



POLO CHAU

Legal name:
Duen Horng Chau

Associate Professor, School of Computational Science & Engineering
Associate Director, MS in Analytics
Director of Industry Relations, The Institute for Data Engineering and Science
Associate Director of Corporate Relations, The Center for Machine Learning
Machine Learning Area Leader, College of Computing
Georgia Tech

[in](#) LinkedIn [t](#) Twitter [g](#) Google Scholar [y](#) YouTube

Admin: Carolyn Young Financial Manager: Arlene Washington
polo@gatech.edu www.cc.gatech.edu/~dchau
Office: CODA 1321 404-385-7682

POSITIONS

- Oct 2019 - Director of Industry Relations
[Institute for Data Engineering and Science](#), Georgia Tech
- Oct 2019 - Associate Director of Corporate Relations for Machine Learning
[The Center for Machine Learning](#), Georgia Tech
- May 2014 - Associate Director
[MS in Analytics](#), Georgia Tech
- Aug 2018 - Associate Professor
[School of Computational Science & Engineering](#), Georgia Tech
- Aug 2012 - Aug 2018 Assistant Professor
[School of Computational Science & Engineering](#), Georgia Tech
- Dec 2012 - Dec 2015 Adjunct Assistant Professor
[School of Interactive Computing](#), Georgia Tech

EDUCATION

- Aug 2012 **Ph.D. Machine Learning** Carnegie Mellon University
Thesis: [Data Mining Meets HCI: Making Sense of Large Graphs](#)
Award: [Carnegie Mellon SCS Dissertation Award, Honorable Mention](#)
Committee: [Christos Faloutsos](#), [Jason Hong](#), [Niki Kittur](#), [Jiawei Han](#) (UIUC)
- May 2010 **M.S. Machine Learning** Carnegie Mellon University
- Aug 2005 **Masters of Human-Computer Interaction** Carnegie Mellon University
- 2004 **B.Eng. Information Engineering (Honors)** The Chinese Univ. of Hong Kong
Online Auction Fraud Detection
Advisor: [Prof. Soung-Chang Liew](#)
- 2000 **Diocesan Boys' School** (high school) Hong Kong

RESEARCH AREAS & HIGHLIGHTS

The [Polo Club of Data Science](#) is my research group. We innovate at the intersection of **data mining** and **human-computer interaction (HCI)** to synthesize **scalable, interactive, and interpretable** tools that amplify human's ability to understand and interact with billion-scale data and machine learning models. Our current research thrusts: [human-centered AI](#) (interpretable, fair, safe AI; adversarial ML); [large graph visualization and mining](#); [cybersecurity](#); and [social good](#) (health, energy). Notable projects:

[Comprehensive survey on visual analytics for deep learning](#) (TVCG; presented at VAST'18) --- highly recommended for practitioners and new researchers.

[GAN Lab](#): interactive visualization for playing with GAN, [joint work with Google AI](#) (VAST'18).

[ShapeShifter](#): FIRST physical targeted attack on object detector! Self-driving cars beware! [joint work with Intel Research](#) (PKDD'18).

ActiVis: visual exploration of deep neural networks, [deployed on Facebook's ML platform](#) (VASI'17).

SHIELD: fast, practical defense for deep learning (KDD'18).

Visage: interactive visual graph querying, without writing complex code ([see Visage in action](#)); won SIGMOD'17 **best demo, honorable mention**. [Vigor](#) summarizes query results (VAST'17).

Firebird: **award-winning** (KDD'16), [open-source project](#), helping Atlanta Fire Rescue Department predict fire risk and prioritize fire inspections.

Polonium and **Aesop**: malware detection using machine learning, over massive graph with **37 billion** machine-file relationships; protects 120 million Symantec machines worldwide; **both patented and deployed**.

Apolo and **Facets**: mixed-initiative system (ML+vis) for making sense of large network data (watch a [demo](#)), by helping users incrementally find relevant and interestingly surprising subgraphs to explore, avoids overwhelming them.

Marco and **NetProbe**: **award-winning** fake review detection (SDM'14) and auction fraud detection (eBay) that fingers bad guys by identifying their suspicious transactions (appeared in Wall Street Journal, USA Today, and more)

CONFERENCE LEADERSHIP

Program Co-chair	ACM Intelligent User Interfaces Conference (IUI) 2019
Co-Chair	KDD workshop on Interactive Data Exploration and Analytics (IDEA) : 2013 , 2014 , 2015 , 2016 , 2017 , 2018
Co-organizer	IEEE VIS workshop on Visualization for AI Explainability (VISxAI) : 2018, 2019
	ICML workshop on Visualization for Deep Learning : 2016, 2017
Steering Committee	ACM Intelligent User Interfaces Conference
	USENIX Security and AI Networking Conference (ScAINet)
Co-chair	ACM Intelligent User Interfaces Conference (IUI) 2015
Publicity Chair	ACM WSDM Conference Series Web Search and Data Mining (WSDM) 2016
Publicity Chair	ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2014
Publicity Chair	IEEE International Conference on Data Mining (ICDM) 2014

AWARDS & HONORS

2019	Intel Outstanding Researcher Award
2019	IDC 2019 Best Work-in-Progress, Honorable Mention
2018	ACM TiS 2018 Best Paper, Honorable Mention
2018	Chinese CHI 2018 Best Poster
2018	KDD Audience Appreciation Award, Runner-up
2018	James D. Lester III Family Award. College of Computing, Georgia Tech.
2017	SIGMOD 2017 Best Demo, Honorable Mention
2016	KDD 2016 Applied Data Science Best Student Paper, Runner-up
2015	Google Faculty Research Award.
2015	Outstanding Junior Faculty Research Award. College of Computing, Georgia Tech.
2015-16	James Edenfield Faculty Fellowship, with Munmun De Choudhury (IC)
2014	Yahoo Faculty Research and Engagement Program (FREP) Award by Yahoo! Labs . (GT press releases 1 & 2)
2014-15	Raytheon Faculty Fellowship, with Rahul Basole (IC).
2014	SIAM Data Mining (SDM) 2014 Best Student Paper award
2014	LexisNexis Dean's Excellence Award
Fall 2014	Wearable Computing Center Mentoring Grant for CS undergraduate students Nathan Dass and Samuel Clarke
Spring 2014	Advisor of Mr. Zhiyuan (Jerry) Lin , for Sigma Xi Best Undergraduate Research Award .
F13, F16, S17	Recipient of " Thank-a-Teacher " where students honor great teachers.
2012	Carnegie Mellon School of Computer Science Dissertation Award, Honorable Mention
2010	Open Source Software World Challenge, Silver Award (3rd place) , for the PEGASUS project which mines billion-node graphs. U Kang, Duen Horng Chau, Christos Faloutsos
2009 - 2010	Symantec Research Labs Graduate Fellowship , covers full tuition and stipend. Re-selected, as one of the only three graduate students worldwide to receive the award.
2009	Yahoo! Key Scientific Challenges Award , in Information Retrieval, Algorithms, and Data Mining.
2008 - 2009	Symantec Research Labs Graduate Fellowship , covers full tuition and stipend.
2008	Winner , Symantec research competition (internal).
2008	Best Presentation Award, 2nd Place , PKDD'08

- 2000 **Best Presentation Award, 3rd Place, FORD CO.**
- 2001, 2002, 2003 Dean's List
- 2002, 2003 Nominated for university scholarships

INDUSTRY POSITIONS & EXPERIENCES

- Summer 2014 **eBay, Search Science** San Jose
Visiting Professor
- Summer - Fall 2011 **Google, Ads Backend Team** Mountain View, CA
Ph.D. Software Engineer Intern Mentor: Dr. Arun Swami
- Fall 2009 **Symantec Research Labs** Los Angeles, CA
Ph.D. Research Intern Mentor: Mr. Carey Nachenberg
- Summer 2008 **Symantec Research Labs** Los Angeles, CA
Ph.D. Research Intern Mentor: Mr. Darren Shou
- 2005 - 2007 **Carnegie Mellon University, Human-Computer Interaction Institute** Pittsburgh, PA
Research Associate Supervisor: Prof. Brad Myers
- Summer 2003 **The Chinese University of Hong Kong, Lightwave Communications Lab** Hong Kong
Undergraduate Research Assistant
- 2002 - 2007 **Elfware Company** Hong Kong
System Consultant

TEACHING

Courses **Data and Visual Analytics**, Georgia Tech. (CSE 6242 A, Q: campus grad; CX 4242 A: campus undergrad; CSE 6242 OAN, O01, O3: online grad - OMS Analytics, OMS CS)

- 2019 Fall. CSE 6242 A, Q, OAN, O01. 843 students: 249 campus; 594 online
- 2019 Spring. CSE 6242 A, Q, OAN, O01; CX 4242 A. 1000 students: 178 campus (26 UG); 822 online
- 2018 Fall. CSE 6242 A, Q, OAN, O01, O3; CX 4242 A. 677 students: 225 campus (22 UG); 452 online
- 2018 Spring. CSE 6242 A, Q, OAN; CX 4242 A. 287 students. 200 campus (45 UG); 87 online
- 2017 Fall. CSE 6242 A, Q; CX 4242 A. 273 campus students (40 UG)
- 2017 Spring. CSE 6242 A, Q; CX 4242 A. 214 campus students (29 UG)
- 2016 Fall. CSE 6242 A, Q; CX 4242 A. 215 campus students (29 UG)
- 2016 Spring. CSE 6242 A, Q; CX 4242 A. 187 campus students (32 UG)
- 2015 Fall. CSE 6242 A, Q, Q3; CX 4242 A. 146 campus students (32 UG)
- 2015 Spring. CSE 6242 A, Q, Q3; CX 4242 A. 113 campus students (17 UG)
- 2014 Fall. CSE 6242 A, Q, Q3; CX 4242 A. 118 campus students (17 UG)
- 2014 Spring. CSE 6242 A, Q3; CX 4242 A. 95 campus students (19 UG)
- 2013 Spring. CSE 6242 A; CS 4803 DVA. 35 campus students (3 UG)

Computing for Data Analytics: Methods and Tools, CSE 6040, Fall 2014. Georgia Tech. Co-taught with [Dr. Da Kuang](#).

Bee-Snap, an undergraduate cross-semester **VIP project course (Vertically Integrated Projects)**. Georgia Tech. ECE-2811-VV4, ECE-3811-VV4, ECE-3812-VV4, ECE-4811-VV4, ECE-4812-VV4. Analyzes bee-flower interactions data at Georgia Tech and Atlanta for pollinator health. Co-taught with [Jennifer Leavey](#), [Bistra Dilkina](#), [Jason Reidy](#).

- 2016 Fall. 14 students
- 2016 Spring. 18 students
- 2015 Fall. 10 students

Introduction to Computational Science and Engineering. CSE 6001, Fall 2013, Georgia Tech. Co-taught with Rich Vuduc.

Tutorials **HCI Meets Data Mining: Principles and Tools for Big Data Analytics**. Polo Chau. ACM Conference on Human Factors in Computing Systems (CHI) 2014. Toronto, Canada. April 24-May 1, 2014.

Big Graph Mining for the Web and Social Media. U Kang, Leman Akoglu, Polo Chau. The 7th ACM International Conference on Web Search and Data Mining (WSDM2014). New York City. February 24, 2014.

Big Graph Mining: Algorithms, Anomaly Detection, and Applications. U Kang, Leman Akoglu, Polo Chau. The 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM). Niagara Falls, Canada, Aug 25-28, 2013.

PhD Consortium Mentor [IEEE International Conference on Big Data \(IEEE BigData 2014\)](#)

Guest lectures **Information Visualization (CS7450)**. Instructor: Prof. Alex Endert. Fall 2014. Georgia Tech.

Data Mining for Malware Detection and Fraud Detection. Computing and Society (CS 4001). Instructor: Prof. Jimeng Sun. Spring 2014. Georgia Tech.

Web-scale malware detection & fraud detection, and **Interactive graph exploration & mining** for *Massive Graph Analytics* (CSE 8803 MGA). Instructor: Prof. David Bader. Fall 2012. Georgia Tech.

Data Warehousing and Data Mining for *Database Applications (15-415)*. Instructor: Prof. Christos Faloutsos. Spring 2012. Carnegie Mellon University.

Web Search for *Science of the Web (15-396)*. Instructor: Prof. Luis von Ahn, Brendan Meeder. Fall 2011. Carnegie Mellon University.

Making Sense of Large Networks for *Sensemaking: Cognitive, Social, and Technical Perspectives (05-899)*. Instructor: Prof. Niki Kittur. Spring 2011. Carnegie Mellon University.

Teaching Assistant **Science of the Web** (15-396). Instructor: Prof. Luis von Ahn, Brendan Meeder. Fall 2011. Carnegie Mellon University.

Multimedia Databases and Data Mining (15-826). Instructor: Prof. Christos Faloutsos. Spring 2010. Carnegie Mellon University.

OUTREACH INVITED TALKS & ACTIVITIES

- Dec 12, 2019 [Ask A Prof! inaugural blog post](#) of On *Teaching and Learning @ Georgia Tech*
- Jul 9, 2019 **Undergraduate Research Faculty Panel** (panelist), Georgia Tech
- Jun 4, 2019 **Visual Data Analytics** tutorial. Smart Grid Edge Analytics Workshop, Georgia Tech
- Aug 8, 2019 **Visual Data Analytics** tutorial. Foundation of Data Science – Summer School 2019, Georgia Tech
- Sept 26, 2018 Hands-on augmented reality (AR) research demonstration for elementary school students from [Charles R. Drew Charter School](#), using Microsoft HoloLens
- Aug 6, 2018 **Introduction to Machine Learning**. Summer workshop on data and scientific computing, Georgia Tech
- Aug 1, 2017 **Introduction to Machine Learning**. Summer workshop on data and scientific computing, Georgia Tech
- Mar 6, 2017 **10 Lessons Learned from Working with Tech Companies**. [Undergraduate Consulting Club](#), Georgia Tech
- Apr 16, 2016 **10 Lessons Learned from Working with Tech Companies**. [Hacklytics](#), organized by Georgia Tech undergraduate students.
- Jun 16, 2015 **The Internet of Things (IoT) Joins the Enterprise: Strategies for Managing & Using All That Data**. All Analytics Academy.
- May 21, 2015 **Catching Bad Guys with Graph Mining and Visualization**. Center of Academic Excellence (NSA)
- Jun 13, 2014 **Graph Mining meets Human-Computer Interaction**. DIMACS REU Tutorial. Rutgers University.
- Jun 20, 2013 **Making sense of big data: combining data mining and visualization** Teachers Workshop (CS Principles - Big Ideas), organized by Institute for Computing Education (ICE), a partnership between the Georgia Department of Education and the College of Computing at Georgia Tech.

