

# Alex Beutel

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EDUCATION	<b>Carnegie Mellon University</b> August 2011–May 2016 <i>Ph.D., Computer Science</i> May 2016 <i>Masters of Science, Computer Science</i> December 2013 Thesis title: “Understanding User Behavior through Large-Scale Graph Analysis” Committee: Christos Faloutsos, Alex Smola, Geoff Gordon, Phillip Yu
	<b>Duke University</b> August 2007–May 2011 <i>Bachelor of Science, Quantitative Studies in Computer Science and Physics</i> GPA: 3.858/4.0; Dean’s List (FA08, FA09) with Distinction (FA07, SP08, SP10) Graduated <i>Magna cum Laude</i> and with <i>Highest Distinction</i> in Computer Science
INDUSTRY EXPERIENCE	<b>Google</b> , Research Senior Research Scientist Aug. 2016–Present Research Intern, hosted by Ed H. Chi May 2015–Aug. 2015 <b>Marianas Labs</b> , Deep learning research consultant Feb. 2015–May 2015 <b>Microsoft</b> , Research Intern Cloud and Information Service Lab, hosted by Markus Weimer June 2014–Aug. 2014 <b>Facebook</b> , Software Engineering Intern Site Integrity, hosted by Wanhong Xu, Chris Palow May 2012–Aug. 2013 Site Integrity (remote part-time) Sept. 2012–May 2013 News Feed Ranking, hosted by Wanhong Xu, Lars Backstrom May 2013–Aug. 2013
ACADEMIC EXPERIENCE	<b>Carnegie Mellon University, Computer Science Department</b> Sept. 2011–Aug. 2016 Advised by Professor Christos Faloutsos and Professor Alex Smola. My research focuses on large-scale user behavior modeling, including fraud detection, recommendation systems, and scalable machine learning. <b>Duke University, Department of Computer Science</b> Jan. 2010–Aug. 2011 Research assistant for Prof. Pankaj K. Agarwal in computational geometry. <b>Duke University, Department of Computer Science</b> Oct. 2009–Dec. 2010 Research assistant for Prof. Xiaowei Yang in networks and distributed systems. <b>Duke University, Department of Physics</b> April 2009–Aug. 2009 Research assistant for Prof. Chris Walter in the high energy physics, neutrino group
HONORS	<b>SIGKDD Doctoral Dissertation Award Runner-up</b> , 2017 <b>Best Paper Award</b> , <i>ACM KDD</i> 2016 <b>Young Researcher at the Heidelberg Laureate Forum 2015</b> , Heidelberg, Germany. <b>Best Paper Finalist</b> , <i>ACM KDD</i> 2014 <b>Phi Beta Kappa Honor Society</b> , 2012 <b>Alex Vasilos Memorial Award</b> , Duke University Computer Science, 2011 <b>Best Paper Award</b> , <i>ACM GIS</i> 2010 <b>Computer Science Undergraduate Research Fellow</b> , Duke University 2010
FUNDING AWARDS	<b>Facebook Graduate Fellowship</b> , 2013–2014 \$79,202 <b>NSF Graduate Research Fellowship</b> , 2011–2016 \$132,000 <b>Yahoo! Faculty Research and Engagement Program</b> , 2014 \$10,000 Aided Professor Christos Faloutsos in writing the research proposal <b>NSF Collaborative Grant (Award No. IIS-1408924)</b> , 2014 \$307,908 Helped multiple professors with the research proposal <b>ACM GIS Student Travel Grant Award</b> , 2011 \$1,000

