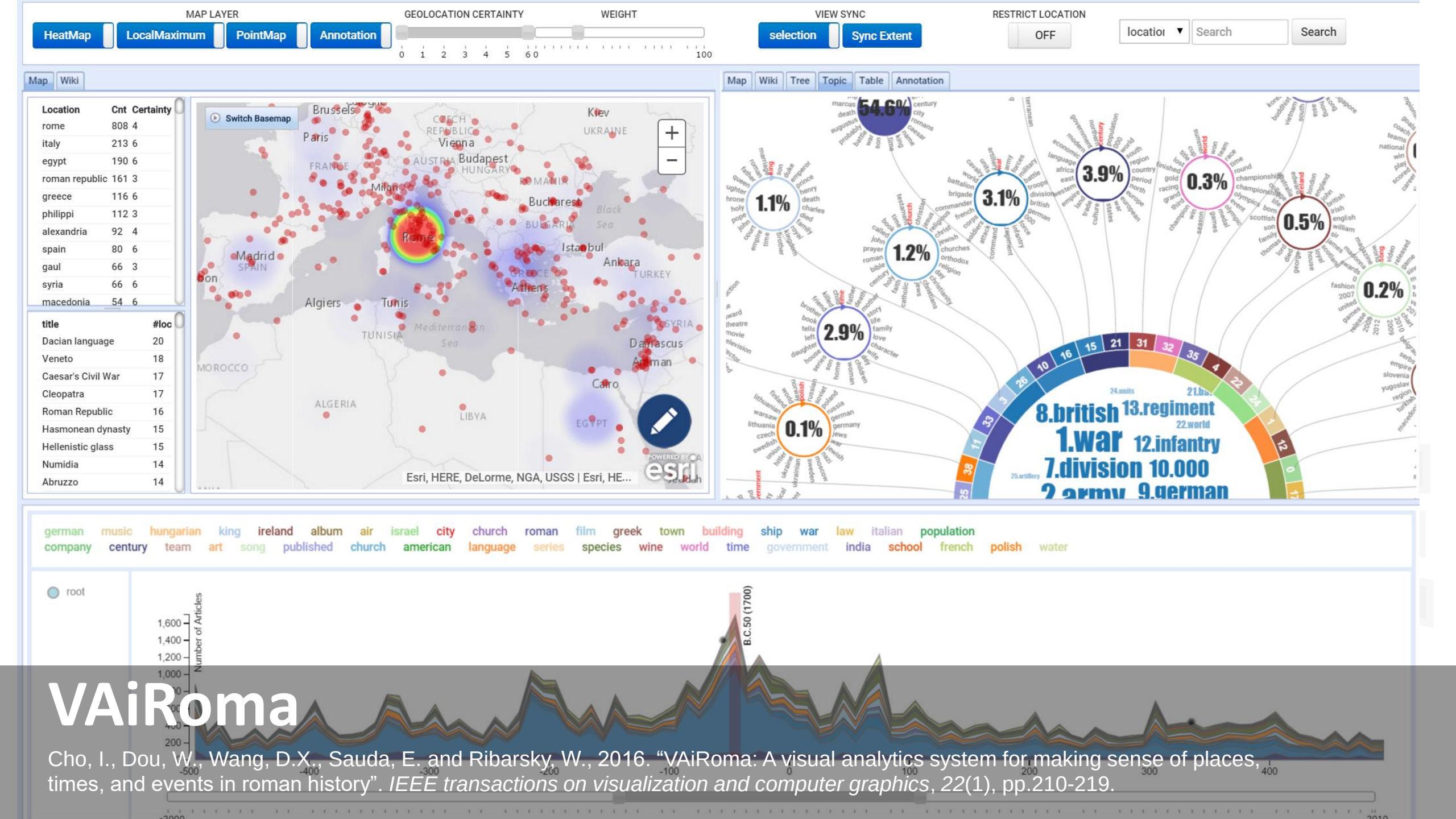
ACM CHI, IEEE ISMAR, IEEE TVCG, ACM TiiS ..

https://imgflip.com/i/1ioj9t


Visualization
Data Analysis
Improving
Sensemaking
Decision-making
UI & UX
Human Factor

Research Work

Google: “Isaac Cho Scholar”



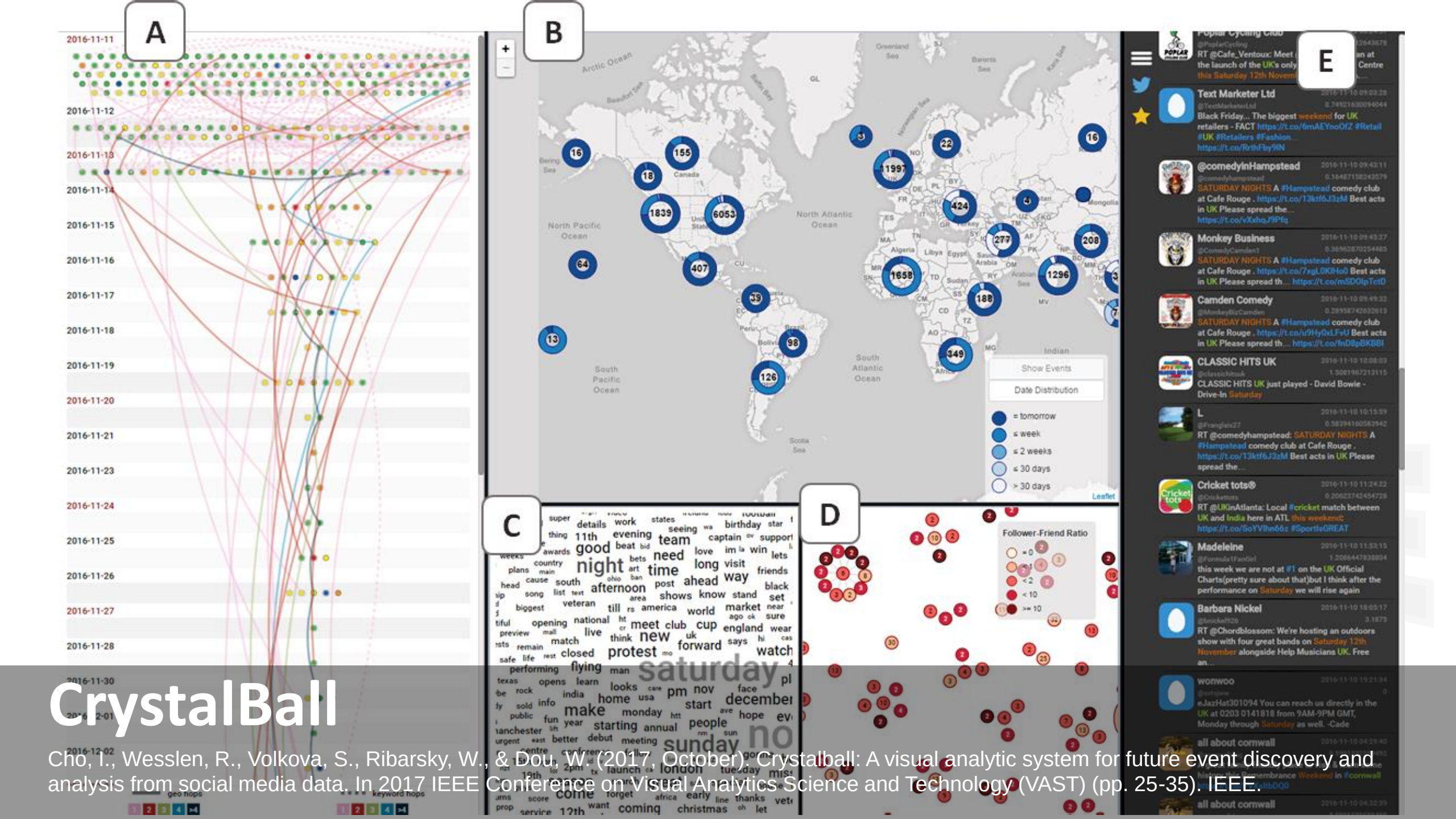
VAiRoma

Cho, I., Dou, W., Wang, D.X., Sauda, E. and Ribarsky, W., 2016. “VAiRoma: A visual analytics system for making sense of places, times, and events in roman history”. *IEEE transactions on visualization and computer graphics*, *22*(1), pp.210-219.

VAiRoma: A Visual Analytics System for Making Sense of Places, Times, and Events in Roman History

Isaac Cho, Wenwen Dou, Derek Xiaoyu Wang, Eric Sauda and William Ribarsky

Charlotte Visualization Center
UNC Charlotte



CrystalBall

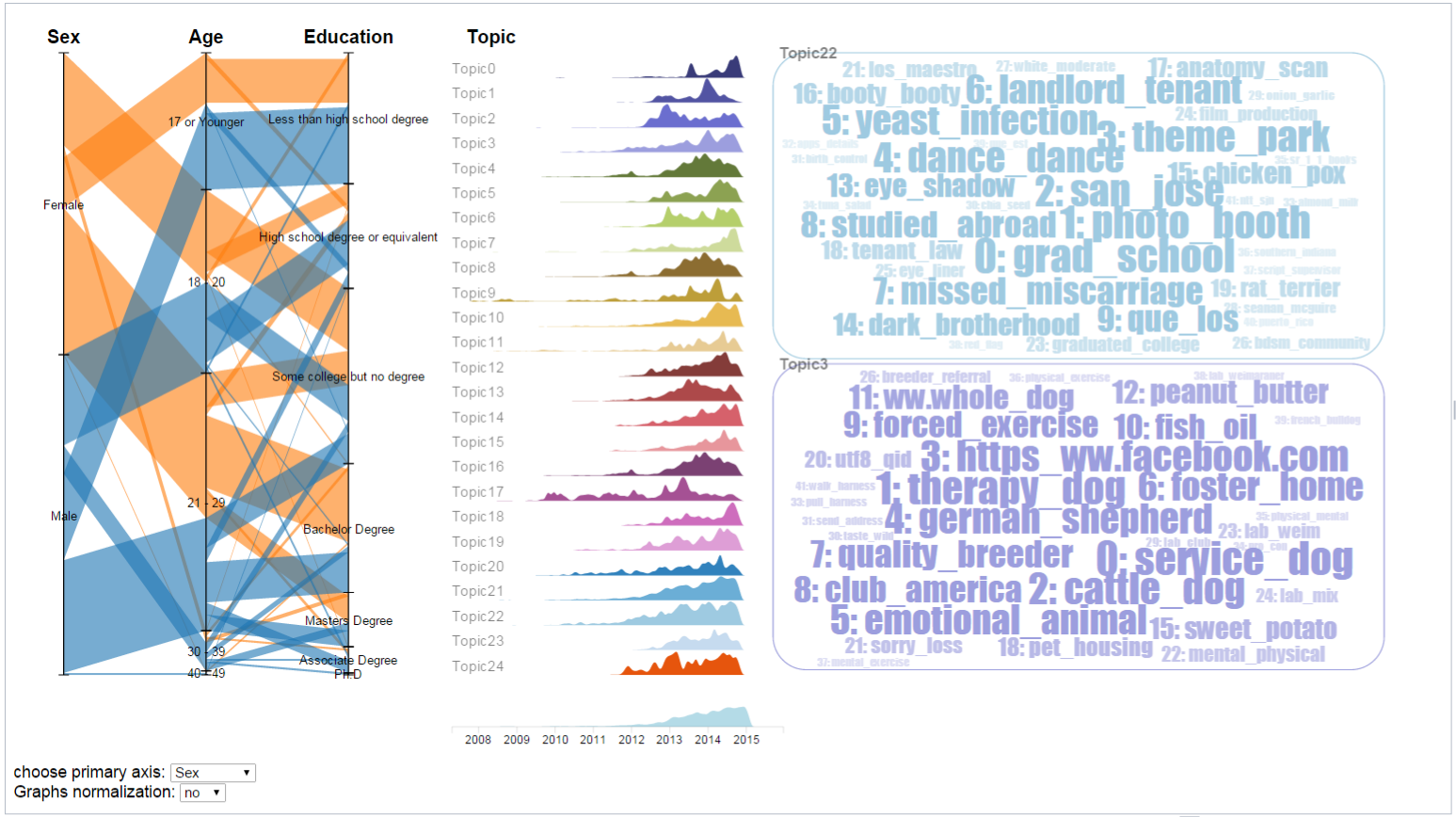
Cho, I., Wesslen, R., Volkova, S., Ribarsky, W., & Dou, W. (2017, October). Crystalball: A visual analytic system for future event discovery and analysis from social media data. In 2017 IEEE Conference on Visual Analytics Science and Technology (VAST) (pp. 25-35). IEEE.