PUBLICATIONS

Latest & Greatest
selected from full list below

CNN 101: Interactive Visual Learning for Convolutional Neural Networks. Zijie J. Wang, Robert Turko, Omar Shaikh, Haekyu Park, Nilaksh Das, Fred Hohman, Minsuk Kahng, Duen Horng (Polo) Chau. *Extended Abstracts, CHI 2020*. Apr 25-30, Honolulu, Hawaii, USA. [PDF](#)

Massif: Interactive Interpretation of Adversarial Attacks on Deep Learning. Nilaksh Das, Haekyu Park, Zijie J. Wang, Fred Hohman, Robert Firstman, Emily Rogers, Duen Horng (Polo) Chau. *Extended Abstracts, CHI 2020*. Apr 25-30, Honolulu, Hawaii, USA. [PDF](#)

D2M: Dynamic Defense and Modeling of Adversarial Movement in Networks. Scott Freitas, Andrew Wicker, Duen Horng Chau, Joshua Neil *SIAM International Conference on Data Mining (SDM), 2020*. Cincinnati, Ohio. May 7-9, 2020. [PDF](#)

REST: Robust and Efficient Neural Networks for Sleep Monitoring in the Wild. Scott Freitas, Rahul Duggal, Jimeng Sun, Duen Horng Chau. *The Web Conference (WWW), 2020*. Taipei, Taiwan. Apr 20-24, 2020. [PDF](#)

FairVis: Visual Analytics for Discovering Intersectional Bias in Machine Learning. Ángel Alexander Cabrera, Will Epperson, Fred Hohman, Minsuk Kahng, Jamie Morgenstern, Duen Horng (Polo) Chau *IEEE Conference on Visual Analytics Science and Technology (VAST), 2019*. Vancouver, Canada. Oct 2019. [PDF](#) [Blog](#) [Code](#) [Talk](#) [PDF](#)

ShapeShifter: Robust Physical Adversarial Attack on Faster R-CNN Object Detector. Shang-Tse Chen, Cory Cornelius, Jason Martin, Duen Horng (Polo) Chau. *PKDD 2018*. Sept 10–14, 2018. Dublin, Ireland. [Code](#) [Press Demo](#) [PDF](#) [YouTube](#)

GAN Lab: Understanding Complex Deep Generative Models using Interactive Visual Experimentation. Minsuk Kahng, Nikhil Thorat, Duen Horng (Polo) Chau, Fernanda B. Viégas, and Martin Wattenberg. *IEEE Transactions on Visualization and Computer Graphics, 2018*. [Went viral! Open sourced with Google AI](#)

Visual Analytics in Deep Learning: An Interrogative Survey for the Next Frontiers. Fred Hohman, Minsuk Kahng, Robert Pienta, Duen Horng Chau. *IEEE Transactions on Visualization and Computer Graphics, 2018*. [PDF](#) [Site](#) [Blog](#)

SHIELD: Fast. Practical Defense and Vaccination for Deep Learning using JPEG Compression. [PDF](#)

	<p>Nilaksh Das, Madhuri Shanbhogue, Shang-Tse Chen, Fred Hohman, Siwei Li, Li Chen, Michael E. Kounavis, Duen Horng Chau. <i>ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2018</i>. London, UK. Aug 19-23, 2018.</p> <p>Won Audience Appreciation Award, Runner-up</p>	<p>arXiv Code YouTube</p>
	<p>Augmenting Coding: AugmentedReality for Learning Programming. Nathan Dass, Joonyoung Kim, Sam Ford, Sudeep Agarwal, Duen Horng Chau. <i>The Sixth International Symposium of Chinese CHI (Chinese CHI 2018)</i>. Apr 21-22, 2018. Montreal, Canada.</p> <p>Won Best Poster Award</p>	<p>PDF</p>
	<p>Search Rank Fraud De-Anonymization in Online Systems Mizanur Rahman, Nestor Hernandez, Bogdan Carbutar and Duen Horng Chau. <i>ACM Conference on Hypertext and Social Media (HT'18)</i>.</p>	<p>PDF</p>
	<p>ActiVis: Visual Exploration of Industry-Scale Deep Neural Network Models. Minsuk Kahng, Pierre Andrews, Aditya Kalro, Duen Horng (Polo) Chau. <i>IEEE Transactions on Visualization and Computer Graphics (Proc. VAST'17), Jan 2018</i>. . [21% acceptance rate]</p>	<p>PDF</p>
Book Chapters	<p>Exploratory Visual Analytics of Mobile Health Data: Sensemaking Challenges and Opportunities. Peter J Polack Jr, Moushumi Sharmin, Kaya de Barbaro, Minsuk Kahng, Shang-Tse Chen, and Duen Horng Chau. <i>Mobile Health: Sensors, Analytic Methods, and Applications</i>. Springer. 2017.</p>	
	<p>Case study on fraud detection using social-network analysis. Duen Horng (Polo) Chau and Christos Faloutsos. <i>Encyclopedia of Social Network Analysis and Mining</i>. Springer. 2014.</p>	
Journal	<p>Towards De-Anonymization of Google Play Search Rank Fraud. Mizanur Rahman, Nestor Hernandez, Bogdan Carbutar, Duen Horng (Polo) Chau. <i>IEEE Transactions on Knowledge and Data Engineering (TKDE)</i>.</p>	
	<p>Summit: Scaling Deep Learning Interpretability by Visualizing Activation and Attribution Summarizations. Fred Hohman, Haekyu Park, Caleb Robinson, Duen Horng (Polo) Chau. <i>IEEE Transactions on Visualization and Computer Graphics (TVCG), 2019</i>.</p>	<p>PDF Demo YouTube Code PDF YouTube Code</p>
	<p>GAN Lab: Understanding Complex Deep Generative Models using Interactive Visual Experimentation. Minsuk Kahng, Nikhil Thorat, Duen Horng (Polo) Chau, Fernanda B. Viégas, and Martin Wattenberg. <i>IEEE Transactions on Visualization and Computer Graphics (TVCG), 2018</i>.</p>	<p>PDF Site</p>
	<p>Visual Analytics in Deep Learning: An Interrogative Survey for the Next Frontiers. Fred Hohman, Minsuk Kahng, Robert Pienta, Duen Horng Chau. <i>IEEE Transactions on Visualization and Computer Graphics (TVCG), 2018</i>.</p>	<p>PDF Site</p>
	<p>Chronodes: Interactive Multi-focus Exploration of Event Sequences. Peter J. Polack, Shang-Tse Chen, Minsuk Kahng, Kaya De Barbaro, Rahul Basole, Moushumi Sharmin, Duen Horng (Polo) Chau. <i>ACM Transactions on Interactive Intelligent Systems (TiiS) Special Issue on Interactive Visual Analysis of Human and Crowd Behaviors</i>. 2018.</p> <p>ACM TiiS 2018 Best Paper, Honorable Mention</p>	<p>PDF YouTube</p>
	<p>ActiVis: Visual Exploration of Industry-Scale Deep Neural Network Models. Minsuk Kahng, Pierre Andrews, Aditya Kalro, Duen Horng (Polo) Chau. <i>IEEE Transactions on Visualization and Computer Graphics (Proc. VAST'17), Jan 2018</i>. . [21% acceptance rate]</p> <p>Deployed on Facebook Machine Learning platform</p> <p>Invited to present at SIGGRAPH 2018 as a top VAST'17 paper (4 total)</p>	<p>PDF</p>
	<p>VIGOR: Interactive Visual Exploration of Graph Query Results. Robert Pienta, Fred Hohman, Alex Endert, Acar Tamersoy, Kevin Roundy, Chris Gates, Shamkant Navathe, Duen Horng (Polo) Chau. <i>IEEE Transactions on Visualization and Computer Graphics (Proc. VAST'17), Jan 2018</i>. [21% acceptance rate]</p>	<p>PDF</p>
	<p>Search Rank Fraud and Malware Detection in Google Play. Mahmudur Rahman, Mizanur Rahman, Bogdan Carbutar, Duen Horng Chau. <i>IEEE Transactions on Knowledge and Data Engineering (TKDE)</i> 29(6), 1329. 2017</p>	<p>PDF</p>
	<p>Constraint based temporal event sequence mining for Glioblastoma survival prediction. Kunal Malhotra, Shamkant Navathe, Duen Horng Chau, Costas Hadjipanayis and Jimeng Sun. <i>Journal of biomedical informatics</i>, 16, 267-275. 2016</p>	<p>PDF</p>
	<p>Center of excellence for mobile sensor Data-to-Knowledge (MD2K). Santosh Kumar, Gregory D. Abowd, William T. Abraham, Mustafa al'Absi, J. Gayle Beck, Duen Horng Chau, Tyson Condie, David E. Conroy, Emre Ertin, Deborah Estrin, Deepak Ganesan, Cho Lam, Benjamin Marlin, Clay B. Marsh, Susan A. Murphy, Inbal Nahum-Shani, Kevin Patrick, James M. Rehg, Moushumi Sharmin, Vivek Shetty, Ida Sim, Bonnie Spring, Mani Srivastava and David W. Wetter. <i>Journal of the American Medical Informatics Association (JAMIA)</i> Jul 2015. DOI: 10.1093/jamia/ocv056</p>	<p>PDF</p>
	<p>Node Immunization on Large Graphs: Theory and Algorithms. Chen, C. and Tong, H. and Prakash, B.A. and Tsourakakis, C. and Eliassi-Rad, T. and Faloutsos, C. and Chau, D.H. <i>IEEE Transactions on Knowledge and Data Engineering (TKDE)</i>, 28(1), 113-126. 2015</p>	<p>PDF</p>
	<p>To Catch a Fake: Curbing Deceptive Yelp Ratings and Venues. Mahmudur Rahman, Bogdan Carbutar, Jaime Ballesteros, Duen Horng (Polo) Chau. <i>Statistical Analysis and Data Mining: The ASA Data Science Journal</i>, 8(3), 147-161. 2015.</p>	<p>PDF</p>
	<p>Understanding variations in pediatric asthma care processes in the emergency department using visual analytics. Rahul C. Basole, Mark L. Braunstein, Vikas Kumar, Hyunwoo Park, Minsuk Kahng, Duen Horng (Polo) Chau, Acar Tamersoy, Daniel A. Hirsh, Nicoleta Serban, James Bost, Burton Lesnick, Beth L. Schisler, Michael Thompson. <i>Journal of the American Medical Informatics Association (JAMIA)</i> 2015. DOI:</p>	<p>PDF</p>

Conitzer, Michael; Thompson. *Journal of the American Medical Association (JAMA)* 2016. DOI: 10.1093/jamia/ocu016

GLO-STIX: Graph-Level Operations for Specifying Techniques and Interactive eXploration. Charles D. Stolper, Minsuk Kahng, Zhiyuan Lin, Florian Foerster, Aakash Goel, John Stasko, and Duen Horng Chau. *IEEE Transactions on Visualization and Computer Graphics*, 20(12), 2320-2328. 2014.

PDF
YouTube
Code

SharkFin: Spatio-temporal mining of software adoption and penetration. Evangelos E. Papalexakis, Tudor Dumitras, Duen Horng Chau, B. Aditya Prakash, Christos Faloutsos. *Social Network Analysis and Mining (SNAM)*, 4(1), 1-15. 2014.

PDF

Large Scale Insider Trading Analysis: Patterns and Discoveries. Acar Tamersoy, Elias Khalil, Bo Xie, Stephen L. Lenkey, Bryan R. Routledge. Duen Horng Chau, Shamkant B. Navathe. *Social Network Analysis and Mining (SNAM)*, 4(1), 1-17. 2014.

PDF

Conference **GOGGLES: Automatic Image Labeling with Affinity Coding.** Nilaksh Das, Sanya Chaba, Sakshi Gandhi, Renzi Wu, Duen Horng Chau, Xu Chu. *ACM SIGMOD 2020*. Portland, Oregon. Jun 14-19, 2020.

PDF

D2M: Dynamic Defense and Modeling of Adversarial Movement in Networks. Scott Freitas, Andrew Wicker, Duen Horng Chau, Joshua Neil. *SIAM International Conference on Data Mining (SDM)*, 2020. Cincinnati, Ohio. May 7-9, 2020.

PDF

REST: Robust and Efficient Neural Networks for Sleep Monitoring in the Wild. Scott Freitas, Rahul Duggal, Jimeng Sun, Duen Horng Chau. *The Web Conference (WWW)*, 2020. Taipei, Taiwan. Apr 20-24, 2020.

PDF

FairVis: Visual Analytics for Discovering Intersectional Bias in Machine Learning. Ángel Alexander Cabrera, Will Epperson, Fred Hohman, Minsuk Kahng, Jamie Morgenstern, Duen Horng (Polo) Chau. *IEEE Conference on Visual Analytics Science and Technology (VAST)*, 2019. Vancouver, Canada. Oct 2019.

PDF
Blog
Code
Talk
PDF
Code

ElectroLens: Understanding Atomistic Simulations through Spatially-resolved Visualization of High-dimensional Features. Xiangyun Lei, Fred Hohman, Duen Horng (Polo) Chau, Andrew Medford. *IEEE Visualization Conference (VIS)*, 2019. Vancouver, Canada. Oct 20-25, 2019.

Atlas: Local Graph Exploration in a Global Context. Fred Hohman, James Abello, Varun Bezzam, Duen Horng (Polo) Chau. *ACM Conference on Intelligent User Interfaces (IUI)* 2019. Los Angeles, CA. Mar 16-20, 2019.

PDF
Code
YouTube
Talk
PDF

Local Partition in Rich Graphs. Scott Freitas, Nan Cao, Yinglong Xia, Duen Horng Chau, and Hanghang Tong. *BigData 2018*. Dec 10-13, 2018. Seattle, WA, USA.

Scalable K-Core Decomposition for Static Graphs Using a Dynamic Graph Data Structure. Alok Tripathy, Fred Hohman, Duen Horng Chau, and Oded Green. *BigData 2018*. Dec 10-13, 2018. Seattle, WA, USA.

PDF

ShapeShifter: Robust Physical Adversarial Attack on Faster R-CNN Object Detector. Shang-Tse Chen, Cory Cornelius, Jason Martin, Duen Horng (Polo) Chau. *PKDD 2018*. Sept 10-14, 2018. Dublin, Ireland.

PDF
Code
Press
PDF
Code
YouTube

Shield: Fast, Practical Defense and Vaccination for Deep Learning using JPEG Compression. Nilaksh Das, Madhuri Shanbhogue, Shang-Tse Chen, Fred Hohman, Siwei Li, Li Chen, Michael E. Kounavis, Duen Horng Chau. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)* 2018. London, UK. Aug 19-23, 2018.

Won Audience Appreciation Award, Runner-up

Search Rank Fraud De-Anonymization in Online Systems Mizanur Rahman, Nestor Hernandez, Bogdan Carbutar and Duen Horng Chau. *ACM Conference on Hypertext and Social Media (HT'18)*.

Predicting Cyber Threats with Virtual Security Products. Shang-Tse Chen, Yufei Han, Duen Horng (Polo) Chau, Christopher Gates, Michael Hart, Kevin A. Roundy. *Annual Computer Security Applications Conference (ACSAC)* 2017.

PDF

Analysis of Smoking and Drinking Relapse in an Online Community. Acar Tamersoy, Munmun De Choudhury, Duen Horng Chau. *7th International conference on Digital Health 2017*. July 2-5, 2017. London.

PDF

Facets: Adaptive Local Exploration of Large Graphs. Robert Pienta, Minsuk (Brian) Kahng, Zhiyuan Lin, Jilles Vreeken, Partha Talukdar, James Abello, Ganesh Parameswaran, Duen Horng (Polo) Chau. *SIAM International Conference on Data Mining (SDM)* 2017. April 27-29, 2017. Houston, Texas.

PDF

Firebird: Predicting Fire Risk and Prioritizing Fire Inspections in Atlanta. Michael Madaio, Shang-Tse Chen, Oliver Haimson, Wenwen Zhang, Xiang Cheng, Matthew Hinds-Aldrich, Duen Horng (Polo) Chau, Bistra Dilkina. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)* 2016. San Francisco, CA. Aug 13-17, 2016.

PDF
Presentation
Citation

Won Best Student Paper award, runner up.