- C26. **Top-K Off-Policy Correction for a REINFORCE Recommender System**  
Minmin Chen\*, Alex Beutel\*, Paul Covington, Sagar Jain, Francois Belletti, Ed H. Chi. *Twelfth ACM International Conference Web Search and Data Mining (WSDM)*, 2019.
- C25. **Categorical-Attributes-Based Item Classification for Recommender Systems**  
Qian Zhao, Jilin Chen, Minmin Chen, Sagar Jain, Alex Beutel, Francois Belletti, Ed H. Chi. *Proceedings of the 12th ACM Conference on Recommender Systems (RecSys)*, 2018.
- C24. **Q&R: A Two-Stage Approach Toward Interactive Recommendation**  
Konstantina Christakopoulou, Alex Beutel, Rui Li, Sagar Jain, Ed H. Chi. *Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD Applied Data Science)*, 2018.
- C23. **The Case for Learned Index Structures**  
Tim Kraska, Alex Beutel, Ed H. Chi, Jeffrey Dean, Neoklis Polyzotis. *ACM SIGMOD International Conference on Management of Data (SIGMOD)*, 2018.
- C22. **Factorized Recurrent Neural Architectures for Longer Range Dependence**  
Francois Belletti, Alex Beutel, Sagar Jain, Ed H. Chi. *21st International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2018.
- C21. **Latent Cross: Making Use of Context in Recurrent Recommender Systems**  
Alex Beutel, Paul Covington, Sagar Jain, Can Xu, Jia Li, Vince Gatto, Ed H. Chi. *Eleventh ACM International Conference Web Search and Data Mining (WSDM)*, 2018.
- C20. **The Many Faces of Link Fraud**  
Neil Shah, Hemank Lamba, Alex Beutel, Christos Faloutsos. *IEEE International Conference on Data Mining (ICDM)*, 2017.
- C19. **Beyond Globally Optimal: Focused Learning for Improved Recommendations**  
Alex Beutel, Ed H. Chi, Zhiyuan Cheng, Hubert Pham, John Anderson. *Proceedings of the 26th International Conference on World Wide Web (WWW)*, 2017.
- C18. **Recurrent Recommender Networks**  
Chao-Yuan Wu, Amr Ahmed, Alex Beutel, Alex Smola, How Jing. *Tenth ACM International Conference Web Search and Data Mining*, 2017.
- C17. **FRAUDAR: Bounding Graph Fraud in the Face of Camouflage**  
Bryan Hooi, Hyun Ah Song, Alex Beutel, Neil Shah, Kijung Shin, Christos Faloutsos. *Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)*, 2016.
- C16. **BIRDNEST: Bayesian Inference for Ratings-Fraud Detection**  
Bryan Hooi, Neil Shah, Alex Beutel, Stephan Gunnemann, Leman Akoglu, Mohit Kumar, Disha Makhija, Christos Faloutsos. *2016 SIAM International Conference on Data Mining (SDM)*, 2016.
- C15. **A General Suspiciousness Metric for Dense Blocks in Multimodal Data**  
Meng Jiang, Alex Beutel, Peng Cui, Bryan Hooi, Shiqiang Yang, Christos Faloutsos. *IEEE International Conference on Data Mining (ICDM)*, 2015.
- C14. **ACCAMS: Additive Co-Clustering to Approximate Matrices Succinctly**  
Alex Beutel, Amr Ahmed, Alexander J. Smola. *Proceedings of the 24th International Conference on World Wide Web (WWW)*, 2015.
- C13. **ND-SYNC: Detecting Synchronized Fraud Activities**  
Maria Giatsoglou, Despoina Chatzakou, Neil Shah, Alex Beutel, Christos Faloutsos, Athena Vakali. *19th Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD)*, 2015.
- C12. **Spotting Suspicious Link Behavior with fBox: An Adversarial Perspective**  
Neil Shah, Alex Beutel, Brian Gallagher, Christos Faloutsos. *IEEE International Conference on Data Mining (ICDM)*, 2014.

- C11. **CatchSync: Catching Synchronized Behavior in Large Directed Graphs**  
Meng Jiang, Peng Cui, Alex Beutel, Christos Faloutsos, Shiqiang Yang. *Proceedings of the 20th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)*, 2014.
- C10. **Inferring Strange Behavior from Connectivity Pattern in Social Networks**  
Meng Jiang, Peng Cui, Alex Beutel, Christos Faloutsos, Shiqiang Yang. *18th Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD)*, 2014.
- C9. **Fugue: Slow-Worker-Agnostic Distributed Learning for Big Models**  
Abhimanu Kumar, Alex Beutel, Qirong Ho, Eric P. Xing. *17th International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2014.
- C8. **FlexiFaCT: Scalable Flexible Factorization of Coupled Tensors on Hadoop**  
Alex Beutel, Abhimanu Kumar, Evangelos E. Papalexakis, Partha Pratim Talukdar, Christos Faloutsos, Eric P. Xing. *2014 SIAM International Conference on Data Mining (SDM)*, 2014.
- C7. **CoBaFi: Collaborative Bayesian Filtering**  
Alex Beutel, Kenton Murray, Christos Faloutsos, Alexander J. Smola. *Proceedings of the 23rd International Conference on World Wide Web (WWW)*, 2014.
- C6. **CopyCatch: Stopping Group Attacks by Spotting Lockstep Behavior in Social Networks**  
Alex Beutel, Wanhong Xu, Venkatesan Guruswami, Christopher Palow, Christos Faloutsos. *Proceedings of the 22nd International Conference on World Wide Web (WWW)*, 2013.
- C5. **Network Anomaly Detection using Co-clustering**  
Evangelos E. Papalexakis, Alex Beutel, Peter Steenkiste. *Proceedings of the 2012 International Conference on Advances in Social Networks Analysis and Mining (ASONAM)*, 2012.
- C4. **Interacting Viruses on a Network: Can both survive?**  
Alex Beutel, B. Aditya Prakash, Roni Rosenfeld, Christos Faloutsos. *Proceedings of the 18th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)*, 2012.
- C3. **Winner-takes-all: Competing Viruses on fair-play networks**  
B. Aditya Prakash, Alex Beutel, Roni Rosenfeld, Christos Faloutsos. *Proceedings of the 21st International Conference on World Wide Web (WWW)*, 2012.
- C2. **TerraNNI: Natural Neighbor Interpolation on a 3D Grid Using a GPU**  
Alex Beutel, Thomas Moelhave, Pankaj K. Agarwal, Arnold P. Boedihardjo, James A. Shine. *Proceedings of the 19th International Symposium on Advances in Geographic Information Systems (ACM GIS)*, 2011.
- C1. **Natural Neighbor Interpolation Based Grid DEM Construction Using a GPU**  
Alex Beutel, Thomas Moelhave, Pankaj K. Agarwal. *Proceedings of the 18th International Symposium on Advances in Geographic Information Systems (ACM GIS)*, 2010.
- REFEREED  
WORKSHOP  
PAPERS
- W8. **Data Decisions and Theoretical Implications when Adversarially Learning Fair Representations**  
Alex Beutel, Jilin Chen, Zhe Zhao, Ed H. Chi. *Workshop on Fairness, Accountability, and Transparency in Machine Learning*, 2017.
- W7. **Joint Training of Ratings and Reviews with Recurrent Recommender Networks**  
Chao-Yuan Wu, Amr Ahmed, Alex Beutel, Alex Smola. *Workshop track at 5th International Conference on Learning Representations (ICLR)*, 2017.
- W6. **EdgeCentric: Anomaly Detection in Edge-Attributed Networks**  
Neil Shah, Alex Beutel, Bryan Hooi, Leman Akoglu, Stephan Gunnemann, Disha