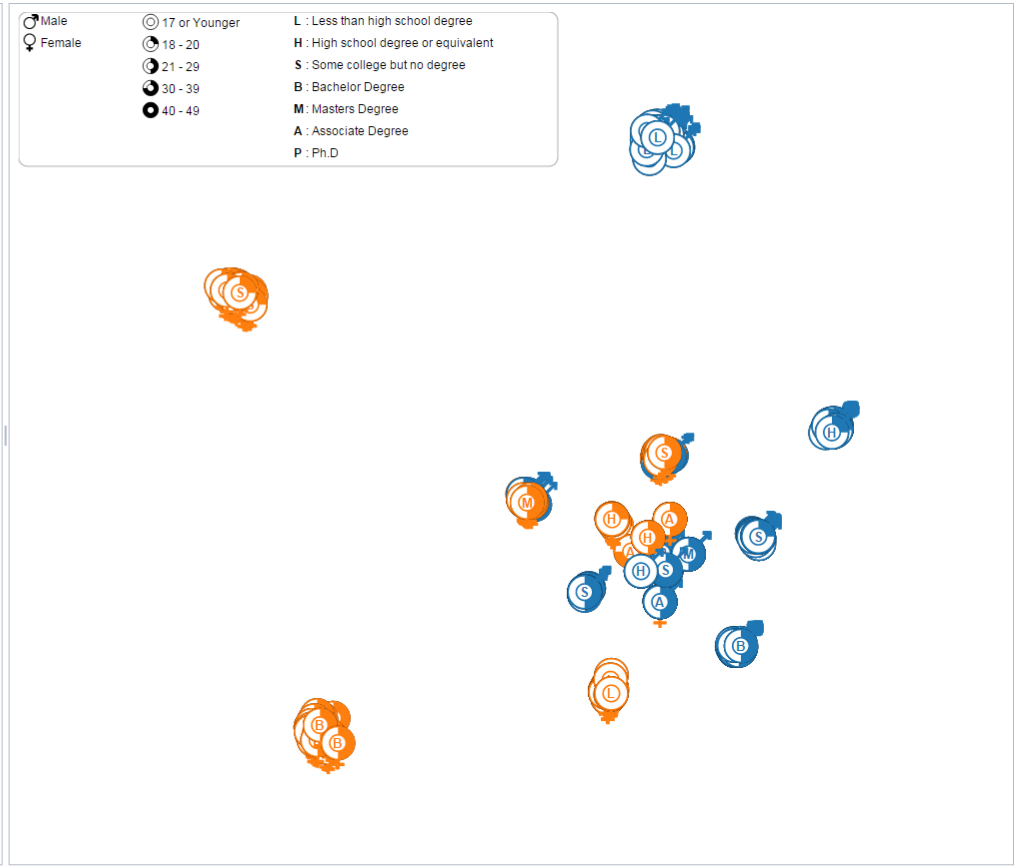
VAST PAPER

CrystalBall: A Visual Analytic System for Future Event Discovery and Analysis from Social Media Data

Isaac Cho, Ryan Wesslen, Svitlana Volkova, Bill Ribarsky, Wenwen Dou

VIS 2017
1-6 October 2017
Phoenix, Arizona, USA
ieeevis.org





	Female	Male	17 or Younger	18 - 20	21 - 29	30 - 39	Less than high school degree	Bachelor Degree	Some college but no degree	High school degree or equivalent	Associate Degree
Linguistic ▲	33.15%	33.55%	3.01%	6.84%	4.50%	0%	0%	5.35%	0%	4.75%	10.63%
	anx	Dash	Comma	filler	future	you	achieve	SemiC	quant	present	relativ
	verb	Exclam	leisure	health	swear	filler	WC	adverb	posemo	negemo	time
	Dash	family	ingest	Dash	shehe	body	leisure	excl	AllPct	humans	filler
	Exclam	money	quant	work	work	they	see	time	assent	you	see
	cogmech	relig	WC	nonfl	SemiC	posemo	verb	i	money	leisure	affect
Topic	8.54%	17.83%	13.46%	9.75%	9.83%	0%	13.68%	0%	0%		37%
Subreddit	32.62%	32.49%	29.78%	13.94%	0%	21.63%	13.01%	0%	3.31%	ex) Cook, chat, movie	.09%
OtherInfo	4%	3.15%	0%	1.47%	1.09%	12.28%	7.57%	0%	2.5%	3.53%	13.66%
Linguistic	80 %	76. %	50 %	26. %	39.32%	%	3 61%	50.78%	39. %	66.27%	62.86%
Topic	8 %	85. %	3 %	%	57. %	9.07	5 .61%	50.78%	41. %	65.34%	63.75%
Subreddit	62.94%	90.74%	65.85%	%	57.05 %	%	67.37%	50.37%	57.42%	64.36%	61.61%
OtherInfo	83.57%	89.81%	65.08%	61.50%	56.13%	36.52%	68.32%	50.00%	53.54%	64.26%	66.70%

User	Title	Selftext	Topic	Ups	downs	Time
bl***	Anyone know what kind of dog this is?	Australian Cattle Dog aka blue or red heeler depending ...	dogpictures	43	0	9/3/2014
bl***	[Photo Friday] I got puppy fever!	[Service Dog puppy](http://i.imgur.com/VuCv31k.jpg). Sh...	dogs	20	0	6/5/2014
bl***	ACDRA took in 14 dogs from a neglect case in Mississipp...	[Australian Cattle Dog Rescue](http://www.acdra.org/) t...	AustralianCattleDog	15	0	9/3/2014
bl***	Anyone a member of Australian Cattle Dog Rescue Associa...	I've been a member for about a year. They're having a C...	AustralianCattleDog	7	0	6/0/2013
bl***	I really want an ACD but I don't know if my home is fit...	Dog parks shouldnt be the only source of exercise and p...	AustralianCattleDog	5	0	7/4/2013
bl***	Gifts that help animals	A lady in my cattle dog rescue started [this](http://gl...	dogs	5	0	11/3/2013
bl***	What breed of dog is this? I want him.	Australian Cattle Dog (aka blue or red heeler). Not a d...	dogpictures	4	0	8/3/2014
bl***	I just adopted a new doggy! Any ideas on what breed	Definitely looks like a cattle dog mix	dogs	3	0	0/3/2014

Title: Anyone know what kind of dog this is?

Selftext: Australian *Cattle Dog* aka blue or red heeler depending on their coloring. He looks very young.

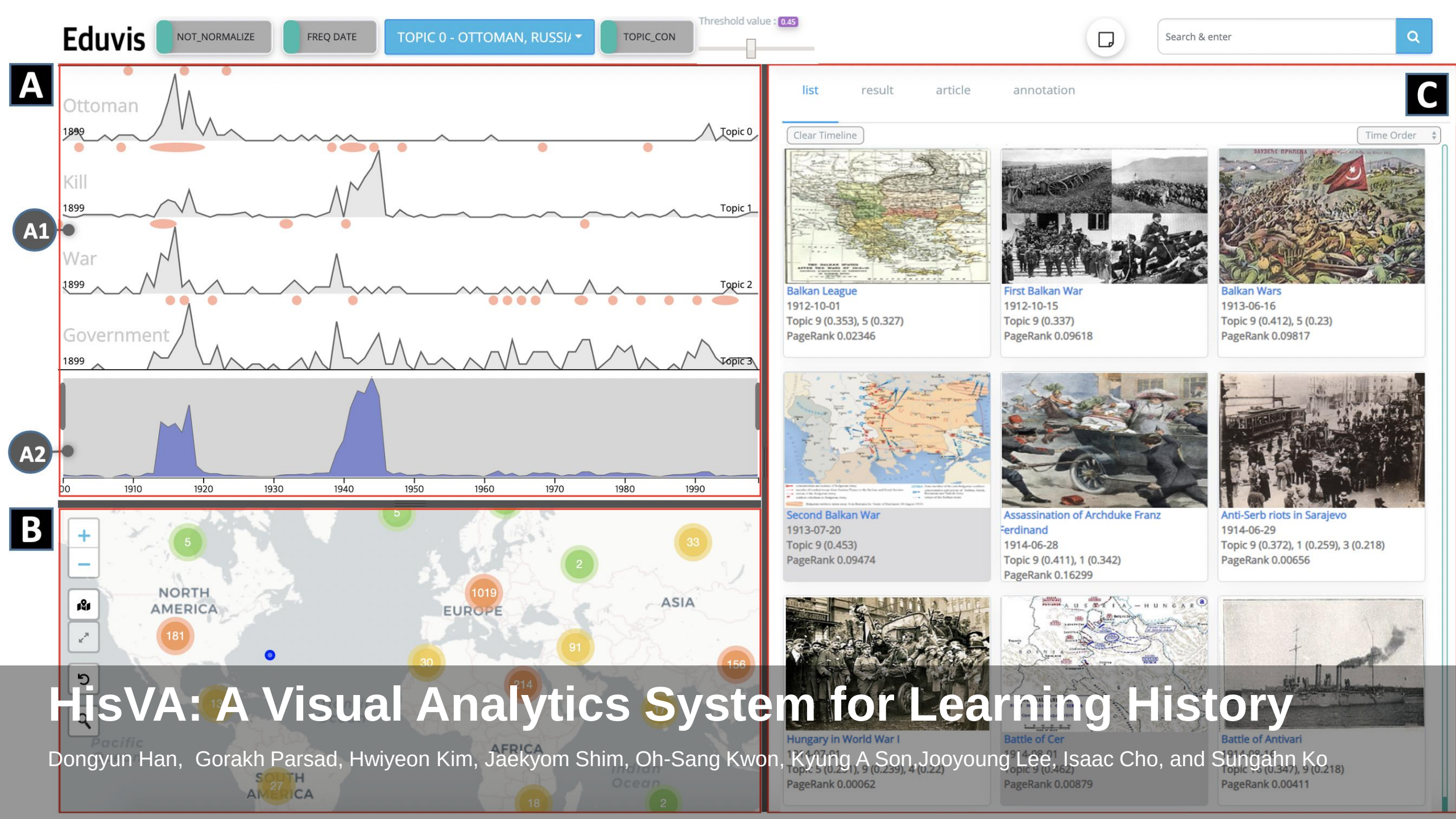
DemographicVis

Dou, W., Cho, I., ElTayeby, O., Choo, J., Wang, X., & Ribarsky, W. (2015, October). DemographicVis: Analyzing demographic information based on user generated content. In 2015 IEEE Conference on Visual Analytics Science and Technology (VAST) (pp. 57-64). IEEE.

DemographicVis: Analyzing Demographic Information based on User Generated Content