[ETable] Interactive Browsing and Navigation in Relational Databases. Minsuk Kahng, Shamkant B. Navathe, John T. Stasko, Duen Horng (Polo) Chau. *VLDB 2016*. New Delhi, India. Sept 5-9, 2016.

PDF
Citation

M-Flash Fast Billion-scale Graph Computation Using a Bimodal Block Processing Model. Hugo Gualdrón, Robson Cordeiro, Jose Rodrigues, Duen Horng (Polo) Chau, Minsuk Kahng, U Kang. *PKDD 2016*. Sept 19-23, 2016. Riva del Garda, Italy.

PDF

VISAGE: Interactive Visual Graph Querying. Robert Pienta, Acar Tamersoy, Alex Endert, Shamkant B. Navathe, Hanghang Tong, Duen Horng (Polo) Chau. *International Working Conference on Advanced Visual Interfaces (AVI)* 2016. June 7-10, 2016. Bari, Italy.

PDF
YouTube

FairPlay: Fraud and Malware Detection in Google Play. Mahmudur Rahman, Mizanur Rahman, Bogdan Carbutar, Duen Horng Chau. *SIAM International Conference on Data Mining (SDM) 2016*. May 5-7, 2016. Miami, Florida. [PDF](#)

Communication Efficient Distributed Agnostic Boosting. Shang-Tse Chen, Maria-Florina Balcan, Duen Horng Chau. *19th International Conference on Artificial Intelligence and Statistics (AISTATS 2016)*. May 9-11, 2016. Cadiz, Spain. [PDF](#)

What's Hot in Intelligent User Interfaces 2015 . Shimei Pan, Oliver Brdiczka, Giuseppe Carenini, Duen Horng Chau, Per Ola Kristensson. *13th AAAI Conference on Artificial Intelligence (AAAI) 2016*. Feb 12-17, 2016. Phoenix, Arizona, USA. [PDF](#)

[Invited](#)

Characterizing Smoking and Drinking Abstinence from Social Media. Acar Tamersoy, Munmun De Choudhury and Duen Horng Chau. *Proceedings of ACM Conference on Hypertext and Social Media (HT)*. September 1-5, 2015. [PDF](#)

explICU: A Web-based Visualization and Predictive Modeling Toolkit for Mortality in Intensive Care Patients. Robert Chen, Vikas Kumar, Natalie Fitch, Jitesh Jagadish, Lifan Zhang, William Dunn, Duen Horng Chau. *37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*. Milano, Italy, August 25-29, 2015. [PDF](#)

Identifying and Prioritizing Fire Inspections: A Case Study of Predicting Fire Risk in Atlanta. Michael Madaio, Oliver L. Haimson, Wenwen Zhang, Xiang Cheng, Matthew Hinds-Aldrich, Bistra Dilikina, Duen Horng (Polo) Chau. *Bloomberg Data for Good Exchange* 2015.

Aurigo: an Interactive Tour Planner for Personalized Itineraries. Alexandre Yahi, Antoine Chassang, Louis Raynaud, Hugo Duthil, Duen Horng (Polo) Chau. *ACM Conference on Intelligent User Interfaces (IUI)*. Atlanta, GA, USA. March 29 - April 1, 2015. [PDF](#)

Scalable Graph Exploration and Visualization: Sensemaking Challenges and Opportunities. Robert Pienta, James Abello, Minsuk Kahng, Duen Horng Chau. *International Conference on Big Data and Smart Computing (BigComp)*. Jeju Island, Korea. February 9-12, 2015. [PDF](#)

[Invited](#)

GLO-STIX: Graph-Level Operations for Specifying Techniques and Interactive eXploration. Charles D. Stolper, Minsuk Kahng, Zhiyuan Lin, Florian Foerster, Aakash Goel, John Stasko, and Duen Horng Chau. *IEEE InfoVis 2014, November 9-14, Paris, France*. [23% acceptance rate] [PDF](#) [YouTube](#)

MMap: Fast Billion-Scale Graph Computation on a PC via Memory Mapping. Zhiyuan Lin, Minsuk Kahng, Kaeser Md. Sabrin, Duen Horng Chau, Ho Lee, and U Kang. *Proceedings of IEEE BigData 2014 conference*. Oct 27-30, Washington DC, USA. [Code](#) [PDF](#)

MAGE: Matching Approximate Patterns in Richly-Attributed Graphs. Robert Pienta, Acar Tamersoy, Hanghang Tong, and Duen Horng Chau. *Proceedings of IEEE BigData 2014 conference*. Oct 27-30, Washington DC, USA. [PDF](#)

[AESOP] Guilt by Association: Large Scale Malware Detection by Mining File-relation Graphs Acar Tamersoy, Kevin Roundy, Duen Horng (Polo) Chau. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2014*. New York City, NY, USA. Aug 24-27, 2014. [PDF](#)

Turning the Tide: Curbing Deceptive Yelp Behaviors. Mahmudur Rahman, Bogdan Carbutar, Jaime Ballesteros, George Burri, Duen Horng (Polo) Chau. *Proceedings of SIAM International Conference on Data Mining (SDM) 2014*. April 24-26, 2014. Philadelphia, PA, USA. [PDF](#)

[Won Best Student Paper award.](#)

["Best of SDM 2014" paper. Invited to Statistical Analysis and Data Mining \(SAM\) Journal.](#)

LatentGesture: Active User Authentication Through Background Touch Analysis. Premkumar Saravana, Samuel Clarke, Duen Horng Chau, Hongyuan Zha. *The Second International Symposium of Chinese CHI (Chinese CHI 2014)*. Apr 26-27, 2014. Toronto, Canada. [PDF](#)

[Featured in popular press: Wired, engadget, gizmodo, Yahoo!, business chronicle, GT press release, and many more...](#)

Detecting Insider Threats in a Real Corporate Database of Computer Usage Activity. Ted E. Senator, Henry G. Goldberg, Alex Memory, William Y. Young, Brad Rees, Robert Pierce, Daniel Huang, Matthew

Reardon, David A. Bader, Edmond Chow, Irfan Essa, Joshua Jones, Vinay Bettadapura, Duen Horng Chau, Oded Gree, Oguz Kaya, Anita Zakrzewska, Erica Briscoe, Rudolph L. Mappus IV, Robert McColl, Lora Weiss, Thomas G. Dietterich, Alan Fern, Weng-Keen Wong, Shubhomoy Das, Andrew Emmott, Jed Irvine, Jay-Yoon Lee, Danai Koutra, Christos Faloutsos, Daniel Corkill, Lisa Friedland, Amanda Gentzel, David Jensen. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2013*. Chicago, Illinois, USA. Aug 11-14, 2013. [PDF](#)

Inside Insider Trading: Patterns & Discoveries from a Large Scale Exploratory Analysis. Acar Tamersoy, Bo Xie, Stephen L. Lenkey, Bryan R. Routledge. Duen Horng Chau, Shamkant B. Navathe. *IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM) 2013*. Niagara Falls, Canada. August 25-28, 2013. [PDF](#)

[Invited to Social Network Analysis and Mining journal \(SNAM\).](#)

Spatio-temporal Mining of Software Adoption & Penetration. Evangelos E. Papalexakis, Tudor Dumitras, Duen Horng (Polo) Chau, B. Aditya Prakash, Christos Faloutsos. *IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM) 2013*. Niagara Falls, Canada. [PDF](#)

Conference on Advances in Social Networks Analysis and Mining (ASONAM) 2013. Niagara Falls, Canada. August 25-28, 2013.

[Invited to Social Network Analysis and Mining journal \(SNAM\).](#)

Inference-assisted Choosing by Advantages. John Haymaker, Duen Horng Chau, Bo Xie. *21th Conference of the International Group for Lean Construction (IGLC)*. Fortaleza, Brazil. Jul 29 - Aug 2, 2013.

[PDF](#)

Mining Connection Pathways for Marked Nodes in Large Graphs. Leman Akoglu, Jilles Vreeken, Hanghang Tong, Duen Horng Chau, Nikolaj Tatti, and Christos Faloutsos. *Proceedings of SIAM International Conference on Data Mining (SDM) 2013*. May 2-4, 2013. Austin, Texas. [25% accept]

[PDF](#)

PEGASUS: Mining Billion-Scale Graphs in the Cloud. U Kang, Duen Horng Chau, and Christos Faloutsos. *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2012*. Mar 25-30, 2012. Kyoto, Japan

[PDF](#)

Unifying Guilt-by-Association Approaches: Theorems and Fast Algorithms. Danai Koutra, Tai-You Ke, U Kang, Duen Horng (Polo) Chau, Hsing-Kuo Kenneth Pao, and Christos Faloutsos. *European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (PKDD) 2011*. Sept 5-9, 2011. Athens, Greece. [20% acceptance rate]

[PDF](#)

Mining Large Graphs: Algorithms, Inference, and Discoveries. U Kang, Duen Horng (Polo) Chau, Christos Faloutsos. *IEEE International Conference of Data Engineering (ICDE) 2011*. April 11-16. Hannover, Germany. [20% acceptance rate]

[PDF](#)

Apollo: Making Sense of Large Network Data by Combining Rich User Interaction and Machine Learning. Duen Horng (Polo) Chau, Aniket Kittur, Jason I. Hong, Christos Faloutsos. *ACM Conference on Human Factors in Computing Systems (CHI) 2011*. May 7-12, 2011. Vancouver, BC, Canada. [26% acceptance rate]

[PDF](#)
[YouTube](#)

Polonium: Tera-Scale Graph Mining and Inference for Malware Detection. Duen Horng (Polo) Chau, Carey Nachenberg, Jeffrey Wilhelm, Adam Wright, Christos Faloutsos. *Proceedings of SIAM International Conference on Data Mining (SDM) 2011*. April 28-30, 2011. Mesa, Arizona. [25% acceptance rate]

[PDF](#)

On the Vulnerability of Large Graphs. Hanghang Tong, B. Aditya Prakash, Charalampos Tsourakakis, Tina Eliassi-Rad, Christos Faloutsos, Duen Horng (Polo) Chau. *IEEE International Conference on Data Mining (ICDM) 2010*. Dec 14-17, 2010. Sydney, Australia. [19% acceptance rate]

[PDF](#)
[Code](#)

What to Do When Search Fails: Finding Information by Association. Duen Horng (Polo) Chau, Brad Myers, and Andrew Faulring. *ACM Conference on Human Factors in Computing Systems (CHI) 2008*. April 5-10, 2008. Florence, Italy. New York: ACM Press, Pages 999-1008. [22% acceptance rate]

[PDF](#)
[YouTube](#)

The eBay Graph: How Do Online Auction Users Interact? Yordanos Beyene, Michalis Faloutsos, Duen Horng (Polo) Chau, Christos Faloutsos. *Computer Communications Workshops, 2008. INFOCOM*. April 13-18, 2008. Phoenix, AZ.

[PDF](#)

NetProbe: A Fast and Scalable System for Fraud Detection in Online Auction Networks. Shashank Pandit, Duen Horng (Polo) Chau, Samuel Wang, Christos Faloutsos. *International Conference on World Wide Web (WWW) 2007*. May 8-12, 2007. Banff, Alberta, Canada. Pages 201-210. [15% acceptance rate]

[PDF](#)

Eyes on the Road, Hands on the Wheel: Thumb-based Interaction Techniques for Input on Steering Wheels. Ivan E. Gonzalez, Jacob O. Wobbrock, Duen Horng (Polo) Chau, Andrew Faulring, Brad A. Myers. *Graphics Interface (GI) 2007*. May 28-30, 2007. Montreal, Quebec, Canada. Pages 95-102. [48% acceptance rate]

[PDF](#)

Demonstrating the Viability of Automatically Generated User Interfaces. Jeffrey Nichols, Duen Horng (Polo) Chau, Brad A. Myers. *ACM Conference on Human Factors in Computing Systems (CHI) 2007*. April 28-May 3, 2007. San Jose, CA. Pages 1283-1292. [25% acceptance rate]

[PDF](#)

An Alternative to Push, Press, and Tap-tap-tap: Gesturing on an Isometric Joystick for Mobile Phone Text Entry. Jacob O. Wobbrock, Duen Horng (Polo) Chau and Brad A. Myers. *ACM Conference on Human Factors in Computing Systems (CHI) 2007*. April 28-May 3, 2007. San Jose, CA. Pages 667-676. [25% acceptance rate]

[PDF](#)

Huddle: Automatically Generating Interfaces for Systems of Multiple Connected Appliances. Jeffrey Nichols, Brandon Rothrock, Duen Horng (Polo) Chau, Brad A. Myers. *ACM Symposium on User Interface Software and Technology (UIST) 2006*. October 15-18, 2006. Montreux, Switzerland. Pages 279-288. [23% acceptance rate]

[PDF](#)

In-stroke Word Completion. Jacob O. Wobbrock, Brad A. Myers, and Duen Horng (Polo) Chau. *ACM Symposium on User Interface Software and Technology (UIST) 2006*. October 15-18, 2006. Montreux, Switzerland. Pages 333-336. [23% acceptance rate]

[PDF](#)

Detecting Fraudulent Personalities in Networks of Online Auctioneers. Duen Horng (Polo) Chau, Shashank Pandit, and Christos Faloutsos. *European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (PKDD) 2006*. Sept 18-22, 2006. Berlin, Germany. Pages 103-114. [15% acceptance rate]

[PDF](#)

[Best Presentation Award, 3rd place](#)

A Linguistic Analysis of How People Describe Software Problems. Andrew J. Ko, Brad A. Myers, and Duen Horng (Polo) Chau. *Proceedings of VL/HCC 2006*. September 4-8, 2006, Brighton, UK. Pages 127-134. [28% acceptance rate]

[PDF](#)

Answering Why and Why Not Questions in User Interfaces. Brad Myers, David A. Weitzman, Andrew J. Ko, and Duen Horng (Polo) Chau. *ACM Conference on Human Factors in Computing Systems (CHI) 2006*. April 22-27, 2006. Montreal, Canada. Pages 397-406. [23% acceptance rate]

[PDF](#)

Edited Volumes	Catching Bad Guys with Graph Mining. Polo Chau. <i>Crossroads: The ACM Magazine for Students - The Fate of Money</i> . Volume 17 Issue 3, Spring 2011. Pages 16-18.	PDF
Workshop	Visual Analytics for Interpretability on Deep Neural Networks. Haekyu Park, Fred Hohman, Nilaksh Das, Caleb Robinson, Duen Horng Chau. <i>NeurIPS Workshop on Women in Machine Learning (WiML), 2019</i> . Vancouver, Canada. Dec 9, 2019.	
	How Does Visualization Help People Learn Deep Learning? Evaluation of GAN Lab. Minsuk Kahng, Duen Horng (Polo) Chau. <i>IEEE VIS 2019 Workshop on Evaluation of Interactive Visual Machine Learning Systems (EVIVA-ML)</i> . Vancouver, Canada. Oct 21, 2019.	PDF
	Extracting Knowledge For Adversarial Detection and Defense in Deep Learning. Scott Freitas, Shang-Tse Chen, Duen Horng (Polo) Chau. <i>KDD 2019 Workshop on Learning and Mining for Cybersecurity (LEMINGS)</i> . Anchorage, Alaska. Aug 5, 2019.	PDF
	The Efficacy of SHIELD under Different Threat Models strong>. Cory Cornelius, Nilaksh Das, Shang-Tse Chen, Li Chen, Michael Kounavis, Duen Horng (Polo) Chau. <i>KDD 2019 Workshop on Learning and Mining for Cybersecurity (LEMINGS)</i> . Anchorage, Alaska. Aug 5, 2019.	PDF
	Discovery of Intersectional Bias in Machine Learning Using Automatic Subgroup Generation. Ángel Alexander Cabrera, Minsuk Kahng, Fred Hohman, Jamie Morgenstern, Duen Horng (Polo) Chau. <i>ICLR 2019 Workshop on Debugging Machine Learning Models Workshop Debug-ML</i> . New Orleans, LA. May 6, 2019.	PDF
	Towards the Realistic Evaluation of Evasion Attacks using CARLA. Cory Cornelius, Shang-tse Chen, Jason Martin, Duen Horng (Polo) Chau. <i>The 2nd DSN Workshop on Dependable and Secure Machine Learning (DSN-DSML'19)</i> .	PDF
	Defense against Adversarial Attacks using JPEG Compression. Nilaksh Das, Mahduri Shanbhogue, Shang-Tse Chen, Fred Hohman, Li Chen, Michael. E. Kounavis, Duen Horng (Polo) Chau. <i>NIPS Workshop on Women in Machine Learning (WiML), 2017</i> .	
	Designing a Visual Analytics System for Industry-Scale Deep Neural Network Models. Minsuk Kahng, Pierre Y. Andrews, Aditya Kalro, Duen Horng (Polo) Chau. <i>IEEE VIS'17 Workshop on Visual Analytics for Deep Learning</i> .	
	Scalable Architecture for Anomaly Detection and Visualization in Power Generating Assets. Paras Jain, Chirag Tailor, Sam Ford, Liexiao Ding, Michael Phillips, Fang Liu, Nagi Gebraeel, Duen Horng Chau. <i>The 3rd IEEE International Workshop on High-Performance Big Data Computing (HPBDC, at IPDPS 2017)</i> . May 29, 2017. Orlando, Florida.	PDF
	[MLCube] Visual Exploration of Machine Learning Results using Data Cube Analysis. Minsuk Kahng, Dezhi Fang, Duen Horng (Polo) Chau. <i>SIGMOD 2016 Workshop on Human-In-the-Loop Data Analytics (HILDA)</i> . Jun 26, 2016. San Francisco, USA.	PDF
	Building a Research Data Science Platform from Industrial Machines. Fang (Cherry) Liu, Fu Shen, Duen Horng Chau, Neil Bright and Mehmet Belgin. <i>IEEE Big Data 2016 Workshop on Advances in Software and Hardware for Big Data to Knowledge Discovery (ASH)</i> . Dec 5-8, 2016. Washington D.C.	PDF
	Building a Data Science Platform from Scratch. Fang (Cherry) Liu, Fu Shen, Duen Horng (Polo) Chau, Paras Jain. <i>Women in HPC Workshop at Super Computing (SC) 2016</i> . Nov 13, 2016. Salt Lake City, USA.	
	ISPARK: Interactive Visual Analytics for Fire Incidents and Station Placement. Subhajit Das, Andrea McCarter, Joe Minieri, Nandita Damaraju, Sriram Padmanabhan and Duen Horng Chau. <i>KDD 2015 Workshop on Interactive Data Exploration and Analytics (IDEA)</i> Aug 10, 2015. Sydney, Australia.	PDF
	A Visual Analytics Approach to Understanding Care Process Variation and Conformance. Rahul C. Basole, Hyunwoo Park, Mayank Gupta, Mark L. Braunstein, Polo Chau, Michael Thompson, Vikas Kumar, Robert Pienta, Minsuk Kahng. <i>2015 Workshop on Visual Analytics in Healthcare</i> . Oct 25, 2015. Chicago IL, USA.	PDF
	Towards Scalable Graph Computation on Mobile Devices. Yiqi Chen, Zhiyuan Lin, Robert Pienta, Minsuk Kahng, Duen Horng (Polo) Chau. <i>IEEE BigData 2014 Workshop on Scalable Machine Learning: Theory and Applications</i> . Oct 27, 2014. Washington DC, USA.	PDF
	Bicentric Visualization of Pediatric Asthma Care Process Activities. Rahul C. Basole, Hyunwoo Park, Vikas Kumar, Mark L. Braunstein, James Bost, Duen Horng (Polo) Chau, Minsuk Kahng. <i>IEEE VIS 2014 Workshop on Visualizing Electronic Health Record Data (EHRVis)</i> . Nov 9, 2014. Paris, France.	
Exploring Clinical Care Processes Using Visual and Data Analytics: Challenges and Opportunities. Vikas Kumar, Hyunwoo Park, Rahul C. Basole, Mark Braunstein, Minsuk Kahng, Duen Horng Chau, Acar Tamersoy, Daniel A. Hirsh, Nicoleta Serban, James Bost, Burton Lesnick, Beth Schissel, Michael Thompson. <i>ACM KDD'14 Data Mining for Social Good Workshop</i> . Aug 24, 2014, New York City, NY.	PDF	
Temporal Event Sequence Mining for Glioblastoma Survival Prediction. Kunal Malhotra, Duen Horng (Polo) Chau, Jimeng Sun, Costas Hadjipanayis, Shamkant B. Navathe. <i>KDD 2014 Workshop on Health Informatics (HI-KDD 2014)</i> . Aug 24, 2014. New York City, NY. USA.	PDF	
Leveraging Memory Mapping for Fast and Scalable Graph Computation on a PC. Zhiyuan (Jerry) Lin, Duen Horng (Polo) Chau, U Kang. <i>IEEE BigData'13 Scalable Machine Learning: Theory and Applications</i> . Oct 6, Santa Clara, CA.	PDF	
Exploring Large Scale Insider Trading Data: Network Patterns & Discoveries. Acar Tamersoy, Bo Xie, Stephen Lenkey, Bryan R. Routledge, Duen Horng (Polo) Chau, Shamkant B. Navathe. <i>Workshop on Information in Networks (WIN 2012)</i> . Oct 4-5, New York, NY.		

Information in Networks (WIN 2013). Oct 4-5, New York, NY.

Scalable, Minimalist Graph Computation on a PC via Memory Mapping. Zhiyuan (Jerry) Lin, Duen Horng (Polo) Chau, U Kang. *Workshop on Information in Networks (WIN 2013)*. Oct 4-5, New York, NY.

Augmenting MATLAB with Semantic Objects for an Interactive Visual Environment. Changhyun Lee, Jaegul Choo, Duen Horng (Polo) Chau, Haesun Park. *KDD 2013 Workshop on Interactive Data Exploration and Analytics (IDEA 2013)*. Aug 11, 2013. Chicago, Illinois.

Polonium: Tera-Scale Graph Mining for Malware Detection. Duen Horng (Polo) Chau, Carey Nachenberg, Jeffrey Wilhelm, Adam Wright, Christos Faloutsos. *The 2nd Workshop on Large-scale Data Mining: Theory and Applications (LDMTA 2010)*. July 25, 2010. Washington, DC.
[IBM Student Travel Fellowship](#)

Inference of Beliefs on Billion-Scale Graphs. U Kang, Duen Horng (Polo) Chau, Christos Faloutsos. *The 2nd Workshop on Large-scale Data Mining: Theory and Applications (LDMTA 2010)*. July 25-28, 2010. Washington, DC.

Supporting Ad Hoc Sensemaking: Integrating Cognitive, HCI, and Data Mining Approaches. Aniket Kittur, Duen Horng (Polo) Chau, Christos Faloutsos, Jason I. Hong. *Sensemaking Workshop at CHI 2009*. April 4-5, 2009. Boston, MA.

Feldspar: A System for Finding Information by Association. Duen Horng (Polo) Chau, Brad Myers, and Andrew Faulring. *PIM 2008: CHI 2008 Workshop on Personal Information Management*. April 5-6, 2008. Florence, Italy.

Fraud Detection in Electronic Auction. Duen Horng (Polo) Chau and Christos Faloutsos. *Proceedings of EWMF'05: European Web Mining Forum, at ECML/PKDD'05*. October 3-7, 2005. Porto, Portugal.

Poster Papers

CNN 101: Interactive Visual Learning for Convolutional Neural Networks. Zijie J. Wang, Robert Turko, Omar Shaikh, Haekyu Park, Nilaksh Das, Fred Hohman, Minsuk Kahng, Duen Horng (Polo) Chau. *Extended Abstracts, CHI 2020*. Apr 25-30, Honolulu, Hawaii, USA.

Massif: Interactive Interpretation of Adversarial Attacks on Deep Learning. Nilaksh Das, Haekyu Park, Zijie J. Wang, Fred Hohman, Robert Firstman, Emily Rogers, Duen Horng (Polo) Chau. *Extended Abstracts, CHI 2020*. Apr 25-30, Honolulu, Hawaii, USA.

Mixed Reality for Learning Programming. Joonyoung Kim, Sudeep Agarwal, Kristina Marotta, Siwei Li, Jonathan Leo, Duen Horng Chau. *Proceedings of the 18th ACM International Conference on Interaction Design and Children (IDC), 2019*. Boise, ID. Jun 12-15, 2019.
[Won Best Work-in-Progress, Honorable Mention](#)

NeuralDivergence: Exploring and Understanding Neural Networks by Comparing Activation Distributions. Haekyu Park, Fred Hohman, Duen Horng (Polo) Chau. *IEEE Pacific Visualization Symposium (PacificVis) 2019*. Bangkok, Thailand. Apr 23-26, 2019.

Augmenting Coding: AugmentedReality for Learning Programming. Nathan Dass, Joonyoung Kim, Sam Ford, Sudeep Agarwal, Duen Horng Chau. *The Sixth International Symposium of Chinese CHI (Chinese CHI 2018)*. Apr 21-22, 2018. Montreal, Canada..
[Won Best Poster](#)

3D Exploration of Graph Layers via Vertex Cloning. James Abello, Fred Hohman, Duen Horng (Polo) Chau. *Poster Abstract, IEEE VIS 2017*.

Atomic Operations for Specifying Graph Visualization Techniques. Charles D. Stolper, Will Price, Matt Sanford, Duen Horng (Polo) Chau, John Stasko. *Poster Abstract, IEEE VIS 2017*.

ShapeShop: Towards Understanding Deep Learning Representations via Interactive Experimentation. Fred Hohman, Nathan Hodas, Duen Horng (Polo) Chau. *Extended Abstracts, CHI 2017* May 6-11, 2017. Denver, CO, USA.

Carina: Interactive Million-Node Graph Visualization using Web Browser Technologies. Dezhi (Andy) Fang, Mahew Keezer, Jacob Williams, Kshitij Kulkarni, Robert Pienta, Duen Horng (Polo) Chau. *26th International World Wide Web Conference (WWW) 2017 Companion*. April 3-7, 2017. Perth, Australia.

Making Sense of Graph Query Results: Interactive Summarization and Exploration. Robert Pienta, Alex Endert, Shamkant Navathe, Duen Horng Chau. *Poster Abstract, IEEE VIS 2016*. Oct 23 - 28, 2016. Baltimore, Maryland, USA.

NaturalMotion: Exploring Gesture Controls for Visualizing Time-Evolving Graphs. Samuel Clarke, Nathan Dass, Duen Horng Chau. *Poster Abstract, IEEE VIS 2016*. Oct 23 - 28, 2016. Baltimore, Maryland, USA.

M3: Scaling Up Machine Learning via Memory Mapping. Dezhi Fang, Duen Horng (Polo) Chau. *SIGMOD/PODS'16*.

Generating Graph Snapshots from Streaming Edge Data. Sucheta Soundarajan, Acar Tamersoy, Elias Khalil, Tina Eliassi-Rad, Duen Horng Chau, Brian Gallagher and Kevin Roundy *25th International World Wide Web Conference 2016*. Apr 11-15, 2016. Montreal, Canada

STEPS: A Spatio-temporal Electric Power Systems Visualization. Robert Pienta, Leilei Xiong, Santiago Grijalva, Duen Horng Chau, Minsuk Kahng. *ACM Conference on Intelligent User Interfaces (IUI)*. March 7-10, 2016. Sonoma, GA, USA.

Effort-based Detection of Comment Spammers. Acar Tamersoy, Hua Ouyang and Duen Horng Chau *36th IEEE Symposium on Security and Privacy 2015*. May 18-20, 2015. San Jose. CA. USA.