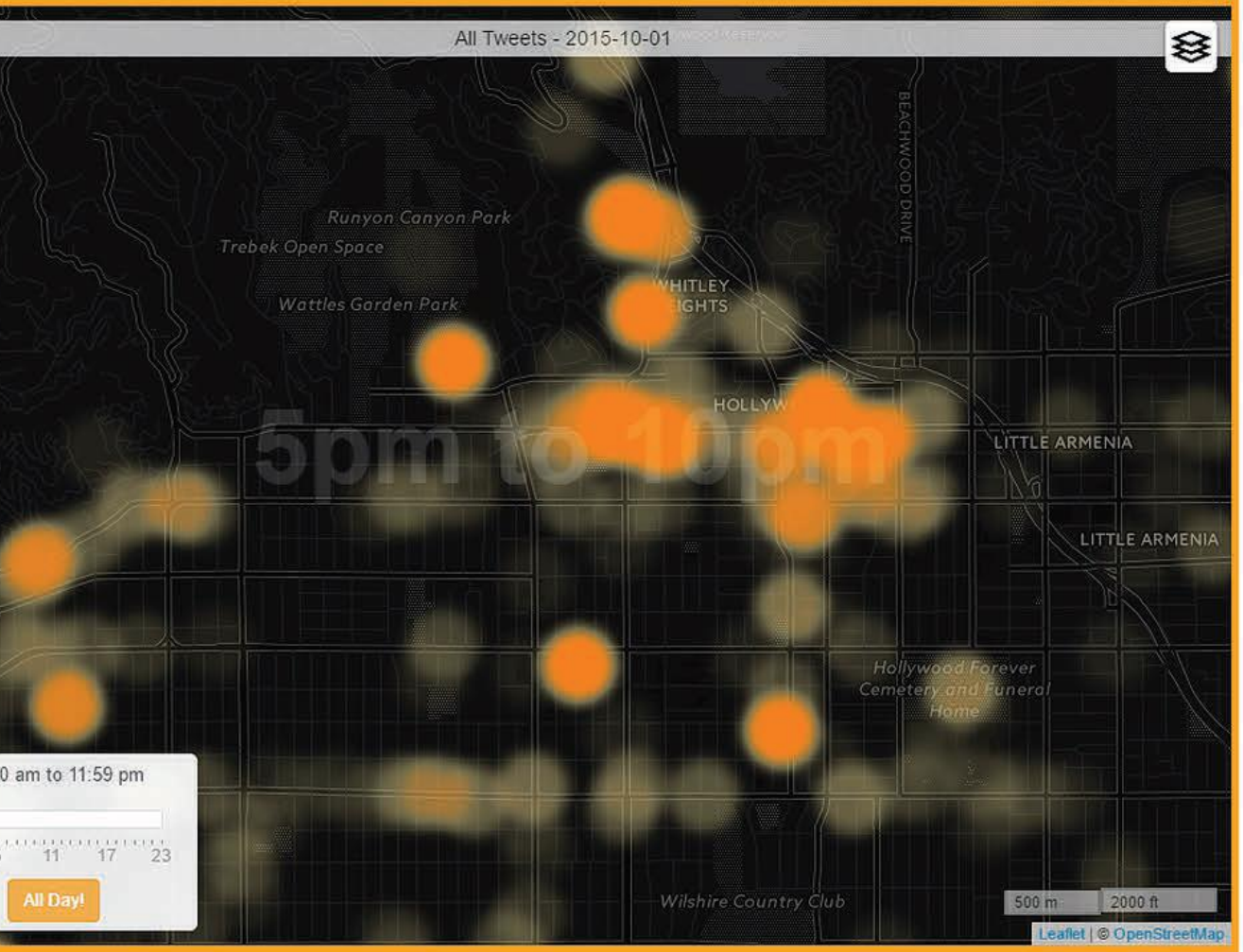
Wenwen Dou, Isaac Cho, Omar ElTayeby, Jaegul Choo, Derek Xiaoyu Wang and William Ribarsky

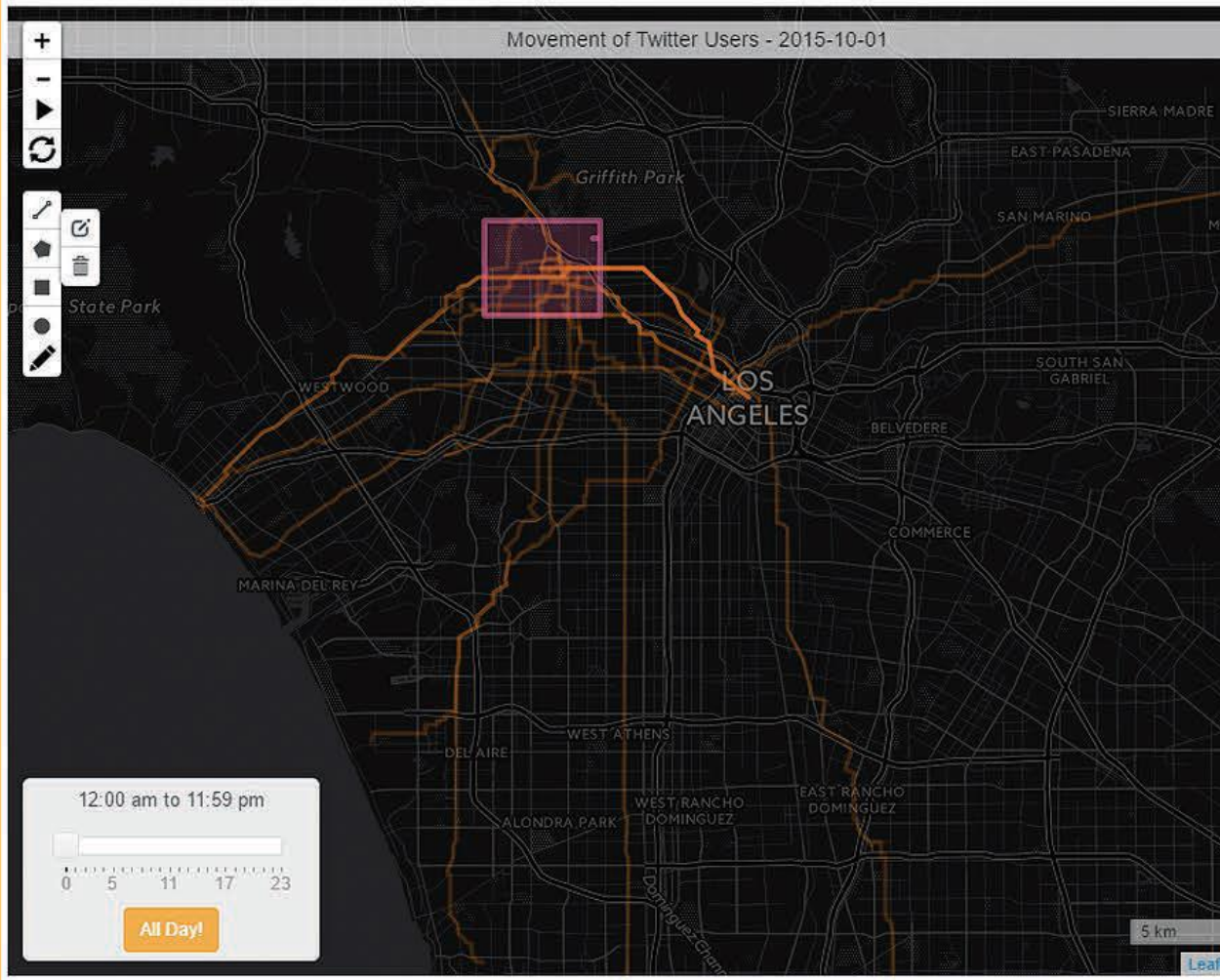
Charlotte Visualization Center
UNC Charlotte

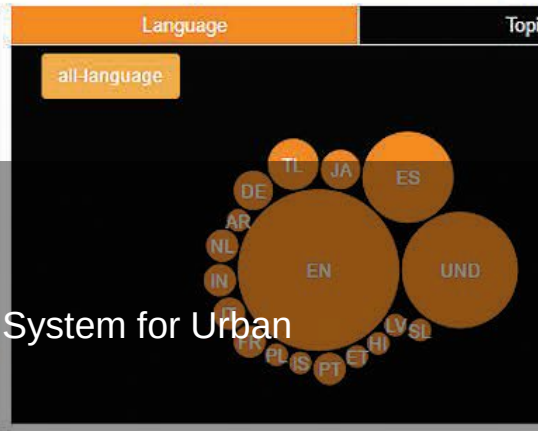


HisVA: A Visual Analytics System for Learning History

Dongyun Han, Gorakh Parsad, Hwiyeon Kim, Jaekyom Shim, Oh-Sang Kwon, Kyung A Son, Jooyoung Lee, Isaac Cho, and Sungahn Ko

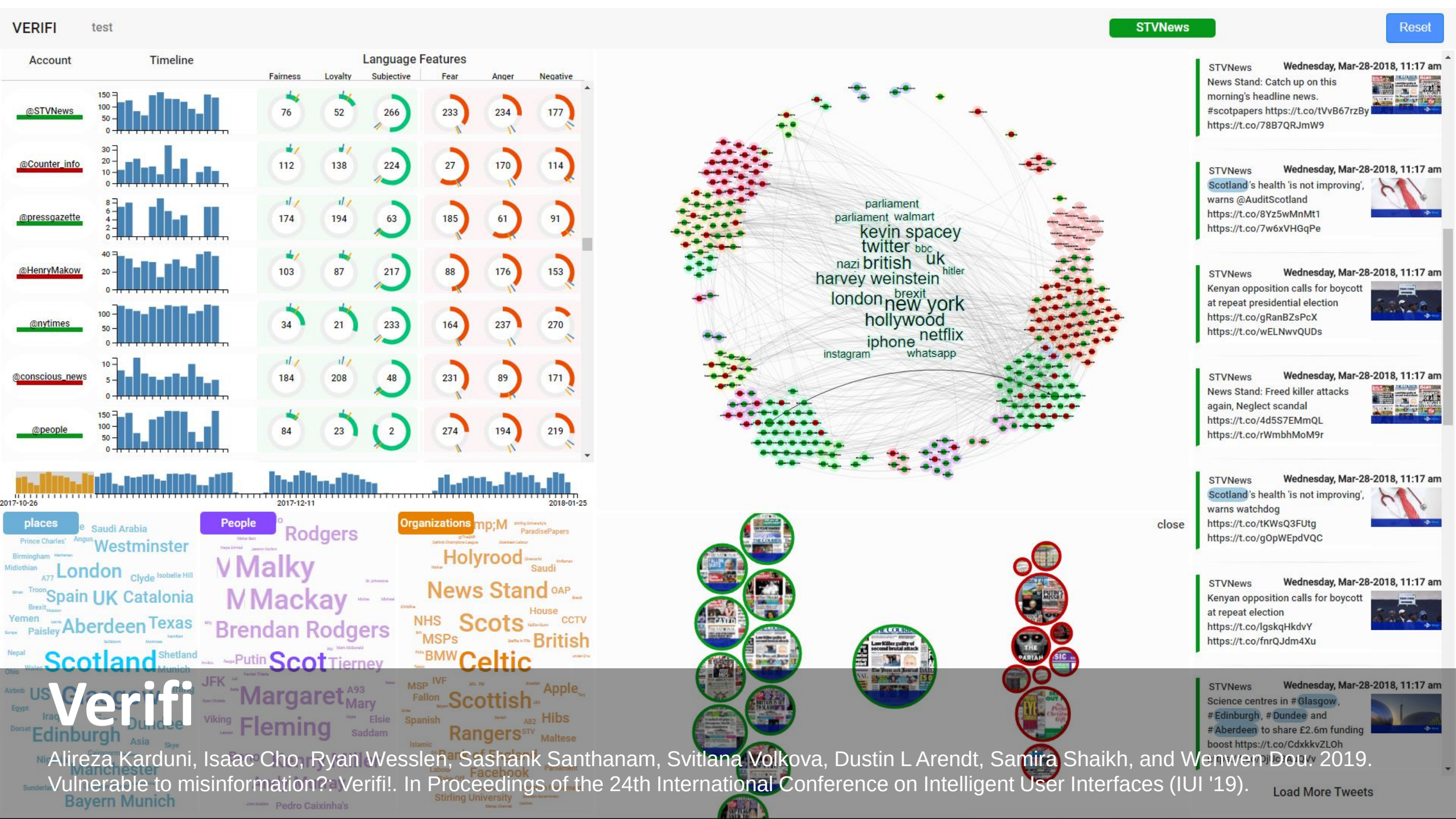






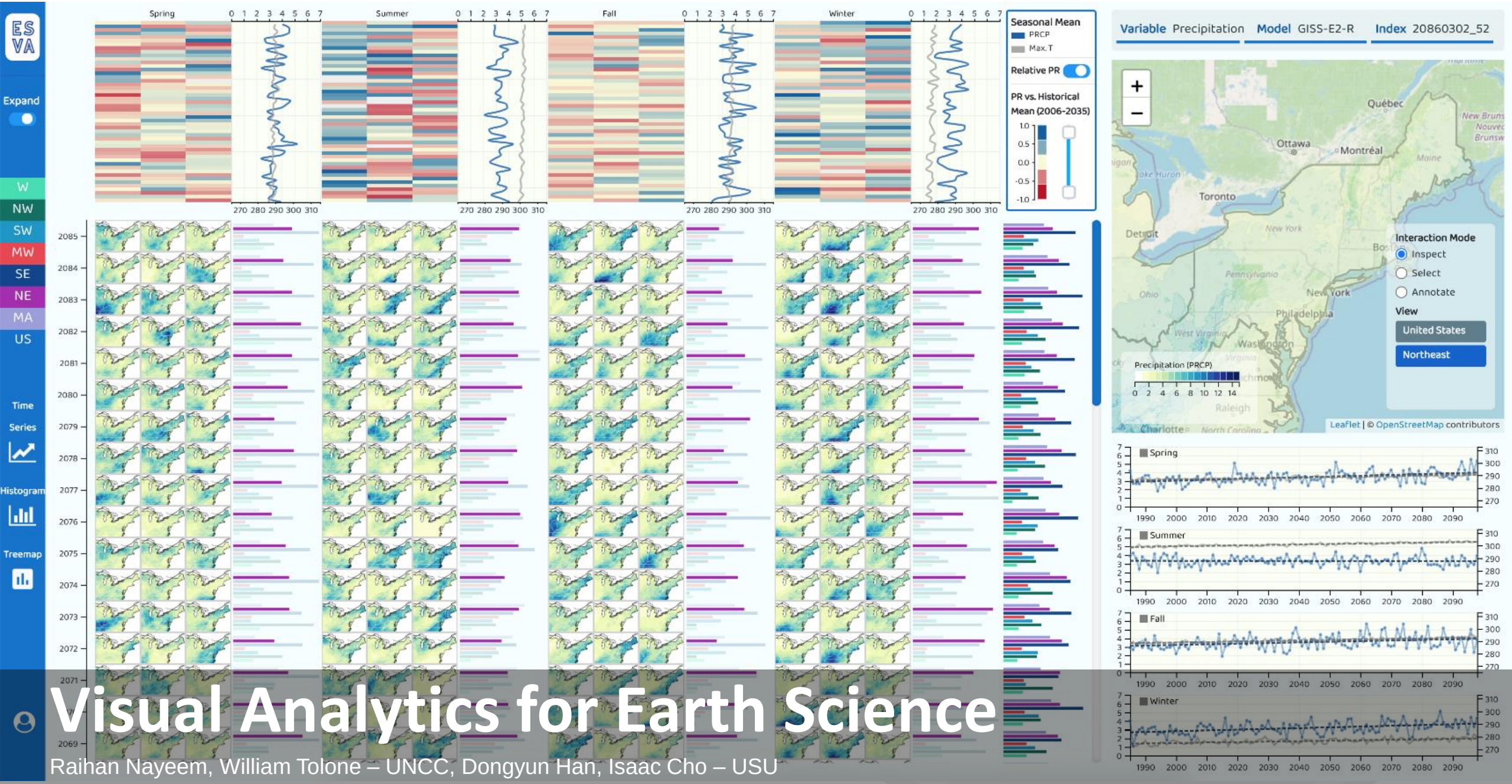
Urban Space Explorer

Karduni, A., Cho, I., Wessel, G., Ribarsky, W., Sauda, E., & Dou, W. (2017). Urban Space Explorer: A Visual Analytics System for Urban Planning. IEEE computer graphics and applications, 37(5), 50-60.



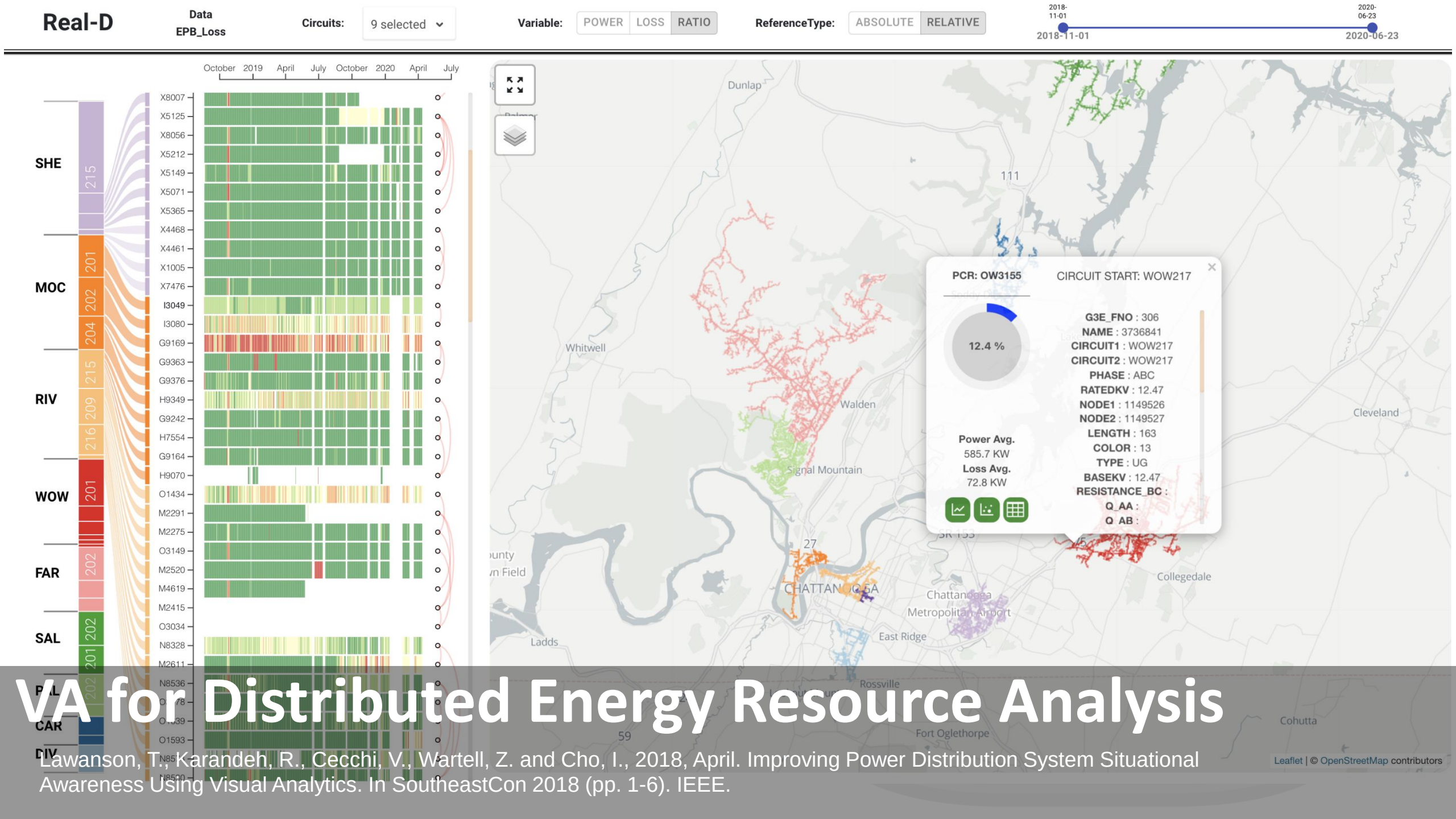
Verifi

Alireza Karduni, Isaac Cho, Ryan Wesslen, Sashank Santhanam, Svitlana Volkova, Dustin L Arendt, Samira Shaikh, and Wenwen Dou. 2019. Vulnerable to misinformation?: Verifi!. In Proceedings of the 24th International Conference on Intelligent User Interfaces (IUI '19).



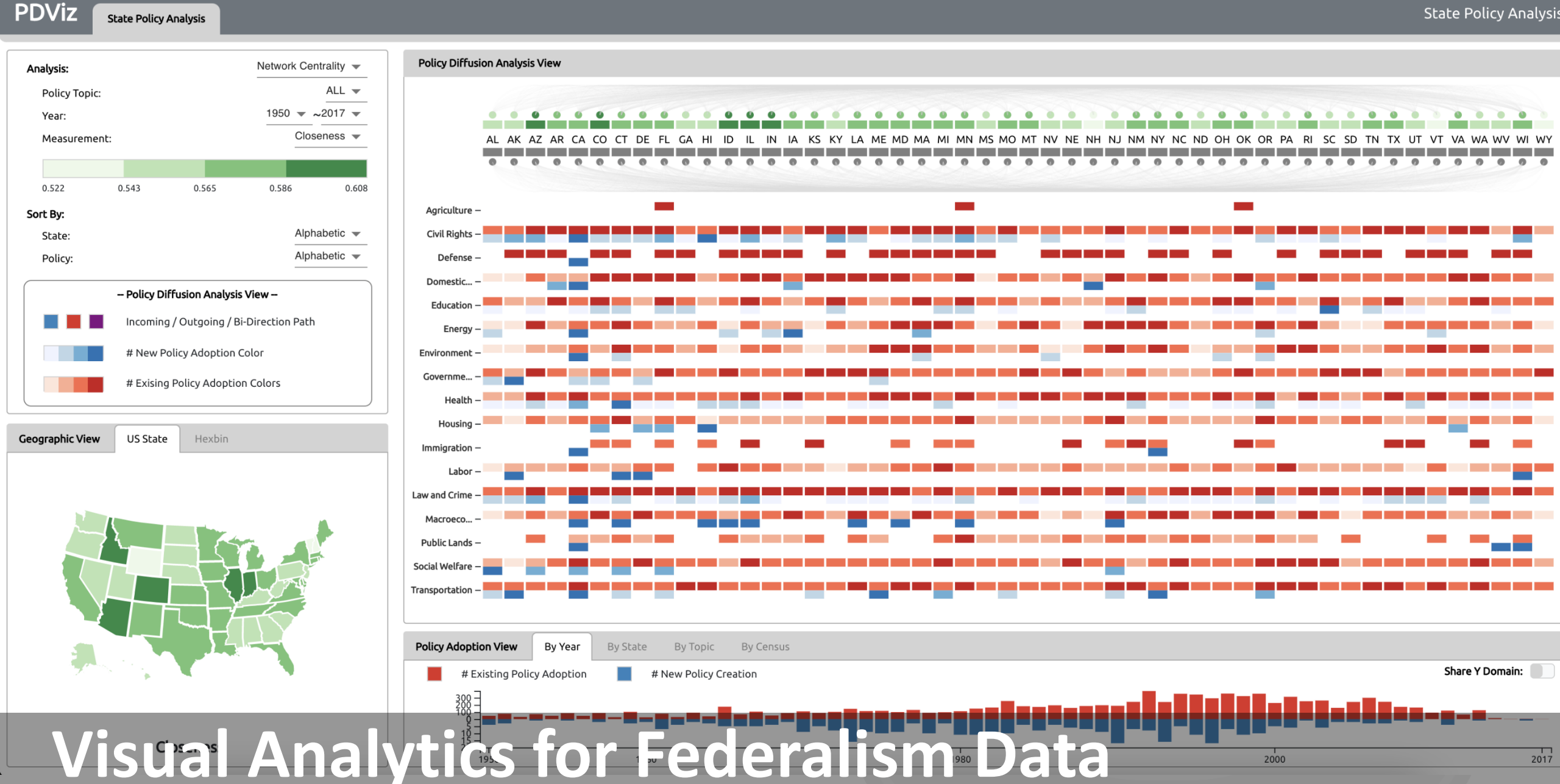
Visual Analytics for Earth Science

Raihan Nayeem, William Tolone – UNCC, Dongyun Han, Isaac Cho – USU
Kyo Lee, Daniel Crichton – NASA JPL



VA for Distributed Energy Resource Analysis

Lawanson, T., Karandeh, R., Cecchi, V., Wartell, Z. and Cho, I., 2018, April. Improving Power Distribution System Situational Awareness Using Visual Analytics. In SoutheastCon 2018 (pp. 1-6). IEEE.