- Spotting Suspicious Reviews via (Quasi-)Clique Extraction.** Paras Jain, Shang-Tse Chen, Mozghan Azimpourkivi, Duen Horng Chau and Bogdan Carbutar. *36th IEEE Symposium on Security and Privacy 2015*. May 18-20, 2015. San Jose, CA, USA. [PDF](#)
- TimeStitch: Interactive Multi-focus Cohort Discovery and Comparison.** Peter J. Polack, Jr., Shang-Tse Chen, Minsuk Kahng, Moushumi Sharmin, Duen Horng (Polo) Chau. *Poster Abstract, IEEE VIS 2015*. Oct 25 - 30, 2015. Chicago, IL, USA. [PDF](#)
- AdaptiveNav: Adaptive Discovery of Interesting and Surprising Nodes in Large Graphs.** Robert Pienta, Zhiyuan Lin, Minsuk Kahng, Jilles Vreeken, Partha P. Talukdar, James Abello, Ganesh Parameswaran, Duen Horng (Polo) Chau. *Poster Abstract, IEEE VIS 2015*. Oct 25 - 30, 2015. Chicago, IL, USA. [PDF](#)
- Interactive Querying over Large Network Data: Scalability, Visualization, and Interaction Design.** Robert Pienta, Acar Tamersoy, Hanghang Tong, Alex Endert, Duen Horng (Polo) Chau. *ACM Conference on Intelligent User Interfaces (IUI)*. Atlanta, GA, USA. March 29 - April 1, 2015. [PDF](#)
- Identifying Successful Investors in the Startup Ecosystem.** Srishti Gupta, Robert Pienta, Acar Tamersoy, Duen Horng Chau, Rahul C. Basole. *International Conference on World Wide Web (WWW) 2015*, May 18 -22, 2015. Florence, Italy [PDF](#)
- GLOs: Graph-Level Operations for Exploratory Network Visualization.** Charles D. Stolper, Florian Foerster, Minsuk Kahng, Zhiyuan Lin, Aakash Goel, John Stasko, Duen Horng (Polo) Chau. *Extended Abstracts, CHI 2014*. Apr 26 - May 1, 2014. Toronto, Canada. [PDF](#)
- Interactive Multi-resolution Exploration of Million Node Graphs.** Zhiyuan (Jerry) Lin, Duen Horng (Polo) Chau. *Poster Abstract, IEEE VIS 2013* Oct 13 - 18, 2013. Atlanta, GA, USA. [PDF](#)
- Fast Interactive Visualization for Multivariate Data Exploration.** Changhyun Lee, Wei Zhuo, Jaegul Choo, Duen Horng (Polo) Chau. *Extended Abstracts, CHI 2013* Apr 27- May 2, 2013. Paris, France. [PDF](#)
- TopicViz: Semantic Navigation of Document Collections.** Jacob Eisenstein, Duen Horng (Polo) Chau, Aniket Kittur, Eric P. Xing. *Extended Abstracts, CHI 2012*. May 5-10, 2012. Austin, TX, USA. [PDF](#)
- Parallel Crawling for Online Social Networks.** Duen Horng (Polo) Chau, Shashank Pandit, Samuel Wang, and Christos Faloutsos. *International Conference on World Wide Web (WWW) 2007*. May 8-12, 2007. Banff, Alberta, Canada. Pages 201-210. [PDF](#)
- Integrating Isometric Joysticks into Mobile Phones for Text Entry.** Duen Horng (Polo) Chau, Jacob O. Wobbrock, Brad A. Myers, Brandon Rothrock. *Extended Abstracts, CHI 2006*. April 22-27, 2006. Montreal, Canada. Pages 640-645. [PDF](#)
- Demos **MLSploit: A Framework for Interactive Experimentation with Adversarial Machine Learning Research.** Nilaksh Das, Siwei Li, Chanil Jeon, Jinho Jung, Shang-Tse Chen, Carter Yagemann, Evan Downing, Haekyu Park, Evan Yang, Li Chen, Michael Kounavis, Ravi Sahita, David Durham, Scott Buck, Duen Horng Chau, Taesoo Kim, Wenke Lee. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2019 Project Showcase*. Ankorage, Alaska. Aug 4-8, 2019. [PDF](#) [Code](#) [YouTube](#)
- MLSploit: A Cloud-Based Framework for Adversarial Machine Learning Research.** Nilaksh Das, Siwei Li, Chanil Jeon, Jinho Jung, Shang-Tse Chen, Carter Yagemann, Evan Downing, Haekyu Park, Evan Yang, Li Chen, Michael Kounavis, Ravi Sahita, David Durham, Scott Buck, Polo Chau, Taesoo Kim, Wenke Lee. *Black Hat Asia - Arsenal, 2019*. Singapore. Mar 26-29, 2019. [Abstract](#)
- ADAGIO: Interactive Experimentation with Adversarial Attack and Defense for Audio.** Nilaksh Das, Madhuri Shanbhogue, Shang-Tse Chen, Li Chen, Michael E. Kounavis, Duen Horng (Polo) Chau. *European Conference on Machine Learning & Principles & Practice of Knowledge Discovery in Databases (ECML-PKDD), 2018*. Dublin, Ireland. Sep 10-14, 2018. [PDF](#)
- Compression to the Rescue: Defending from Adversarial Attacks Across Modalities.** Nilaksh Das, Madhuri Shanbhogue, Shang-Tse Chen, Fred Hohman, Siwei Li, Li Chen, Michael E Kounavis, Duen Horng Chau. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2018 Project Showcase*. London, United Kingdom. Aug 19-23, 2018. [PDF](#)
- Interactive Classification for Deep Learning Interpretation.** Angel Cabrera, Fred Hohman, Jason Lin, Duen Horng (Polo) Chau. *Demo, Conference on Computer Vision and Pattern Recognition (CVPR)*. June 18, 2018. Salt Lake City, USA. [PDF](#) [YouTube](#) [Code](#)
- mHealth Visual Discovery Dashboard.** Dezhi Fang, Fred Hohman, Peter Polack, Hillol Sarker, Minsuk Kahng, Moushumi Sharmin, Mustafa al'Absi, Duen Horng (Polo) Chau. *Demo, ACM International Joint Conference on Pervasive and Ubiquitous Computing (UBICOMP)* Sept 11-15, 2017. Maui, USA. [PDF](#) [YouTube](#) [Poster](#)
- Visual Graph Query Construction and Refinement.** Robert Pienta, Fred Hohman, Acar Tamersoy, Alex Endert, Shamkant Navathe, Hanghang Tong, Duen Horng Chau. *SIGMOD 2017*. May 14-19, 2017. Chicago, IL, USA. [PDF](#) [YouTube](#)
- Best Demo, Honorable Mention**
- Demonstrating Interactive Multi-resolution Large Graph Exploration.** Zhiyuan (Jerry) Lin, Nan Cao, Hanghang Tong, Fei Wang, U Kang, and Duen Horng (Polo) Chau. *ICDM 2013*. Dec 7 - 10, 2013. Dallas, Texas, USA. [PDF](#)
- Interactive Data Analysis Tool by Augmenting MATLAB with Semantic Objects.** Changhyun Lee, Jaegul Choo, Duen Horng (Polo) Chau, and Haesun Park. *ICDM 2013*. Dec 7 - 10, 2013. Dallas, Texas, USA.
- Interactively and Visually Exploring Trains of Marked Nodes in Large Graphs.** Duen Horng (Polo) Chau, Zhiyuan (Jerry) Lin, Hanghang Tong, Alex Endert, Fred Hohman, Jaegul Choo, Changhyun Lee, and Haesun Park. *ICDM 2013*. Dec 7 - 10, 2013. Dallas, Texas, USA. [PDF](#)

Interactively and visually Exploring Tours of Marked Nodes in Large Graphs. Duen Horng (Polo) Chau, Leman Akoglu, Jilles Vreeken, Hanghang Tong, Christos Faloutsos. *ASONAM 2012*. Aug, 2012. Istanbul, Turkey

TourViz: Interactive Visualization of Connection Pathways in Large Graphs. Duen Horng (Polo) Chau, Leman Akoglu, Jilles Vreeken, Hanghang Tong, Christos Faloutsos. *KDD 2012*. Aug, 2012. Beijing, China

[PDF](#)

Large Graph Mining System for Patterns, Anomalies & Visualization. Leman Akoglu, Duen Horng (Polo) Chau, U Kang, Danai Koutra, Christos Faloutsos. *Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD) 2012*. May 29-Jun 1, 2012. Kuala Lumpur, Malaysia

OPAvion: Mining and visualization in large graphs. Leman Akoglu, Duen Horng (Polo) Chau, U Kang, Danai Koutra, Christos Faloutsos. *ACM SIGMOD Conference 2012*. May 20-24, 2012. Scottsdale, Arizona, USA

[PDF](#)
[Poster](#)

Apolo: Interactive Large Graph Sensemaking by Combining Machine Learning and Visualization. Duen Horng (Polo) Chau, Aniket Kittur, Jason I. Hong, Christos Faloutsos. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2011*. Aug 21-21, 2011. San Diego, California, USA.

[PDF](#)

SHIFTR: A Fast and Scalable System for Ad Hoc Sensemaking of Large Graphs. Duen Horng (Polo) Chau, Aniket Kittur, Christos Faloutsos, Hanghang Tong, Jason I. Hong. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2009*. June 28-July 1, 2009. Paris, France.

[PDF](#)

GRAPHITE: A Visual Query System for Large Graphs. Duen Horng (Polo) Chau, Christos Faloutsos, Hanghang Tong, Jason I. Hong, Brian Gallagher, Tina Eliassi-Rad. *International Conference on Data Mining (ICDM) 2008*. Dec 15-19, 2008. Pisa, Italy.

[PDF](#)
[YouTube](#)

Video

SHIFTR: a user-directed, link-based system for ad hoc sensemaking of large heterogeneous data collections. Duen Horng (Polo) Chau, Aniket Kittur, Christos Faloutsos, Jason I. Hong. *Extended Abstracts of CHI 2009*. Apr 4-9, 2009. Boston, MA.

PH.D. STUDENTS

Advisor

[Rahul Duggal](#), CS PhD
Fall 2019 - present. Co-adv: Jimeng Sun.

[Austin Wright](#), ML PhD
Fall 2019 - present.

[Zijie \(Jay\) Wang](#), ML PhD
Fall 2019 - present.

[Haekyu Park](#), CS PhD.
Fall 2018 - present.

[Scott Freitas](#), ML PhD.
Fall 2018 - present.

[NSF Graduate Research Fellowship, 2018-2021](#)
[Raytheon Graduate Research Assistantship, 2019. \\$25k.](#)

[Nilaksh Das](#), CSE PhD.
Fall 2017 - present.

[Fred Hohman](#), CSE PhD.
Summer 2016 - present.

[NASA Space Technology Research Fellowship 2018-2021. ~\\$80k/yr](#)

[Shang-Tse Chen](#), CS PhD. Co-adv: Nina Balcan.
Fall 2014 - Fall 2019.

Thesis: *AI-infused Security: Robust Defense by Bridging Theory and Practice*

[Now: Assistant Professor, National Taiwan University \(NTU\)](#)

[IBM Fellowship, 2018-2020](#)
[Symantec Research Labs \(SRL\) Graduate Fellowship 2016, runner-up](#)

[Minsuk \(Brian\) Kahng](#), CS PhD.
Fall 2013 - Fall 2019.

Thesis: *Human-Centered AI through Scalable Visual Data Analytics*

[Now: Assistant Professor, Oregon State University](#)

[Google PhD Fellowship, 2018-2020](#)

[NSF Graduate Research Fellowship, 2014-2017](#)

[Robert Pienta](#), CSE PhD.
Spring 2013 - Fall 2017.

Thesis: *Adaptive Visual Network Analytics: Algorithms, Interfaces, and Systems for Exploration and Querying*
Proposal: 4/6/16. Defense: 6/27/17

[Now: Data Scientist, Mailchimp](#)

[Acar Tamersoy](#), CS PhD. Co-adv: Sham Navathe.
Spring, 2013 - Spring 2016.

Thesis: *Graph-based Algorithms and Models for Security, Healthcare, and Finance*

Proposal: 11/6/15. Defense: 3/11/16.

[Symantec Research Labs \(SRL\) Graduate Fellowship, 2014-2015](#)

Now: Researcher Scientist, Symantec Research Labs

Co-advisor [Chad Stolper](#). CS PhD. Adv: [John Stasko](#).
Spring 2014 - Summer 2016.
Thesis: Graph-Level Operations: A High-Level Interface for Graph Visualization Specification
Proposal: 5/1/15. Defense: 7/1/16.
Now: Assistant Professor, Southwestern University

Research Project Advisor [Abhijit Suprem](#). CS. Fall 2017.
[Liexiao \(Richard\) Ding](#). ISyE. Adv: [Nagi Gebraeel](#). Fall 2016.
[Oliver Haimson](#). Ph.D. Informatics Department. UC Irvine. Co-adv: [Bistra Dilkina](#), [Matt Hinds-Aldrich](#). Summer 2015.
[Wenwen Chang](#). Ph.D. City and Regional Planning. Co-adv: [Bistra Dilkina](#), [Matt Hinds-Aldrich](#). Summer 2015.
[Can Hantas](#). Co-adv: [Sham Navathe](#). Spring 2014
[Dr. Jaegul Choo](#). CSE. Adv: [Haesun Park](#). Spring 2013 - Fall 2014.
Now: Assistant Professor, Korea University
[Kunal Malhotra](#). CS. Adv: [Sham Navathe](#). Spring 2013 - Spring 2014.
[Kaeser Puryear Sabrin](#). CS. Fall, 2013.
[Wei \(Tina\) Zhou](#). IC. Adv: [Jarek Rossignac](#). Spring 2013 - Fall 2013.
[Bo Xie](#). CSE. Fall 2012 - Spring 2013.

POST DOCS

[Dongkyu Chae](#). Fall 2019 - present

MASTERS STUDENTS

MS Thesis Advisor [Elias Khalil](#). CSE. Spring 2013 - Spring 2014.
Thesis: Optimizing the Structure of Diffusion Networks: Theory and Algorithms
Now: Assistant Professor, University of Toronto
[Marshall D. Williamson Fellowship, for well-rounded second-year Masters' students, Spring 2014](#)
[Donald V. Jackson Fellowship, for well-rounded first year Masters' students, Spring 2013](#)
Now: CSE/CoC PhD student

Research Proj Advisor [Anmol Chhabria](#). MS CSE. Spring 2019.
[Donald V. Jackson Fellowship, for well-rounded first year Masters' students, Spring 2019](#)
[Kristina Marotta](#). OMS CS. Fall 2018.
[Varun Bezzam](#). MS CS. Fall 2017 - Fall 2018
[Madhuri Shanbhogue](#). MS CS. Spring 2017 - Spring 2018
Now: Google
[Prasenjeet Biswal](#). MS CS. Spring 2017 - Fall 2018
[Nilaksh Das](#). MS CSE. Spring 2017
[Chirag Tailor](#). MS CS. Summer 2016 - Spring 2017.
[Michael Phillips](#). MS Analytics. Fall 2016.
[Peter Polack](#). MS CS. Fall 2015 - Fall 2016.
Now: PhD student, UCLA
[Meera Kamath](#). MS CS. Spring 2016.
Now: Microsoft
[Apuv Verma](#). MS CS. Spring 2016.
[Michael Madaio](#). MS Digital Media. Summer 2015. Co-adv: [Bistra Dilkina](#), [Matt Hinds-Aldrich](#).
Now: HCI Ph.D. student, Carnegie Mellon
[Xiang \(Sean\) Cheng](#). MS Computer Science & Physics. Emory University. Summer 2015. Co-adv: [Bistra Dilkina](#), [Matt Hinds-Aldrich](#).
Now: Nokia Technologies
[Alexandre Yahi](#). MS CS Summer 2014 - Spring 2015
Now: PhD student, Biomedical Informatics, Columbia University
[Antoine Chassagn](#). MS CS. Summer 2014 - Spring 2015

Antoine Chacabang. MS CS. Summer 2014 - Spring 2015.

Louis Raynaud. MS CS. Summer 2014 - Spring 2015.

Now: Wavestone

Hugo Duthil. MS CS. Summer 2014 - Spring 2015.

Now: Criteo

Mayank Gupta. Co-adv: Rahul Basole. MS CS. Fall 2014 - Spring 2015.

Now: Apple

Florian Foerster. MS HCI. Spring 2014 - Fall 2014.

Now: Facebook software engineer

Ganesh Parameswaran. MS CSE. Fall 2013.

Now: Yahoo! software engineer

Changhyun Lee. MS CSE. Adv: Haesun Park. Fall 2012 - Spring 2013.

Now: Google software engineer

Neha Reddy. MS Info Networking, CMU. 2009.

Now: Cvent software engineer

Karthik Thiyagarajan. MS Info Networking, CMU. 2009.

Now: QuantFind software engineer

Masters Project Shan Li. MS HCI. Fall 2014 - Spring 2015.

Project: A Course/Major Recommendation System for Georgia Tech Students

Placed: Oracle

Srishti Gupta. MS CS. Spring 2014 - Spring 2015.

Project: A Study of Venture Capitalists through Graph Analysis

Now: Apple

Aakash Goel. MS CSE. Spring, Fall 2013.

Project: Improvements to Apolo (a Machine Learning Based Graph Visualization and Analysis System for Large Network Data)

Placed: Google software engineer

MS Special Problem Vivek Nahbi. MS CS. Spring 2014 - Summer 2014.

Project: Systematic Integration of Large Data Sets for Improved Decision-Making.

Jon Greg. MS CSE. Fall 2012.

Project: Anomaly detection for graphs

Zhen (Henry) Wang. MS CSE. Fall 2012.

Project: Large graph decomposition

Ziaohui Luo. IC. Fall 2012.

Project: Graph visualization on mobile devices

HIGH SCHOOL STUDENTS

Research Advisor Ergin John (EJ) Ozyazgan, Walton high school. Spring 2015 - Summer 2015.

UNDERGRADUATE STUDENTS

Research Advisor [Robert Firstman](#). CS. Fall 2019 - present.

[Robert Turko](#). CS. Fall 2019.

[Jon Saad-Falcon](#). CS. Fall 2019 - present.

[Zhiyan \(Frank\) Zhou](#). CS. Fall 2019 - present.

Anish Upadhayay. CS. Fall 2019 - present.

[Omar Shaikh](#). CS. Fall 2018 - present.

Awarded President's Undergraduate Research Travel Award (PURA) (\$1500, Spring'20)

[Will Epperson](#). CS. Spring 2019 - present.

Stamps President's Scholar, Aug 2016-May 2020. Full-ride scholarship, awarded to 40 students.