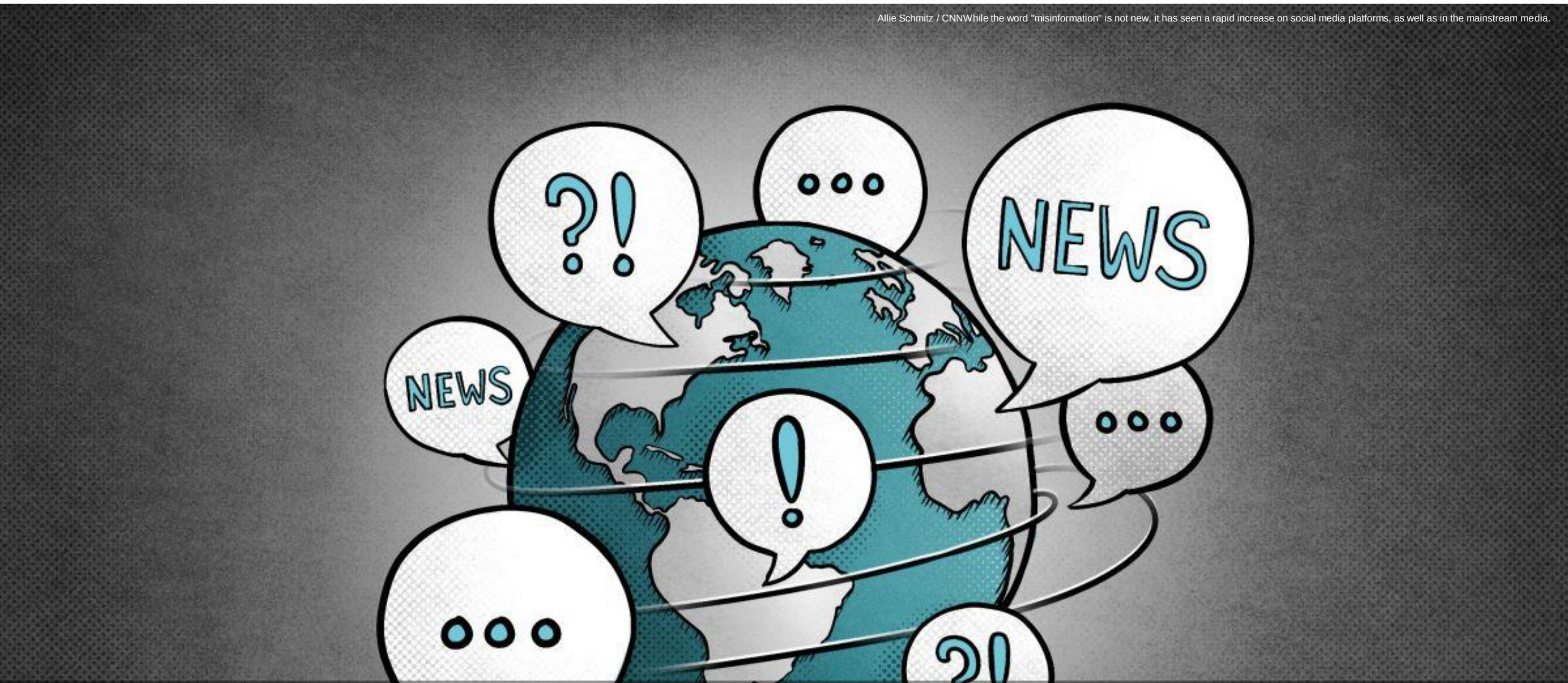


Visual Analytics for Federalism Data

NSF - Convergence Accelerator (C-Accel) Dongyun Han, Isaac Cho – USU, Jason Windett, Samira Shaikh – UNCC
OpenState, RPI, University of Notre Dame, Northwestern etc

The Anchoring Effect in Decision-Making with Visual Analytics

Cho I, Wesslen R, Karduni A, Santhanam S, Shaikh S, Dou W. The anchoring effect in decision-making with visual analytics. In2017 IEEE Conference on Visual Analytics Science and Technology (VAST) 2017 Oct 3 (pp. 116-126). IEEE.

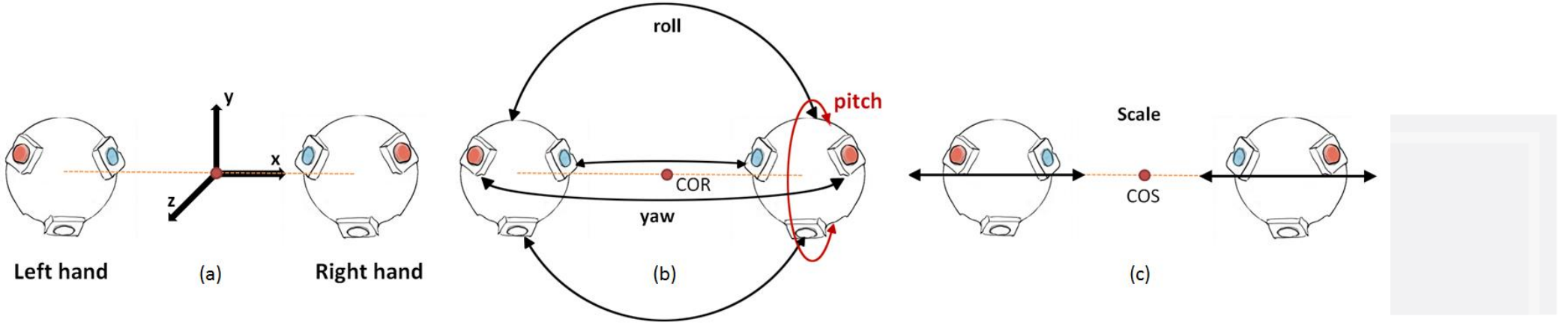


Allie Schmitz / CNNWhile the word "misinformation" is not new, it has seen a rapid increase on social media platforms, as well as in the mainstream media.

Investigating Effects of Visual Anchors on Decision-Making about Misinformation

Wesslen, R., Santhanam, S., Karduni, A., Cho, I., Shaikh, S. and Dou, W., 2019, June. Investigating Effects of Visual Anchors on Decision-Making about Misinformation. In Computer Graphics Forum (Vol. 38, No. 3, pp. 161-171)

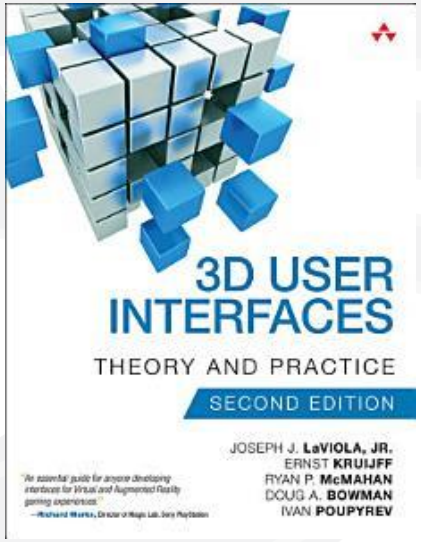
3D User Interfaces in Virtual Environments

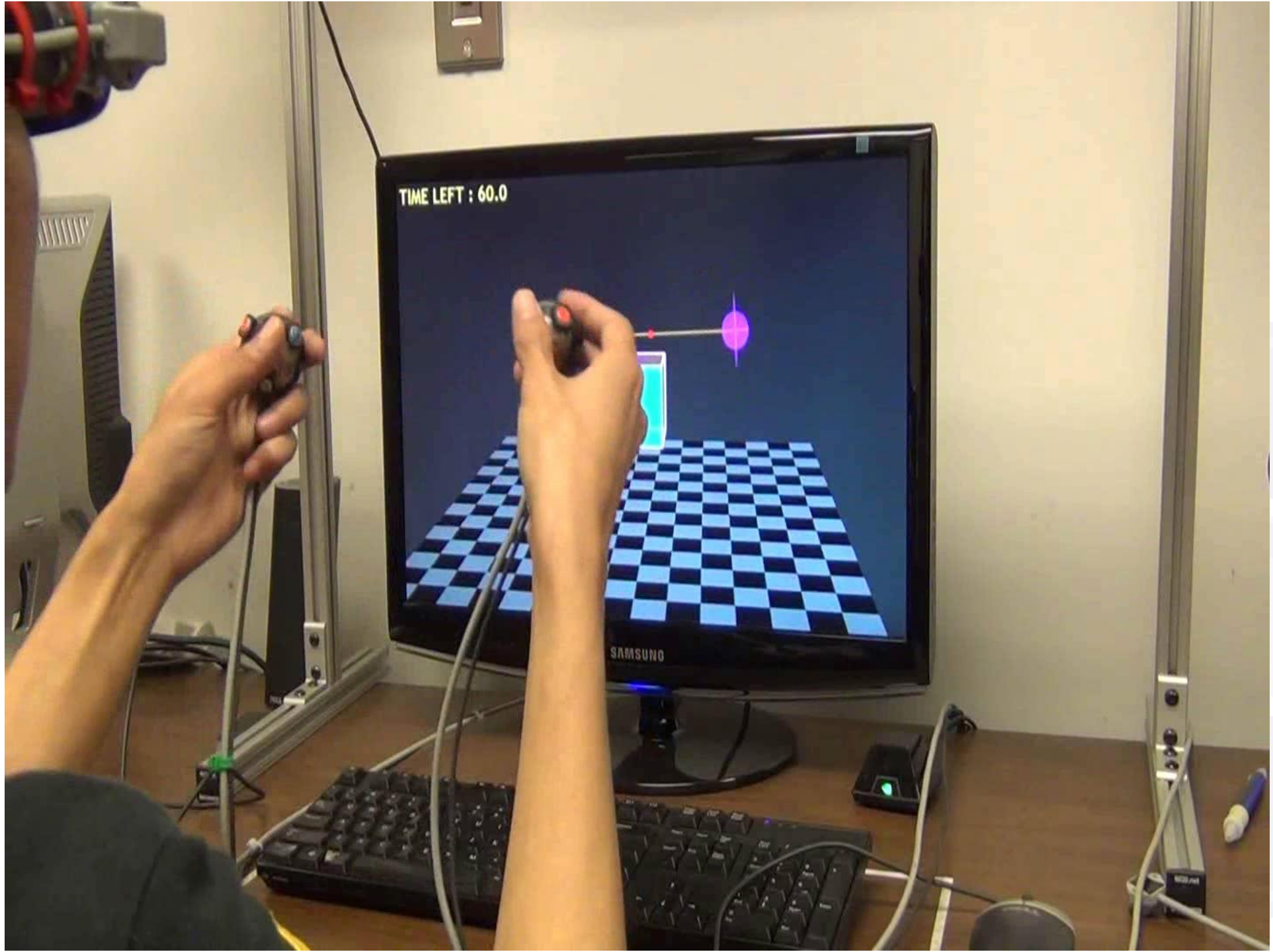


7DOF Manipulation: x,y,z + yaw,pitch,roll + scale

- Cho, I., & Wartell, Z. (2015, March). Evaluation of a bimanual simultaneous 7DOF interaction technique in virtual environments. In *2015 IEEE Symposium on 3D User Interfaces (3DUI)* (pp. 133-136). IEEE.
    - https://www.youtube.com/watch?v=nF4egFHyLYM

- 3D User Interfaces: Theory and Practice, Edition 2, Joseph J. LaViola Jr.Ernst KruijffRyan P. McMahanDoug BowmanIvan P. Poupyrev, Addison-Wesley Professional