Awarded President's Undergraduate Research Travel Award (PURA) (\$1500, Fall'19)

[Jonathan Leo](#). CS. Spring 2019 - present.

Awarded President's Undergraduate Research Travel Award (PURA) (\$1500, Fall'19)

[Ángel \(Alex\) Cabrera](#). CS. Spring 2018 - Spring 2019.

[Angel \(Alex\) Cabrera](#). CS. Spring 2016 - Spring 2019.

Now: CS Ph.D. student, Carnegie Mellon University

Co-recipient of Love Family Scholarship (\$10,000 total), highest award Georgia Tech gives to a graduating senior. 2019.

Stamps President's Scholar, Aug 2015-May 2019. Full-ride scholarship, awarded to 10 students.

[Siwei \(Bob\) Li](#). CS. Fall 2017 - present.

Awarded President's Undergraduate Research Travel Award (PURA) (\$1500, Fall'19)

[Sudeep Agarwal](#). CS. Fall 2017 - Fall 2018.

[Dezhi \(Andy\) Fang](#). CS. Fall 2015 - Spring 2018.

Now: Airbnb

Outstanding Undergraduate Research, College of Computing, Georgia Tech. 2018.

Outstanding Undergraduate Researcher, Georgia Tech. 2018.

Research supported by Faculty Materials, Supplies and Travel Grants for Undergraduate Research (\$1000, Summer'17)

Awarded President's Undergraduate Research Travel Award (PURA) (\$1500, Fall'16)

SIGMOD'16 Undergraduate Research Poster Competition Finalist

[Yili Hui](#). CS. Fall 2017 - Spring 2018.

[Joon Kim](#). CS. Fall 2017 - Spring 2019.

Now: Mailchimp

[Joseph Spall](#). CS. Fall'17.

[Michael Aki](#). CS. Fall'17.

[D'arcy \(Quintin\) W Roper](#). CS. Fall'17.

[Kshitij Kulkarni](#). EE. Fall 2016 - Spring 2017.

[Jake Williams](#). CS. Spring 2016 - Spring 2017.

[Fu Shen](#). CS. Summer 2016. Co-adv: Fang (Cherry) Liu.

[Matthew Keezer](#). CS. Fall 2015 - Spring 2017.

Now: IBM

[Jay Kamat](#). CS. Fall 2015 - Spring 2016.

[Neil Goel](#). CS. Fall 2015.

[Francisco Zampieri](#). CS. Fall 2015.

[Mika Munch](#). CS. Fall 2015.

[Goutam Venkatramanan](#). CS. Fall 2015.

[Sam Ford](#). CS. Summer 2015 - Fall 2017.

Now: Qualcomm

[Ryan Birmingham](#). CS. Summer - Fall 2015.

[Rupert Wu](#). CS. Summer 2015 - Fall.

[Arman Rye](#). ISyE. Fall 2014 - Spring 2015.

[Gustavo Oliver](#). ISyE. Fall 2014 - Spring 2015.

[Nathan Dass](#). CS. Fall 2014 - Fall 2017.

Now: Google

2nd Place InVenture Prize 2017. \$10,000 award

Research supported by Faculty Materials, Supplies and Travel Grants for Undergraduate Research (\$1000, Summer'17)

Wearable Computing Center Grant (with Samuel Clarke) (~\$1000, Fall 2014)

[Paras Jain](#). CS. Fall 2014 - Spring 2017.

Now: EECS PhD student, UC Berkeley

Awarded President's Undergraduate Research Travel Award (PURA) twice (Spring'16: \$1000; Spring'17: \$1500)

[Yiqi \(Victor\) Chen](#). CS. Fall 2013 - Spring 2016.

Now: Facebook software engineer

Awarded President's Undergraduate Research Travel Award (PURA) (\$1000, Spring'15)

[Zhiyuan \(Jerry\) Lin](#). CS. Spring 2013 - Spring 2016.

Now: CS Ph.D. student, Stanford

Computing Research Association's (CRA) Outstanding Undergraduate Male Researcher Award, finalist

Outstanding Undergraduate Research in Computing Award (2015)

Chosen as Georgia Tech representative for 10th Annual ACC Meeting of the Minds Conference at NC State University

Awarded President's Undergraduate Research Travel Award (PURA) (\$1000, Fall'14)

1st place, 9th Undergraduate Research Kaleidoscope (URK). Oct 2014.

Awarded Sigma Xi Best Undergraduate Research Award (\$200, plaque, certificate, Spring 2014)

2nd Place, 9th Annual Undergraduate Research Symposium at Georgia Tech's College of Computing, Spring 2014

Awarded President's Undergraduate Research Salary Award (PURA) (\$1500, Fall'13)

Funded by Faculty Materials, Supplies and Travel Grants for Undergraduate Research (\$1000, Summer'13)

Awarded to attend the prestigious SC13 (SuperComputing) Experiencing HPC for Undergraduates program. 25 total awardees worldwide.

Samuel Clarke. CS. Co-adv: Hongyuan Zha. Spring 2013 - Fall 2016.

Now: Robotics Ph.D. student, Carnegie Mellon

Astronaut Scholarship (2015) -- among the most prestigious scholarships awarding the best and brightest undergraduate students pursuing education in STEM across the nation.

LatentGesture research featured in popular press

Wearable Computing Center Grant (with Nathan Dass) (~\$1000, Fall 2014)

Premkumar (Prem) Saravanan. CS. Co-adv: Hongyuan Zha. Summer 2013 - Spring 2014.

Awarded President's Undergraduate Research Salary Award (PURA) (\$1500, Spring'14)

LatentGesture research featured in popular press

Samarth Agarwal. CS. Spring 2013.

Sahil Jolly. CS, CMU. 2010.

Now: Amazon

Sam Wang. CS, CMU. 2006 - 07.

Project: eBay fraud detection

Now: PhD student at MIT

VISITING SCHOLARS

Hugo Armando Gualdrón Colmenares, visiting from Universidade de São Paulo. Oct 2014 - Mar 2015.

KEYNOTES

Scalable, Interactive Tools for Large Graph Analytics

Oct 27, 2014 [Scalable Machine Learning: Theory and Applications](#) workshop at [IEEE International Conference on Big Data \(IEEE BigData 2014\)](#)

Oct 2, 2014 Undergraduate Research Kaleidoscope. Jointly hosted by Georgia Tech Library and the Undergraduate Research Opportunities Program.

INVITED TALKS

Secure AI: The Next Frontiers

Oct 9, 2019 Intel Labs Open House

Towards Secure and Interpretable AI: Scalable Methods, Interactive Visualizations, and Practical Tools

Dec 6, 2019 New York University. Host: Enrico Bertini

Nov 15, 2019 Chick-fil-A. Hosts: Jae Cha, Jon Hadacek, Melinda Borrero, Cameron Bradley

Nov 6, 2019 IEEE Data Mining Series, Georgia State University

Aug 29, 2019 [GVU Center Brown Bag Seminar](#), Georgia Tech.

Jun 27, 2019 Intel Tech Talk

Adversarial Machine Learning: Perspectives & Recent Developments

Jul 29, 2019 Intel

Human-centered AI: Scalable Interactive Tools for Interpretation & Attribution

Jun 11, 2019 [Machine Learning in Science and Engineering \(MLSE\) Symposium](#)

Apr 23, 2019 Strategic Partnership Program meeting

Explaining Machine Learning Models Using Interactive Visualization

Mar 14, 2019 NASA Jet Propulsion Lab (JPL). Host: Scott Davidoff

ActiVis: Visual Exploration of Industry-Scale Deep Neural Network Models

Aug 12, 2018 ACM SIGGRAPH. Delivered by Minsuk Kahng.

Jun 10, 2018 SIGMOD Workshop on Human-in-the-Loop Data Analytics (HILDA). Delivered by Minsuk Kahng.

Data Mining meeting HCI: Human-Machine Sensemaking of Large Graphs

Apr 14, 2017 Rutgers University. Host: James Abello

Apr 7, 2017 Southern Data Science Conference, Atlanta.

Machine Learning meets Visualization: Human-machine Sensemaking of Large Network Data

Feb 5, 2016 Centers for Disease Control and Prevention (CDC), Atlanta. Host: Robin Wagner.

Data Mining Meets HCI: Interactive Visual Tools for Large Graphs

Feb 16, 2017 Machine Learning Data Analysis Webinar. South Big Data Hub.

May 17, 2016 MIT Lincoln Lab Graph Exploitation Symposium 2016

Jan 29, 2016 Carnegie Mellon University, Human-computer Interaction Institute (HCII) Seminar Series. Host: Brad Myers, Queenie Kravitz

10 Lessons Learned from Working with Tech CompaniesJune 21, 2017 [Data Science for Social Good Atlanta 2017](#).June 8, 2016 [Data Science for Social Good Atlanta 2016](#).**Data and Visual Analytics 101**

Summer, 2015 Atlanta Data Science for Social Good 2015. Faculty advisor student team. Co-advisors: Bistra Dilkina, Matt Hinds-Aldrich (Atlanta Fire Rescue Department)

Catching Bad Guys with Graph Mining and Visualization

Dec 17, 2015 Yahoo Labs, New York

Oct 10, 2015 Emory University Institute for Quantitative Theory and Methods, Data Visualization seminar series

Mar 9-10, 2015 Machine Learning and Data Analytics Symposium (MLDAS). Doha, Qatar. Host: Dragos Margineantu

Human-in-the-loop Graph Sensemaking: Bridging HCI and Data MiningDec 12, 2014 [NIPS 2014 Workshop on Personalization: Methods and Applications](#)**HCI meets Data Mining: Interactive Graph Visualization, Exploration, and Sensemaking**

Jun 12, 2016 Computer Society International Conference on Computers, Software & Applications (COMPSAC) 2016

Interactive Graph Visualization, Exploration, and Sensemaking

Dec 10, 2014 FLAMEL workshop

Data Mining Meets HCI: Scalable, Interactive and Comprehensible Tools for Data AnalyticsNov 18, 2015 Career Builder [Distinguished Speaker Series](#). Host: Khalifeh Al Jadda

Oct 17, 2015 Northwestern University, SONIC Speaker Series. Host: Noshir Contractor

Feb 13, 2015 Twitter. Host: Shuang Yang.

Jun 24, 2014 PARC (Palo Alto Research Center Incorporated). Hosts: Oliver Brdiczka, David Gunning.

Jun 6, 2014 Search Technology Forum, eBay.

Apr 26, 2014 2014 SIAM Data Mining (SDM) Workshop on Exploratory Data Analysis.

Mar 13, 2014 [Data Science ATL](#). Host: [Dr. Raj Bandyopadhyay](#). [SOLD-OUT! 200 attendees. 5-star reviews.](#)

Jan 16, 2014 Big Data Chalk & Talk/Brown Bag. Georgia Tech.

Data Mining Meets HCI: Scalable, Interactive Tools for Large GraphsNov 5, 2013 Rutgers University. Host: [Prof. Tina Eliassi-Rad](#).Nov 4, 2013 Bell Labs. Host: [Chun-Nam \(John\) Yu](#).**Data Mining Meets HCI: Making Sense of Large Graphs**Jun 28, 2013 Goodreads. Host: [Jeff Wong](#).

Mar 15, 2013 Stanford HCI seminar. Host: Prof. Jeff Heer.

Feb 11, 2013 LogicBlox. Host: Nikolaos (Nick) Vasiloglou II.

Nov 28, 2012 UC Berkeley iSchool Dean's Lecture. Host: [Prof. Marti Hearst](#)

Oct 25, 2012 LinkedIn. Host: Dr. Daniel Tunkelang, Dr. Monica Rogati

Sept 26, 2012 Hong Kong University, School of Business. Host: Prof. Michael Chau

Oct 11, 2012 IBM (T.J. Watson Research Center). Host: Dr. Hanghang Tong.

June 11, 2012 Huawei Noah Ark Research Lab, Hong Kong. Host: Prof. Qiang Yang.

May 28, 2012 Hong Kong University of Science and Technology. Host: Lionel Li

Apr 16, 2012 University of Pittsburgh, School of Information. Pittsburgh, PA, USA. Host: Prof. Peter Brusilovsky.

- Apr 6, 2012 Georgia Tech, School of Computational Science & Engineering. Atlanta, Georgia, USA.
- Apr 2, 2012 Virginia Tech, Computer Science Department. Blacksburg, Virginia, USA.
- Mar 26, 2012 University of Rochester, Computer Science Department. Rochester, New York, USA.
- Mar 20, 2012 Stony Brook University, Computer Science Department. Stony Brook, New York, USA.
- Mar 13, 2012 Brown University, Computer Science Department. Providence, Rhode Island, USA.
- Mar 7, 2012 University of Michigan, School of Information. Ann Arbor, Michigan, USA.
- Feb 27, 2012 Pennsylvania State University, College of Information Sciences and Technology. State College, Pennsylvania, USA.
- Feb 24, 2012 Carnegie Mellon University, Tepper School of Business. Pittsburgh, Pennsylvania, USA.

Exploiting Network Effects for Fraud and Malware Detection

- Aug 2, 2013 The Third EITA Young Investigator Conference (EITA-YIC 2013), MIT. Invited

Large Graph Analytics: Anomaly Detection & Visualization

- Mar 24, 2013 SIAM SEAS mini symposium on Anomaly Detection Methods and Applications. Invited by Dr. Blair Sullivan, Dr. Robert Bridges.
- June 4, 2012 Singapore Management University. Host: Kyriakos Mouratidis

Mining Billion-Node Graphs: Ideas & Tools

- May 28, 2012 Carnegie Mellon University, Tepper School of Business. Pittsburgh, Pennsylvania, USA. Invited.

Mining Massive Graphs: Visualization and Anomaly Detection

- May 13, 2011 Google. Mountain View, CA, USA
- May 10, 2011 Simon Fraser University. Vancouver, Canada. Host: Prof. Jian Pei. Invited.

Detecting Fraudulent Personalities in Networks of Online Auctioneers

- Feb 16, 2007 eBay. Palo Alto, CA, USA. Invited.

PROFESSIONAL RECOGNITION

Invited Participant

- Jun 14-15, 2017 Pacific Northwest National Laboratory (PNNL) Faculty Summit
Theme: Machine Learning and Human Computer Interaction for Science and Security
- Feb 15, 2017 Forum on Synthetic Identity Fraud, National Academies of Sciences
- Jul 13-14, 2016 Microsoft Faculty Summit
- Aug 1-2, 2016 Google Faculty Institute
- Jun 17-18, 2014 Pacific Northwest National Laboratory (PNNL) Analysis in Motion (AIM) Workshop

Invited Panel Chair

- Mar 21, 2015 Georgia Tech Business Analytics and Big Data Forum: Visual Analytics Session, with Rahul Basole
- Apr 15, 2013 Center for Data Analytics workshop, Georgia Tech

Invited Panelist

- Jun 10, 2018 SIGMOD 2018 Workshop on [Human-In-the-Loop Data Analytics \(HILDA\)](#).
- Mar 4, 2016 [FLAMEL](#) (NSF IGERT) Workshop.
- Feb 5, 2016 *Seeing for Action - Using Maps and Graphs to Protect the Public's Health*. Centers for Disease and Prevention (CDC).
Host: Robin Wagner.
- Sept 22, 2015 Technology Association of Georgia (TAG) Big Data Panel on *Topic: What are we teaching in Big Data in our universities?*
- Oct 16, 2013 IEEE Vis'2013 Workshop on *Using Visual Analytics to Foster Lateral Thinking About Business Problems*. Host: Chandan Gokhale (Infosys)
- Apr 30, 2013 PACE Town Hall panel, on HPC, visualization
- Dec 11, 2012 SAMSI-FODAVA Workshop on *Interactive Visualization and Analysis of Massive Data*
- Nov 13, 2012 *Big Data Meets Social Media* at Georgia Tech's *Institute for People and Technology (iPaT)*'s annual *People & Technology Forum*

PATENTS

Inferring File and Website Reputations by Belief Propagation Leveraging Machine Reputation. Adam Wright (Symantec), Duen Horng Chau. U.S. Patent No. 8,341,745. 25 Dec. 2012.