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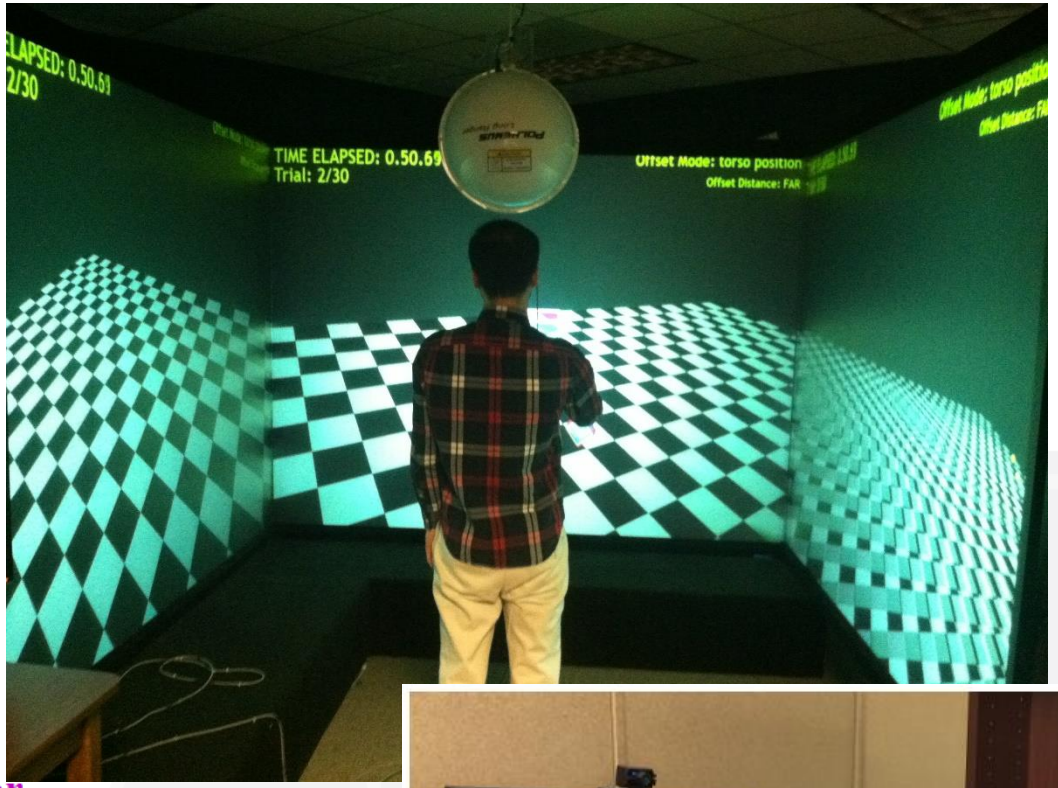
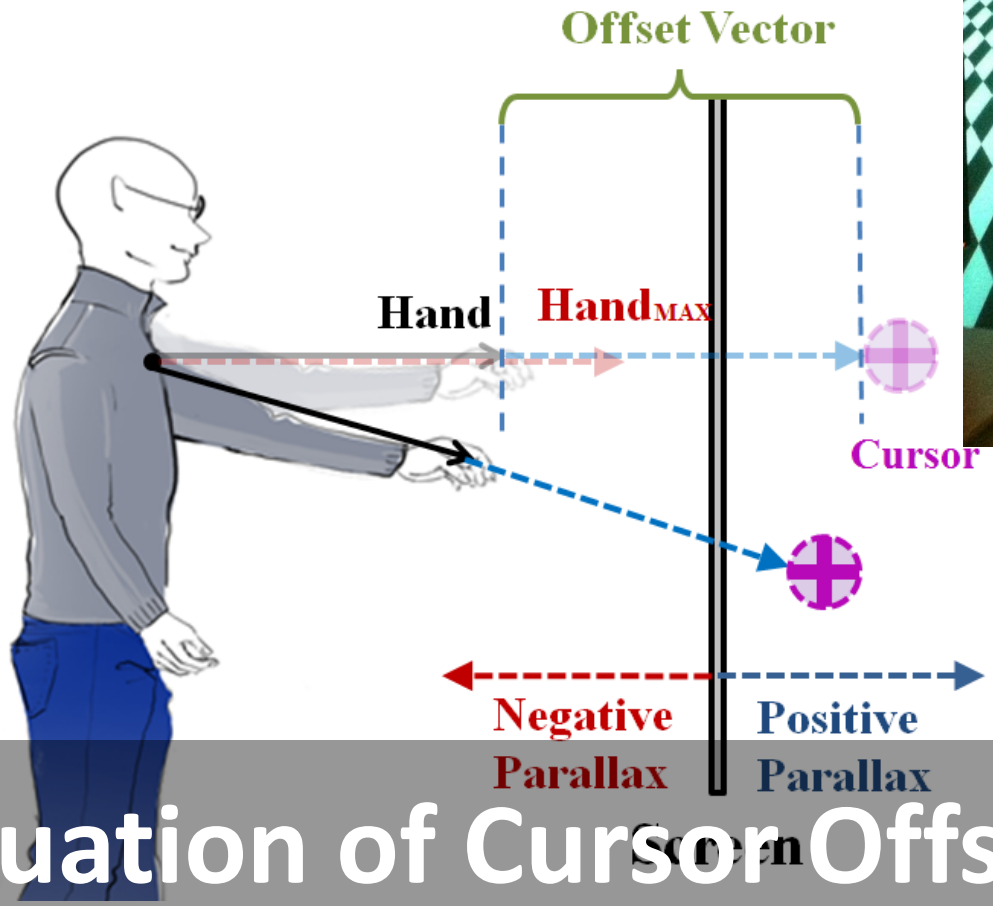
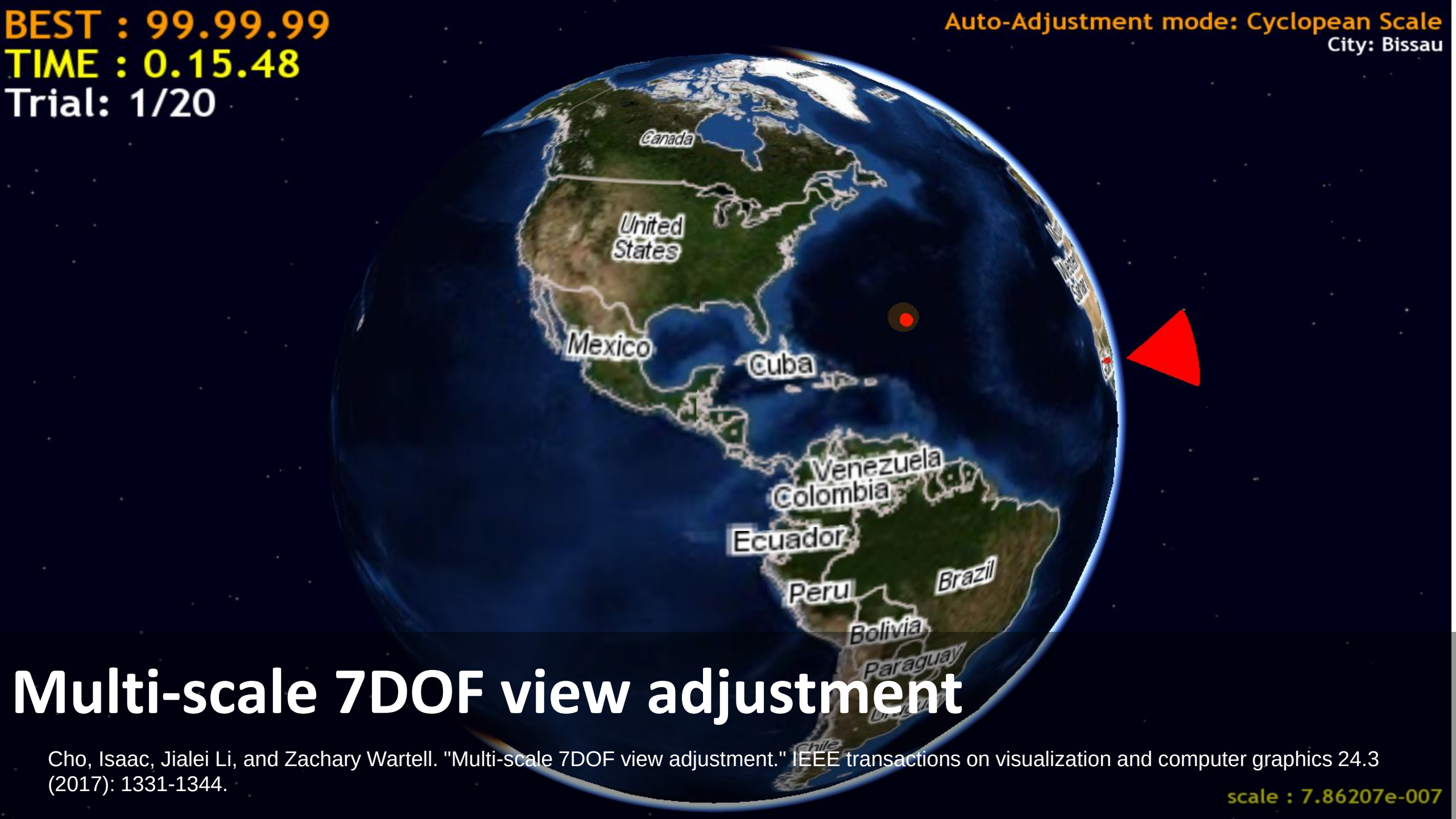
SAMSUNG





Evaluation of Cursor Offset on 3D Selection in VR

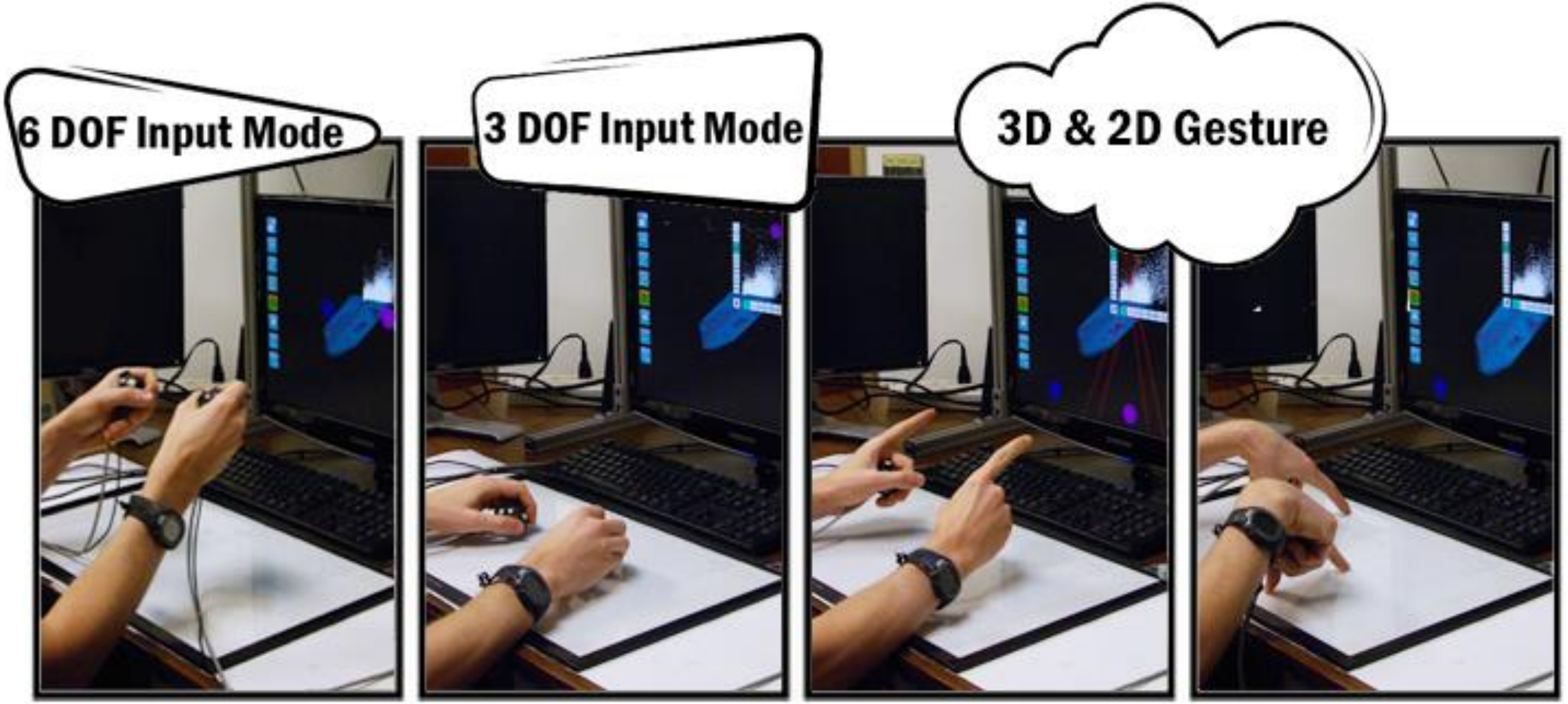
Li, J., Cho, I. and Wartell, Z., 2018, October. Evaluation of cursor offset on 3d selection in vr. In Proceedings of the Symposium on Spatial User Interaction (pp. 120-129).



Multi-scale 7DOF view adjustment

Cho, Isaac, Jialei Li, and Zachary Wartell. "Multi-scale 7DOF view adjustment." IEEE transactions on visualization and computer graphics 24.3 (2017): 1331-1344.

BEST : 99.99.99
TIME : 0.00.00
Trial: Tutorial



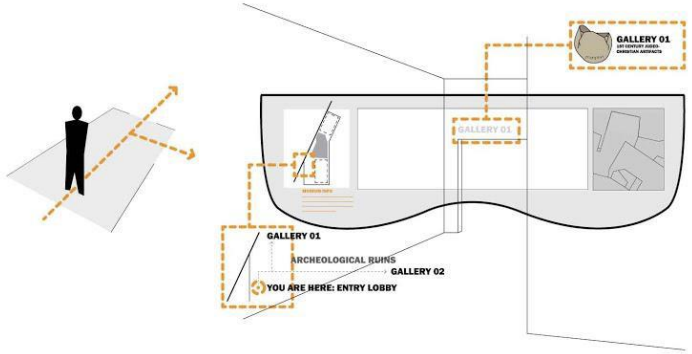
HyFinBall: a two-handed, hybrid 2D/3D desktop VR interface for multi-dimensional visualization

Cho, Isaac, Xiaoyu Wang, and Zachary J. Wartell. "HyFinBall: a two-handed, hybrid 2D/3D desktop VR interface for multi-dimensional visualization." Visualization and Data Analysis 2014. Vol. 9017. International Society for Optics and Photonics, 2014.