System and Method for Identifying Related and Synonymous Phrases in Ad Creatives. Arun Swami (Google), Duen Horng Chau. Pending.

System and Method for Identifying Contextually Relevant Phrases in Ad Creatives. Arun Swami (Google), Duen Horng Chau. Pending.

MEDIA COVERAGE

[Virtual, augmented reality platforms emerge as computer science teaching tool.](#) Lauren Barack. Education Dive. March 13, 2019

[K-12 Teachers Use Virtual and Augmented Reality Platforms to Teach Coding.](#) Eli Zimmerman. EdTech. Feb 28, 2019.

[These Wearables Detect Health Issues Before They Happen.](#) Elizabeth Woyke. **MIT Technology Review**. 11/30/16.

[Feature: Can your mobile phone make you healthier?.](#) Kelly Servick. **Science Magazine**. 12/10/2015.

[The Secret World of Stolen Smartphones, Where Business Is Booming.](#) Matthew Shaer. **Wired**, 12/18/14.

LatentGesture: Active Mobile Device Authentication

Personal Touch Signature Makes Mobile Devices More Secure. Georgia Tech Press Release. April 7, 2014. Jason Maderer.

Forget fingerprints: Your phone could lock out thieves by learning your 'touch signature'. Digital Trends. April 9, 2014. Christian Brazil Bautista.

Researchers teach smartphones to recognize your activity, lock out everyone else. Engadget. Apr 7, 2014. Billy Steele. LatentGesture learns your unique touch signature, keeps everyone else out. Android Authority. Apr 9, 2014. Elmer Montejo.

LatentGesture Recognizes Touch for Added Security Display Central. Apr 18, 2014. Arthur Berman.

Georgia Tech researchers want to kill the smartphone passcode with "touch signature." Atlanta Business Chronicle. Apr 9, 2014. Urvaksh Karkaria.

LatentGesture learns a smartphone's owner by touch and can lock the phone if it's used by another. Pocket-lint. Apr 9, 2014. Luke Edwards.

LatentGesture: A Promising Future For Smartphone Security. Information Security Buzz. Apr 8, 2014. David Bisson. New innovation could put an end to smartphone thefts forever Yahoo News. Apr 9, 2014. Brad Reed.

LatentGesture to make mobile devices more secure. Digit. Apr 9, 2014. Silky Malhotra.

LatentGesture Uses Your Screen Taps & Swipes To Provide Security. Crazy Engineers. Apr 8, 2014. Ankita Katdare.

LatentGesture Makes Smartphones Recognize You By Touch. Engismo. April 10, 2014. Mansoor Mubashra.

The LatentGesture App Works Behind the Scenes to Keep Phones Safe Trend Hunter Apr 9, 2014. Jamie Danielle Munro.

Inkblots and gestures: Getting creative about security. GCN. May 27, 2014. Patrick Marshall.

Tap And Swipe On Your Mobile, LatentGesture Will Identify You! RTT News. Apr 9, 2014.

Yahoo Faculty Research and Engagement Program (FREP) Award by [Yahoo! Labs](#). ([GT press releases 1 & 2](#))

"Fraudsters on Internet Auction Sites Often Leave Trail Leading to Crimes", Lee Gomes, **The Wall Street Journal**, December 6, 2006.

"Researchers: Software Can Nip eBay Fraud in The Bud", Bob Sullivan, **MSNBC**, December 8, 2006.

KQV Radio live interview, Host: Frank Gottlieb, December 10, 2006.

"Researchers Developing Anti-Fraud Tool", Joe Mandak, **The Associated Press**, December 11, 2006. Also appeared in over 100 newspapers around the world, including **USA Today**, **Los Angeles Times**, **The Washington Post**.

"CMU Develops Program To Online Auction Fraud", Keith Jones, **KDKA-TV News**, originally aired December 12, 2006.

BizRadio live interview, Host: Brent Clenton, December 13, 2006

"Online Auction Frauds Not As Clever As They Think, Researchers Say", Alpha Doggs, **Network World**, December 5, 2006.

DESIGN AWARDS & LEADERSHIP

2006 **Winner**, Carnegie Mellon ID card design contest.

Winner, *Graduate Student Assembly* logo design contest. Carnegie Mellon University.

Winner, *Language Technologies Institute* T-shirt design contest. Carnegie Mellon University.

2005 **Design lead**, HCI Masters capstone project. Client: *Office of Naval Research*.

2004 **Winner**, webpage design contest for the *New Asia College* homepage. The Chinese University of Hong Kong.

Lead graphics designer, The Chinese University of Hong Kong 40th Anniversary Concert.

1999 - 2000 **Art Director** of school yearbook. Diocesan Boys' School (Hong Kong).

ART INSTALLATIONS

Butterflies

Installed at the Pittsburgh Children's Museum on March 5, 2009

Installed at the Pittsburgh Children's Museum on March 3, 2009
Team: Jesse Chornig, Joanna Ricou, Polo Chau

The Curator

Installed at the Pittsburgh Children's Museum on April 25, 2009
Team: Polo Chau François Chu, Sue Ann Hong, Patrick Gage Kelley

GRANTS & FUNDING

SitS NSF-UKRI: Rapid Deployment of Multi-Functional Modular Sensing Systems in the Soil

NSF 1935548
PI: Chloé Arson
Co-PIs: David Frost, Daniel Goldman, Duen Horng (Polo) Chau, Frank Hammond
Amount: \$1.7 million (with Imperial College London via UK Research and Innovation); Georgia Tech amount: \$800,000
Period: 9/1/2019 – 8/31/2022
[News Release](#)

SPARC-X: Quantum simulations at extreme scale - reactive dynamics from first principles

DE-SC0019410
PI: Phanish Suryanarayana
Co-PI: Andrew J. Medford, Edmond Chow, John E. Pask (Lawrence Livermore National Laboratory)
Senior Personnel: Duen Horng Chau
Amount: \$2.8 million
Period: 09/15/2018 - 09/14/2022
[News release](#)

SaTC: CORE: Medium: Understanding and Fortifying Machine Learning Based Security Analytics

NSF CNS 1704701
PI: Polo Chau
Co-PIs: Taesoo Kim, Wenke Lee, Le Song
Amount: \$1.2 million
Period: 8/1/2017 – 7/31/2021

III: Medium: Collaborative Research: Human-computer Graph Exploration and Tele-discovery

NSF IIS 1563816 (& 1563971)
PIs: Polo Chau, James Abello
Amount: \$1.2 million
Period: 8/1/2016 – 7/31/2020

Intel Science & Technology Center for Adversary-Resilient Security Analytics (ISTC-ARSA)

Intel
PI: Wenke Lee
Co-PIs: Polo Chau, Taesoo Kim, Le Song
Gift: \$1.5 million
7/27/2016 – 6/30/2019

Center of Excellence for Mobile Sensor Data-to-Knowledge (MD2K)

National Institute of Health (NIH: 1-U54EB020404-01)
Amount: \$10.8 million (Prime: Univ. of Memphis); Georgia Tech amount: \$1,250,035
PI: Jim Rehg
Co-PIs: Gregory Abowd, Polo Chau
Period: 9/29/2014 – 09/30/2018

TWC: Small: Collaborative: Cracking Down Online Deception Ecosystems

NSF TWC 1526254
PIs: Bogdan Carbutar, Duen Horng (Polo) Chau
Amount: \$499,413
Period: 9/1/2015 – 8/31/2018

EAGER: Scaling up Machine Learning with Virtual Memory

NSF IIS 1551614
PIs: Polo Chau, Rich Vuduc
Amount: \$184,904
Period: 10/1/2015 – 9/30/2017

Scalable Architecture for Anomaly Visualization in Power Generating Assets

Strategic Energy Institute (SEI), Georgia Tech
PI: Polo Chau
Amount: \$52,344
Period: 1/1/2016 - 12/31/2017

Data Science Platform for Strategic Industry Partnerships, Innovations, & Talent Development

Institute for Data Engineering and Science (IDEaS), Georgia Tech
PI: Polo Chau
Co-PIs: Le Song, Hongyuan Zha, Sridhar Narasimhan, Jeffrey Hu, John Stasko, Cherry Liu
Amount: \$75,000
Period: 1/1/2016 - 6/30/2016

CGV: Small: Making Sense out of Large Graphs - Bridging HCI with Data Mining

NSF IIS-1217559
PI: Christos Faloutsos
Co-PI Duen Horna Chau, Aniket Kittur

Amount: \$528,578.00
 Period: 8/25/2012 - 8/31/2015

Identifying Risks to Psychological Distress in University Student Populations from Online Interaction Data

James Edenfield Faculty Fellowship, with Munmun De Choudhury (IC). One graduate student support for one academic year, co-advised by two College of Computing faculty.
 Amount: ~\$25k
 Period: Fall 2015 - Spring 2016

Illuminating Paths to Success: Mining Common Sequences of Courses

Georgia Tech Professional Education
 PI: Polo Chau
 Amount: \$18,625
 Period: 5/11/2015 - 8/1/2015

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

Microsoft
 PI: John Stasko
 Co-PIs: Rahul Basole, Alex Endert, Polo Chau
 Amount: \$25,000 and received an 84-inch Surface Hub.

Reimagining Humanities Visualization: A Research-Through-Design Workshop for Civic and Cultural Data

GVU research and engagement grant
 PI: Lauren Klein
 Co-PIs: Rahul Basole, Polo Chau, Carl DiSalvo, Alex Endert, Jim Foley, Nassim JafariNaimi, Yanni Loukissas, John Stasko, Jimeng Sun

Discovery, Analysis, & Visualization of Pediatric Asthma Careflow

Children's Healthcare of Atlanta
 PI: Rahul Basole
 Co-PIs: Mark Braunstein, Nicoleta Serban, Duen Horng Chau Amount: \$202,867
 Period: 9/1/2014 - 8/31/2015

Proactive Detection of Insider Threats with Graph Analysis at Multiple Scales

PIs: T. Senator (SAIC) and D.A. Bader (GTRI)
 Defense Advanced Research Projects Agency
 Anomaly Detection at Multiple Scales (ADAMS) Program
 Amount: \$2,927,976 (GT portion)
 Period: 5/1/2011 - 4/30/2013

Discovery, Analysis, and Visualization of Pediatric Careflow Processes

Raytheon Faculty Fellowship, with [Rahul Basole](#) (IC). One graduate student support for one academic year, co-advised by two College of Computing faculty. Amount: ~\$25k
 Period: Fall 2014 - Spring 2015

Gift NVIDIA. Donation of a Titan V GPU. 2018.

Google Faculty Research Award. 2015. \$52,000.

[200 server donation from Yahoo Labs](#), as part of Yahoo Servers to Academic Researchers program (Y-STAR). Thanks [Seth Tropper!](#)

Intel. Spring 2015. \$40,000. Support for big data curriculum.

LogicBlox. Fall 2013 - Spring 2014: \$12,500.

Symantec. Summer 2013: \$10,000. April 2014: \$26,000. Spring 2015: \$40,000.

eBay. Summer 2014: \$15,000.

Yahoo Faculty Research Engagement (FREPP) award. 2014 - 2015: \$10,000.

Yahoo sponsoring student seminars and distinguished lectures. 2014 - 2015: \$13,500.

Georgia Tech Wearable Computing Center Mentorship Grant. \$1000, Fall 2014. Advising undergraduate students Samuel Clarke and Nathan Dass

MS&T Faculty Materials, Supplies and Travel Grants for Undergraduate Research, advising Mr. Dezhi (Andy) Fang and Nathan Dass. Awarded: \$1000, summer 2017

Faculty Materials, Supplies and Travel Grants for Undergraduate Research, advising Mr. Yiqi (Victor) Chen. Awarded: \$800, summer 2014

Faculty Materials, Supplies and Travel Grants for Undergraduate Research, advising Mr. Zhiyuan (Jerry) Lin. Awarded: \$1000, summer 2013

Fellowship Research proposals led to two full years of research funding from Symantec. Awarded:\$140,000.

Co-author \$35 million DARPA proposal on *Anomaly Detection at Multiple Scales* (ADAMS). CMU funded ~\$500,000. Co-authored the winning proposal, represented CMU and led research efforts.

Education Grant **Microsoft Azure Grant**

2016 - 2017 \$20,000 for CSE 6242 / CX 4242 Data and Visual Analytics

Amazon Web Services (AWS) Machine Learning Grant

Fall 18 \$5000 credits for distributed machine learning research

Spring 15 \$2500 credits for distributed machine learning research

Amazon Web Services (AWS) Teaching Grant

Spring 2015 \$12000 credits for CSE 6242 / CX 4242 Data and Visual Analytics

Fall 2014 \$14000 credits for CSE 6242 / CX 4242 Data and Visual Analytics

Spring 2014 \$10000 credits for CSE 6242 / CX 4242 Data and Visual Analytics

Spring 2013 \$4000 credits to CSE 6242 A / CS 4803 DVA Data and Visual Analytics

Unfunded Helped in creating an NEC proposal for *University Awards from NEC Labs Data Management*. \$75,000

PROFESSIONAL ACTIVITIES

Program Co-chair ACM Intelligent User Interfaces Conference (IUI) 2019

USENIX Security and AI Networking Conference (ScAI.Net) 2019

Co-Chair VIS workshop on [Visualization for AI Explainability \(VISXAI\)](#) 2018

KDD workshop on **Interactive Data Exploration and Analytics (IDEA)**: 2013, 2014, 2015, 2016, 2017

ICML workshop on **Visualization for Deep Learning**: 2016, 2017

Steering Committee [ACM Intelligent User Interfaces Conference](#)

[USENIX Security and AI Networking Conference \(ScAI.Net\) 2019](#)

Advisory Board [Southern Data Science Conference 2017](#)

Co-chair [ACM Intelligent User Interfaces Conference \(IUI\) 2015](#)

Publicity Chair [ACM WSDM Conference Series Web Search and Data Mining \(WSDM\) 2016](#)

Publicity Chair [ACM SIGKDD Conference on Knowledge Discovery and Data Mining \(KDD\) 2014](#)

Publicity Chair [IEEE International Conference on Data Mining \(ICDM\) 2014](#)

Journal Co-editor ACM TKDD Special Issue on Interactive Data Exploration and Analytics (IDEA), 2015

NSF Review Panelist Information and Intelligent Systems (IIS) Division. 2014, 2015, 2016, 2018

Secure and Trustworthy Cyberspace (SaTC). 2018

(CISE) Research Initiation Initiative (CRII). 2016.