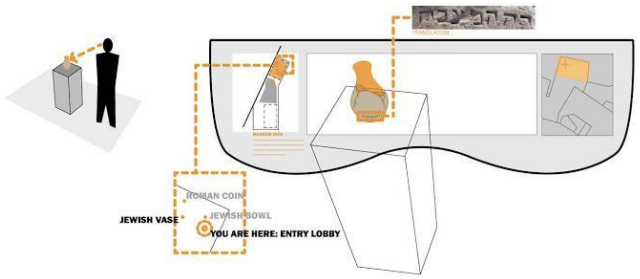
Mixed Reality & 3DUI

- Mixed Reality for Architecture Design

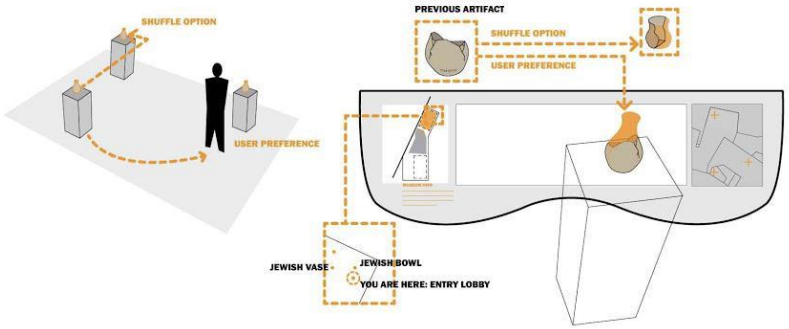
HOLOLENS INTERFACE



USER DEFINED EXPERIENCE

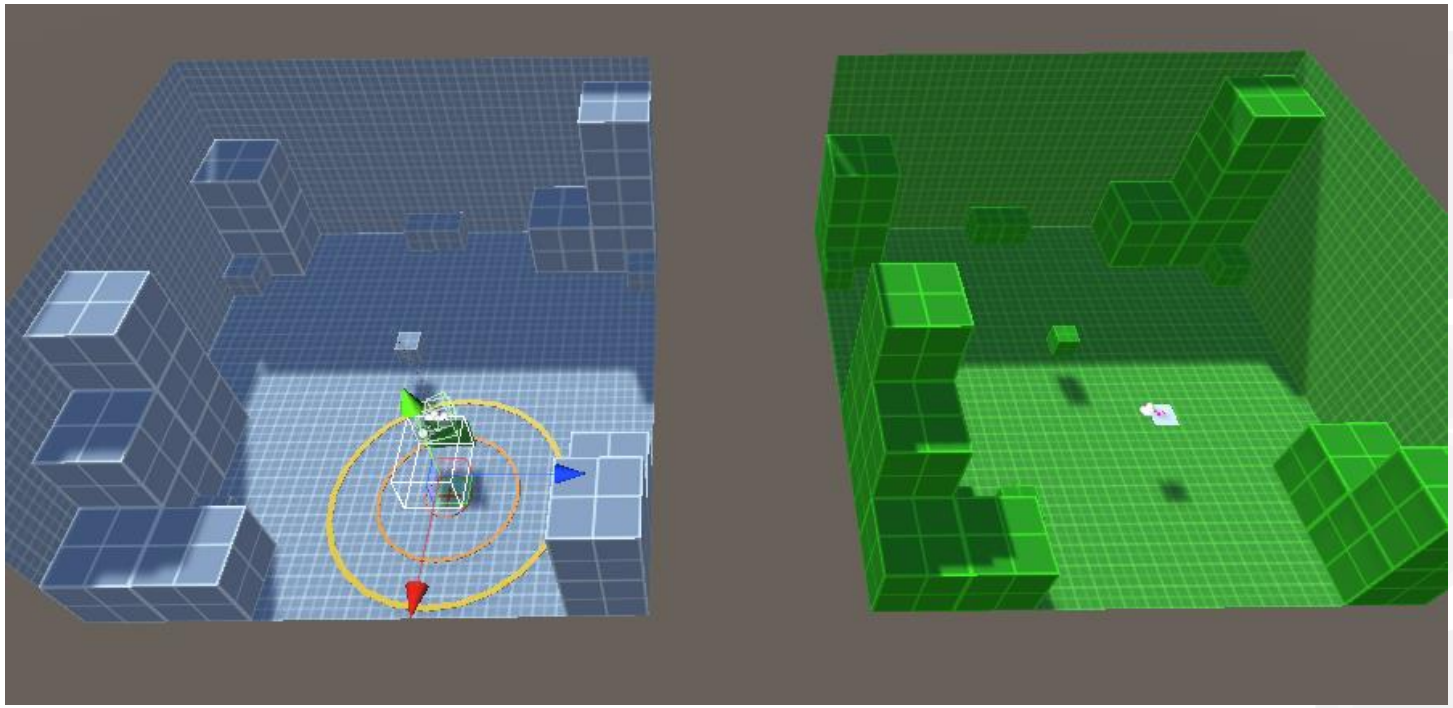


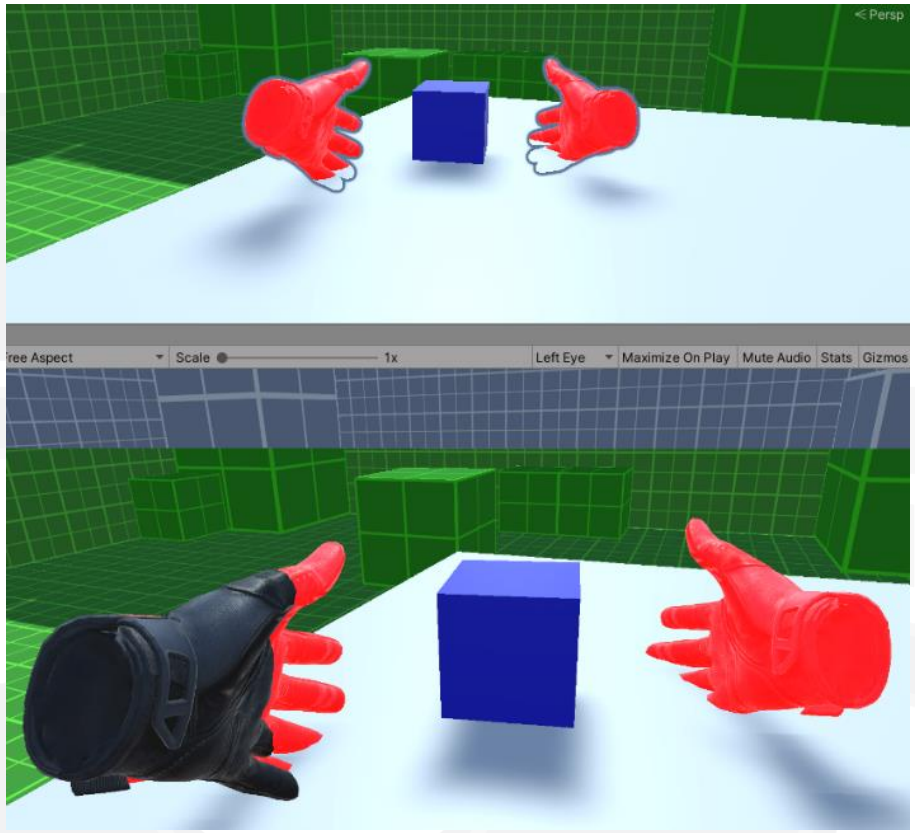
ARTIFACT ENGAGEMENT INTERFACE



MULTI-USER EXPERIENCE INTERFACE

3DUI




Persp
ree Aspect
Scale
1x
Left Eye
Maximize On Play
Mute Audio
Stats
Gizmos

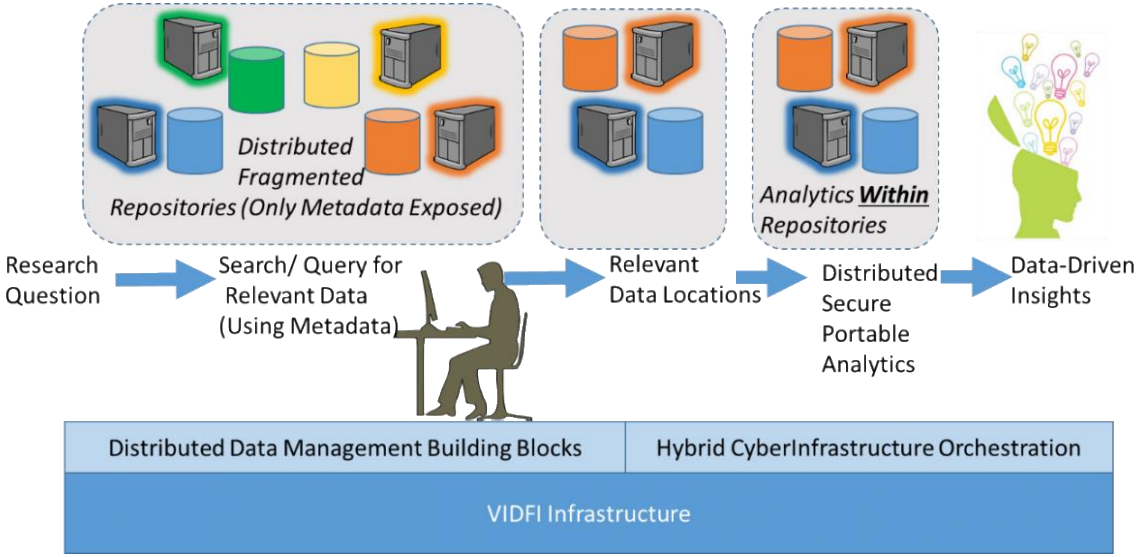
What I want to do at ?

https://www.kaspersky.com/resource-center/threats/security-and-privacy-risks-of-ar-and-vr

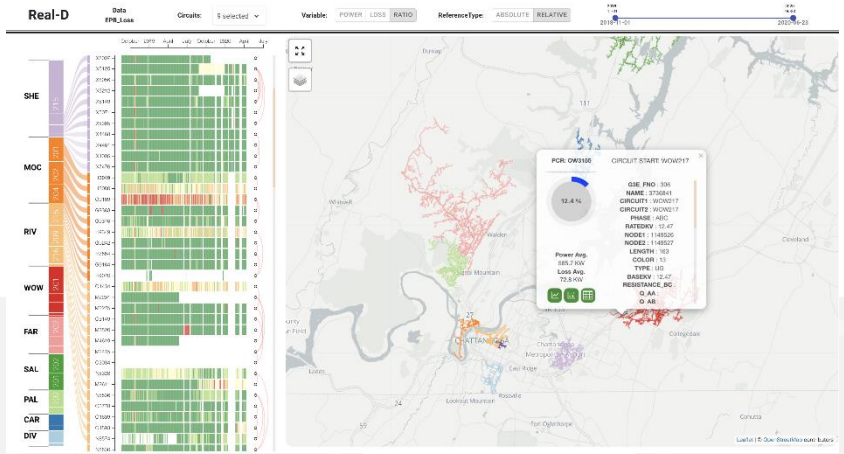
- **VizUS (Visualization lab at Utah State)**
  - Viz + VR Makerspace
  - Old Main 406
  - https://cs.usu.edu/faculty-sites/vizus-lab/

Vive Pro Eye system
Oculus Quest 2
Workstation with GTX 3090, 64 GB Ram
49" ultra wide display
Data/Web server
hololens 2
Motion Capture Cameras
120" 3D ready display
3D printer
AI server (with 2 high-end Qaudro GPUs with 512 ram)
Workstation with Quadro GPU for stereoscopic 3D applications
iMac/mac mini
Microsoft Azure Kinect DKs
Driving simulator
3D ready workstations laptop
….

Virtual Information Fabric Infrastructure (VIFI)



Visual Analytics for Enhanced Decision-Making and Situational Awareness in Modern Distribution Systems



Building the Federalism Data and Advanced Statistics Hub (FDASH)

National Science Foundation
WHERE DISCOVERIES BEGIN

Computer Science

Computer Engineering

Architecture

Information Technology

Psychological Science

Political Science

Data Science

Parks, Recreation and Tourism Management

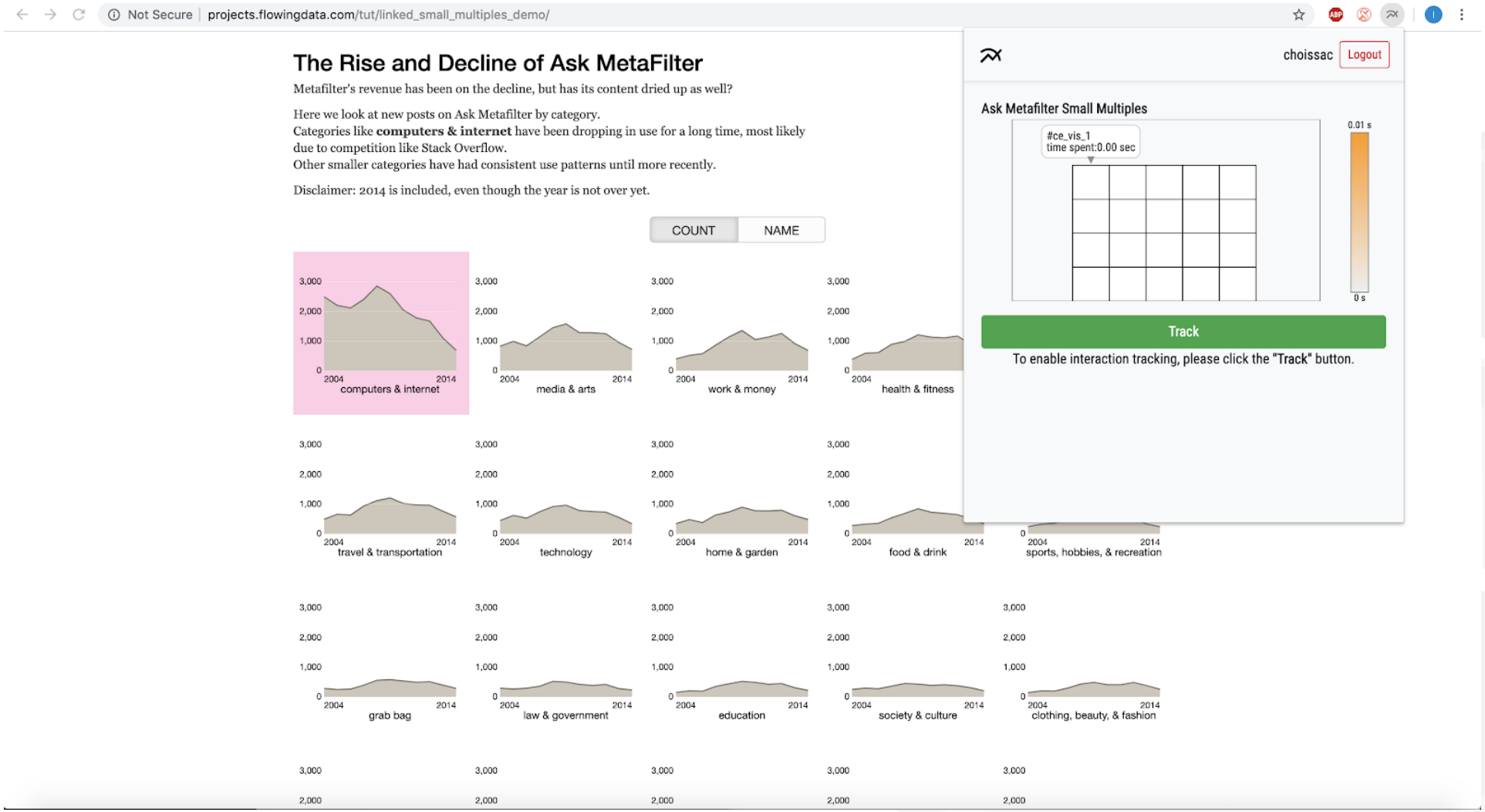
Systems Engineering and Engineering Management

Mechanical Engineering

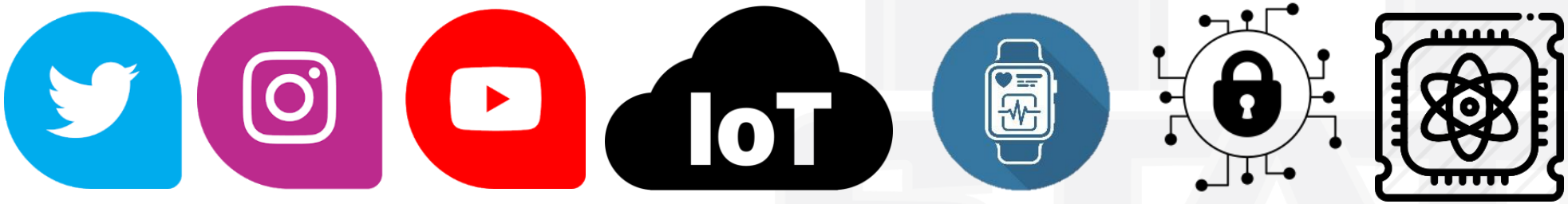
Construction Management

…

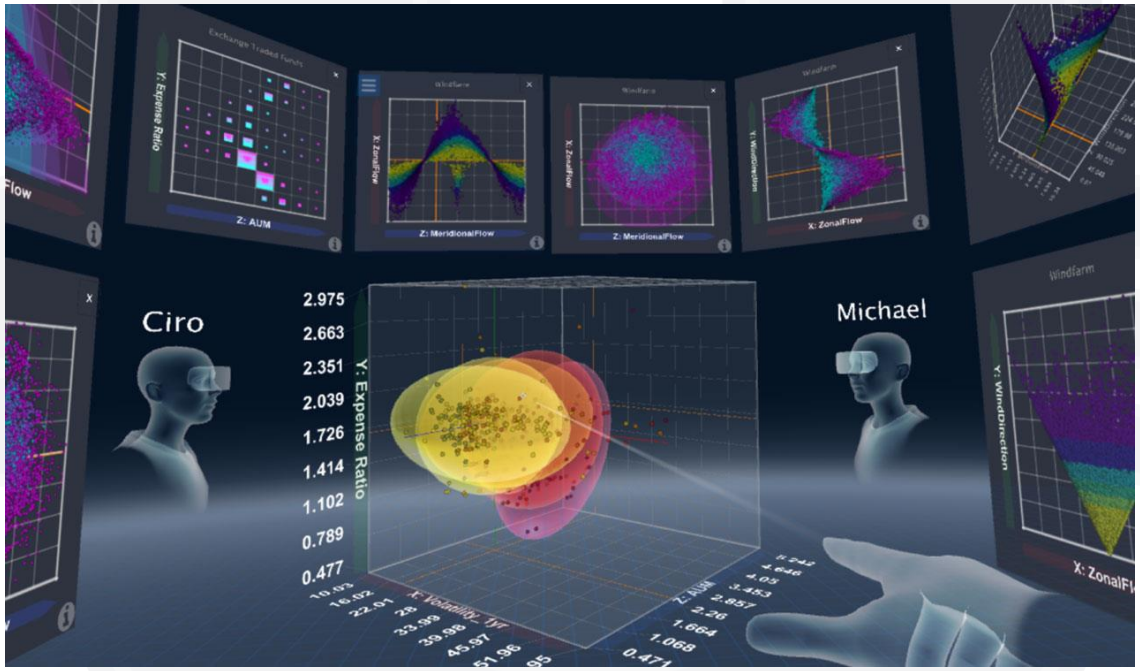
Interaction Log Analysis



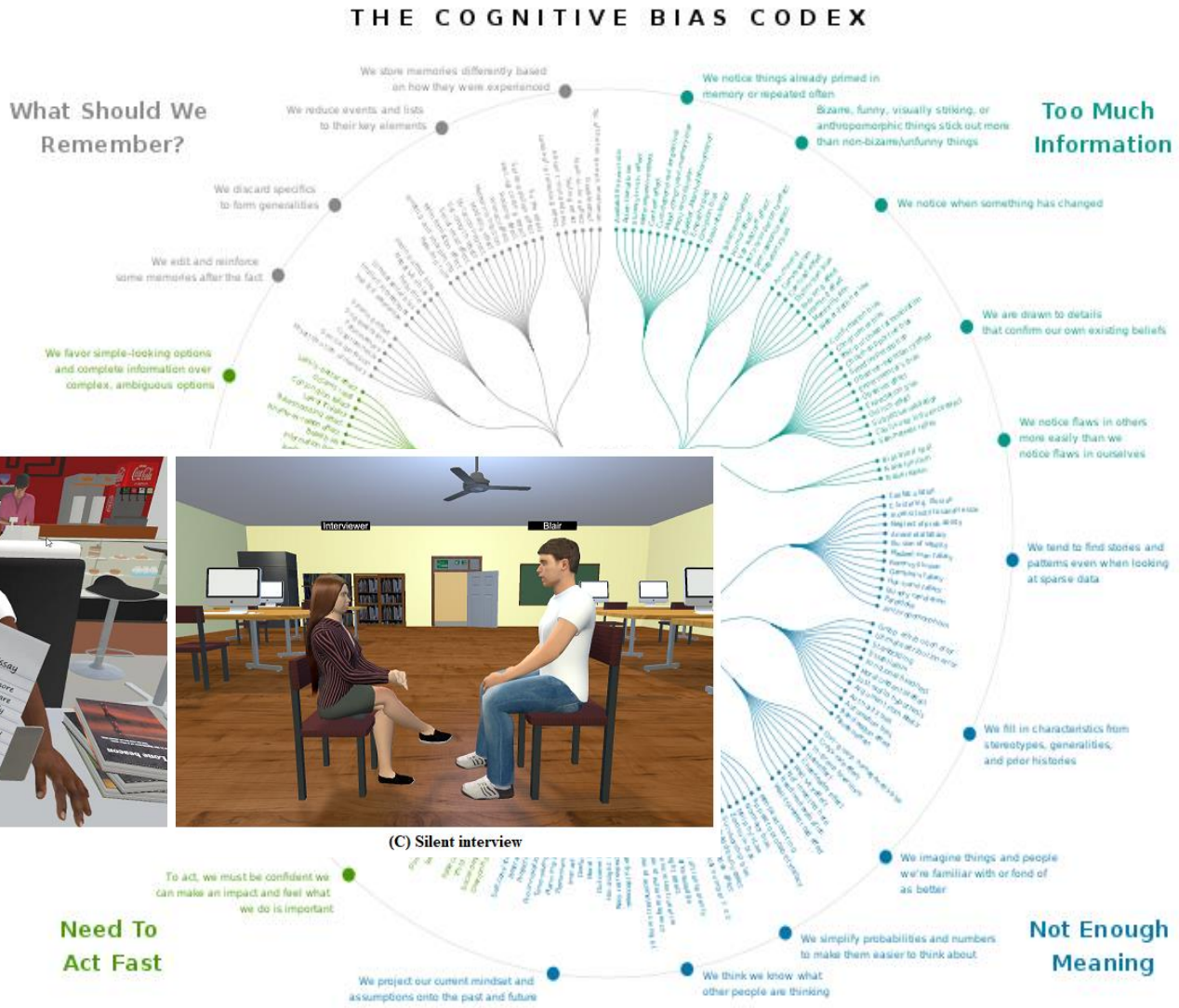
Interactive Visual Analytics with ML and AI for heterogeneous data



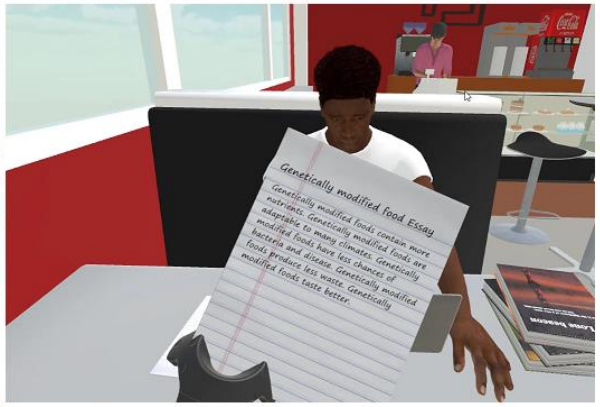
AR/VR/MR + Visual Analytics = Immersive Analytics



Human Cognitions in Decision Making (VA/VR/AR)



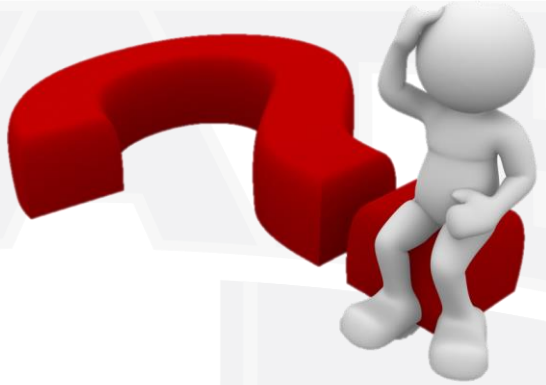
(A) Classroom



(B) Cafeteria

(C) Silent interview

Thank you

- **Isaac Cho (icho@usu.edu)**
  - https://cs.usu.edu/people/Isaac-cho/
  - Google “Isaac Cho"

- **VizUS:**
  - https://cs.usu.edu/faculty-sites/vizus-lab/
  - https://cs.usu.edu/faculty-sites/vizus-lab/pstudent