Workshop Organizer IEEE VIS Workshop on [Visualization for AI Explainability](#) 2018, 2019

KDD workshop on **Interactive Data Exploration and Analytics (IDEA)** 2013, 2014, 2015, 2016, 2017, 2018

PKDD-ECML Workshop on [Graph Embedding and Mining](#), 2019

ICML workshop on **Visualization for Deep Learning** 2016, 2017

WWW 2014 workshop on [Big Graph Mining](#) (BGM)

Conf Area Chair ECML-PKDD 2020 (Research Track)

Session Chair SDM 2017: Classification

KDD 2015: Social Good

KDD 2014: Scaling-up Graph Algorithms

Conf Associate Chair [CHI 2018 \(Engineering Interactive Systems and Technologies\)](#)

[AVI 2014](#)

Conf Senior Program Committee SIAM SDM 2019

ACM IUI 2019

Conf Program Committee IEEE VIS (VAST) 2018-2020

KDD 2013-2019

SDM 2014-2017 (SIAM International Conference on Data Mining)

ICDCS 2017

[WSDM 2015](#), WSDM 2016

ACM IUI 2016

ECML/PKDD 2013-2017

ASONAM 2015

[SC14](#) (SuperComputing 2014) - Data Analytics, Visualization and Storage

Chinese CHI 2014

Workshop Program
CommitteeKDD 2019 Workshop on [Learning and Mining for Cybersecurity \(LEMNCS\)](#)IEEE VIS 2017 Workshop on [Visualization in Data Science \(VDS\)](#)[IEEE VIS 2015 Workshop on Exploring Graphs at Scale \(IEEE EGAS\)](#)WWW 2015 Workshop on [Diffusion, Activity and Events in Networks: Models, Methods & Applications](#)WWW 2015 Workshop on [Modeling Social Media - Behavioral Analytics in Social Media, Big Data and the Web](#)[IEEE International Conference on Data Mining \(ICDM 2014\)](#) workshop on [Scalable Machine Learning: Theory and Applications](#)[IEEE International Conference on Big Data \(IEEE BigData 2014\)](#) workshop on [Scalable Machine Learning: Theory and Applications](#)[Reliability and Security Data Analysis \(RSDA 2014\)](#)ICDM workshop on [Scalable Data Analytics: Theory and Applications](#)WWW 2014 workshop on [Mining Big Data in Social Media and the Web \(MSM\)](#)

ACM SAC 2014 (Symposium On Applied Computing)

KDD 2013 workshop on **Outlier Detection and Description (ODD)**KDD 2014 workshop on **Outlier Detection & Description under Data Diversity (ODD²)**

ICDM 2012 (Demo Session)

ECML PKDD 2012 Workshop on **Instant Interactive Data Mining**NIPS 2011 workshop on parallel and large-scale machine learning (**Big Learning**)CSCW 2012 workshop on **Personal Information Management (PIM)**ASIST 2009 workshop on **Personal Information Management (PIM)**Symposium Org. **The First Student Research Symposium**. CMU/Machine Learning Department. 2009.

Journal Reviewer TOCHI, 2015

IEEE's Transactions on Knowledge and Data Engineering (TKDE), 2014

ACM Computing Surveys, 2014

Statistical Analysis and Data Mining journal Special Issue of "Best of SDM 2014"

International Journal on Human-Computer Interaction (2014)

Data & Knowledge Engineering (DKE) Journal (2013)

IEEE Journal of Biomedical and Health Informatics (2013)

Software: Practice and Experience (2013)

IEEE Intelligent Systems (2012)

Parallel Computing (2011)

IBM Systems Journal (2007)

Conference Reviewer

SDM 2014-17

KDD 2013-17

ECML/PKDD 2008-09, 2013, 2015-17

ICDM 2012

WSDM 2015-16

WWW 2008-10

IEEE BigData 2014

IEEE Vis 2017

CHI 2007-16

UIST 2007-10, 2014

IUI 2012-16

AVI 2014

SuperComputing (SC) 2014

NIPS 2013

VLDB 2008-09

HICSS 2013

International Cross Domain Conference and Workshop (CD-ARES 2013)

- Seminar Organizer **Machine Learning Lunch Seminar**. CMU/Machine Learning Department. 2008-2011.
 CSE Seminar Co-organizer. GT/CSE. 2012–2013 AY.
- Member Association for Computing Machinery (ACM). Since 2006.
 The Institute of Electrical and Electronics Engineers (IEEE). Since 2006.
 HCIC (Human Computer Interaction Consortium)
 Machine Learning Department (CMU) website committee

SERVICES AT GEORGIA TECH

- Institute Georgia Tech's Strategic Planning Steering Committee, Oct 2019 - May 2020.
 Director of Industry Relations, The Institute for Data Engineering and Science. Since Oct 2019.
 Associate Director of Corporate Relations, The Center for Machine Learning. Since Oct 2019.
 Provost learning and teaching fellow. 2018-2020 AY
 Associate Director, [Masters of Science in Analytics](#). Since 8/2014.
 Machine Learning Faculty Advisory Committee
 Academic Faculty Senate Representative for CSE, 2015-2018 AY
 Institute for Information Security & Privacy (IISP) faculty council member. Since 6/2015
 Strategic Energy Institute (SEI) Faculty Advisory Council (FAC) member. Since July 2018.
 Strategic Energy Institute (SEI) faculty member
 Institute for Data Engineering and Science (IDEaS) faculty member
 Center for Machine Learning (ML@GT) faculty member
- College of Computing Machine Learning Area Leader. Since 8/2018.
 Advisory board member of GT DataWorks, a new data literacy program to broaden participating in data science. Sep 2019 - Dec 2020.
- CSE School Honors Committee, 2019–2020 AY, 2020–2021 AY
 School Reappointment, Promotion, and/or Tenure (RPT) Committee, 2018–2019 AY, 2019–2020 AY
 School Advisory Committee (SAC), 2013-2014 AY, 2014-2015 AY, 2015–2016 AY, 2016–2017 AY
 Graduate Admissions Committee (CS, CSE programs), 2012–2013, 2013–2014 AY (Chair of CSE), 2015–2016 AY, 2017–2018 AY, 2018–2019 AY
 PhD Recruiting Committee (Chair of CSE), 2012–2013 AY, 2013–2014 AY
 CSE Chair Search Committee Member, 2012–2013 AY, 2019-2020 AY
 CSE Seminar Co-organizer, 2012–2013 AY
 Space Planning Committee, 2012–2013 AY
 Created *State of CSE* info graphics
- IC + CSE Visual Analytics area coordinator (with Alex Endert of IC), MS CS, 2014-2017
- Student Club Faculty advisor, Data Science @ Georgia Tech (DSGT), a data science club for Georgia Tech students.
- PhD Thesis Junghyun (Andy) Kim. GT/CSE-AE. Adv: Dimitri Mavris. TBD
 Hanjun Dai. GT/CSE. Adv: Le Song. Proposal: 7/10/19. Defense: 12/3/19.
 Po Ming (Terrance) Law. GT/CS. Adv: Alex Endert, John Stasko. Proposal: TBD.
 Karl Gemayel. GT/CSE. Adv: Mark Borodovsky. Proposal: 12/27/19. Defense TBD.
 Weiyang Liu. GT/CSE. Adv: Le Song. 10/11/19.
 Rakshit Trivedi. GT/CSE. Adv: Rakshit Trivedi. Proposal: 10/3/19. Defense: TBD.
 Yuzhi Guo. GT/CSE. Adv: David Frost. Proposal: 12/26/19. Defense: TBD.
 Julia Deeb-Swihart. GT/CS. Adv: Amy Bruckman, Alex Endert. Proposal: 10/30/19. Defense: TBD.
 Amrita Gupta. GT/CSE. Adv: Bistra Dilkina. Proposal: 12/17/19. Defense: TBD.
 Hang Wu. GT/ML. Adv: May Wang. Proposal: 12/12/19. Defense: TBD.
 Xiangyun (Ray) Lei. GT/Chem Eng. Adv: AJ Meford. Proposal: 11/30/18. Defense: TBD.
 Hanna Kim. GT/CSE. Adv: Haesun Park. Proposal: 8/27/19. Defense: TBD.
 Payam Siyari. GT/CS. Adv: Konstantinos Dovrolis. Proposal: 4/25/18. Defense: 10/17/18.

Leilei Xiong. GT/ECE. Adv: Santiago Grijalva. Defense: 12/14/18.

Xiaochen Zhang. GT/ECE. Adv: Santiago Grijalva. Defense: 7/24/17.

Ahmet Cecen. GT/CSE. Adv: Surya Kalidindi. Proposal: 2/1/17. Defense: 7/20/17

Mengmeng (Helen) Liu. GT/CSE. Adv: David Frost. Proposal: 4/18/17. Defense: 8/14/17.

Young Jin Kim. GT/CSE. Adv: Dimitri Mavris. Co-adv: Richard Fujimoto. Proposal: 2/9/17. Defense: 7/28/17.

Youngchul Park. GT/CSE. Adv: Dimitri Mavris. Proposal: 11/18/16.

Hillol Sarker. Univ. of Memphis/CS. Adv: Santosh Kumar. Proposal: 4/8/16. Defense: 11/4/16.

James Fairbanks. GT/CSE. Adv: David Bader. Defense: 3/28/16.

Kunal Malhotra. GT/CS. Adv: Sham Navathe. Co-adv: Jimeng Sun. Proposal: 12/8/15. Defense: 11/7/16.

Ramakrishnan (Ramki) Kannan. GT/CS. Adv: Haesun Park. Proposal: 5/5/15. Defense: 2/22/16.

Joonseok Lee. GT/CSE. Adv: Guy Lebanon, Hongyuan Zha. Defense: 2/19/15.

[Long Tran](#). GT/CSE. Adv: Hongyuan Zha, Alex Gray. Proposal: 9/10/14. Defense: 1/6/15, GT/CSE

Saeideh Bakhshi, GT/IC. Adv: Eric Gilbert. Defense: 7/1/14

Da Kuang, GT/CSE. Adv: Haesun Park. Defense: 6/12/14

Albert Brzeczko, GT/ECE. Adv: John Copeland. Defense: 4/2/14

Liangda Li, GT/CSE. Adv: Hongyuan Zha. Proposal: 4/9/2014. Defense: 4/22/15

Mengdie Hu. GT/IC. Adv: John Stasko. Proposal: 12/11/13. Defense: 4/5/17

Zhaoming Yin. GT/CSE. Adv: David Bader. Proposal: 4/26/2013.

Oded Green. GT/CSE. Adv: David Bader. Proposal: 3/26/2013. Defense: 3/14/2014.

Ke Zhou. GT/CSE. Adv: Hongyuan Zha. Proposal: 1/24/2013. Defense: 8/6/13

Soumitry Ray. GT/Civil Eng. Adv: Jochen Teizer. Proposal: 11/21/2012. Defense: 3/24/2014

PhD Qualifying Exam Yuqin Yang. GT/ML. Adv: Negar Kiyavash. TBD

Hayeong Song. GT/IC. Adv: John Stasko. TBD

Dongjin Choi. GT/CSE. Adv: Haesun Park. TBD

James Pagan. GT/CSE. Adv: Dimitri Mavris. 12/12/19

Rodrigo Borela. GT/CSE. Adv: David Frost. TBD

Ali Siahkoobi. GT/CSE. Adv: Felix Herrmann. 11/13/19

Junghyun (Andy) Kim. GT/CSE. Adv: Dimitri Mavris. 12/12/19

Weiyang Liu. GT/CSE. Adv: Le Song. 10/11/19

Rakshit Trivedi. GT/CSE. Adv: Hongyuan Zha. 11/9/19

Xiaojing (Jing) An. GT/CSE. Adv: David Bader. 10/16/18

Sarmistha Dutta. GT/CS. Adv: Munmun De Choudhury. 4/13/18

Subhajit Das. GT/CS. Adv: Alex Ender. 4/8/19

Apaar Shanker. GT/CSE. Adv: Surya Kalidindi. 5/4/19

Po Ming (Terrance) Law. GT/CS. Adv: Rahul Basole. 3/31/19

Yuzhi Guo. GT/CSE. Adv: David Frost. 3/12/18

Srinivas Eswar. GT/CSE. Adv: Rich Vuduc, Haesun Park. 1/26/18

Hanjun Dai. GT/CSE. Adv: Le Song. 1/25/18

Harsh Shrivastava. GT/ML. Adv: Srinivas Aluru. 5/2/18

David Betancourt. GT/CSE. Adv: Rafi Muhanna. 11/12/19

Siddharth Biswal. GT/CSE. Adv: Jimeng Sun. TDB

Sungtae An. GT/CSE. Adv: Jimeng Sun. TDB

Robert Chen. GT/CSE. Adv: Jimeng Sun. 3/15/17

Amrita Gupta. GT/CSE. Adv: Bistra Dilkina. 11/30/16

Caleb Robinson. GT/CSE. Adv: Bistra Dilkina. 11/22/16

Hyunjee Jin. GT/CSE. Adv: Dimitri Mavris. 11/21/16

Fred Hohman. GT/CSE. Adv: Polo Chau. 11/17/16

Edward Choi. GT/CSE. Adv: Jimeng Sun. 11/9/16

Saman Yarmohammadi. GT/CSchool of Building Construction. Adv: Deborah Ashuri. 10/10/16

Samanth Ramnarayanan. GT/SCHOOL OF BUILDING CONSTRUCTION. Adv. Badrak Ashuri. 12/10

Shang-Tse Chen. GT/CS. Adv: Polo Chau. 3/29/16

Sarah Karamanti. GT/CSE. Adv: Rich Vuduc. 12/3/15

Young Jin Kim. GT/CSE. Adv: Dimitri Mavris. 11/23/15

Youngchul Park. GT/CSE. Adv: Dimitri Mavris. 11/23/15

Bo Dai. GT/CSE. Adv: Le Song. 4/22/15

Minsuk (Brian) Kahng. GT/CS. Adv: Polo Chau. 4/29/15

Mehrdad Farajtabar. GT/CSE. Adv: Edmond Chow. 11/25/2014

[Lluis Miquel Munguia](#). GT/CSE. Adv: David Bader. 11/8/13

[James Fairbanks](#). GT/CSE. Adv: David Bader. 10/9/13.

Bo Xie. GT/CS. Adv: Haesun Park, Le Song. 11/5/14

Kunal Malhotra. GT/CS. Adv: Sham Navathe. 4/22/13

Ramakrishnan (Ramki) Kannan. GT/CSE. Adv: Haesun Park. 3/29/13

Chad Stolper. GT/IC. Adv: John Stasko. 3/27/13

Anita Zakrzewska. GT/CSE. Adv: David Bader. 12/6/12

Robert Pienta. GT/CSE. Adv: Richard Fujimoto. 10/5/12

Masters Thesis Aroua Gharbi. GT/CSE. Adv: Dimitri Mavris. Defense: 11/18/16

Kevin flansburg. GT/CS. Adv: Taesoo Kim. Defense: 11/23/15

Kaushik Patnaik. GT/CSE. Adv: Le Song

Adam Coulon. GT/CSE (Aerospace Eng). Scott Duncan (Chair), Dimitri Mavris. Proposal: 4/2/14. Defense: 11/10/14.

Misc *Mascot Task Force* committee member. Carnegie Mellon University. 2006.

The Chinese University of Hong Kong 40th Anniversary Concert committee. 2004.

SKILLS

HCI Contextual inquiry Think-aloud protocol Cognitive walkthrough Heuristic evaluation GOMS Persona
Focus groups Rapid paper prototyping

Programming Java C++ C SQL VB Assembly JavaScript ActionScript CSS PHP ASP XML HTML

Design Photoshop Illustrator Premiere InDesign Flash Lightwave 3D 3D Studio MAX

Music Pianist (20+ years) Cellist (20+ years) High school string orchestra conductor
Chamber music group member Choir member

Languages English Mandarin Cantonese (native)