Makhija, Mohit Kumar, Christos Faloutsos. *IEEE International Conference on Data Mining (ICDM) Workshop on Data Mining for Cyber Security*, 2016.

**W5. Additive Co-Clustering of Gaussians and Poissons for Joint Modeling of Ratings and Reviews**

Chao-Yuan Wu, Alex Beutel, Amr Ahmed, Alexander J. Smola. *NIPS workshop on Nonparametric Methods for Large Scale Representation Learning*, 2015.

**W4. Collaborative Bayesian Filtering: Patterns and Methods**

Alex Beutel, Kenton Murray, Christos Faloutsos, Alexander J. Smola. *Workshop on Information Networks (WIN)*, 2015.

**W3. Elastic Distributed Bayesian Collaborative Filtering**

Alex Beutel, Markus Weimer, Tom Minka, Yordan Zaykov, Vijay Narayanan. *NIPS Distributed Machine Learning and Matrix Computations workshop*, 2014.

**W2. FlexiFaCT: Scalable Flexible Factorization of Coupled Tensors on Hadoop**

Alex Beutel, Abhimanu Kumar, Evangelos E. Papalexakis, Partha Pratim Talukdar, Christos Faloutsos, Eric P. Xing. *NIPS Big Learning Workshop*, 2013.

**W1. Volumetric Grid Construction using 3D Natural Neighbor Interpolation on the GPU**

Alex Beutel, Thomas Moelhave, Pankaj K. Agarwal. *MASSIVE '11: Proceedings of the Workshop on Massive Data Algorithmics*, 2011.

REFEREED  
JOURNAL  
PAPERS

**J5. Graph-Based Fraud Detection in the Face of Camouflage**

Bryan Hooi, Kijung Shin, Hyun Ah Song, Alex Beutel, Neil Shah, Christos Faloutsos. *ACM Transactions on Knowledge Discovery from Data (TKDD)*, 2017.

**J4. Spotting Suspicious Behaviors in Multimodal Data: A General Metric and Algorithms**

Meng Jiang, Alex Beutel, Peng Cui, Bryan Hooi, Shiqiang Yang, Christos Faloutsos. *Transactions on Knowledge and Data Engineering (TKDE)*, 2016.

**J3. Catching Synchronized Behaviors in Large Networks: A Graph Mining Approach**

Meng Jiang, Peng Cui, Alex Beutel, Christos Faloutsos, Shiqiang Yang. *ACM Transactions on Knowledge Discovery from Data (TKDD)*, 2016.

**J2. TerraNNI: Natural Neighbor Interpolation on 2D and 3D Grids using a GPU**

Pankaj K. Agarwal, Alex Beutel, Thomas Moelhave. *ACM Transactions on Spatial Algorithms and Systems (TSAS)*, 2016.

**J1. Inferring Lockstep Behavior from Connectivity Pattern in Large Graphs**

Meng Jiang, Peng Cui, Alex Beutel, Christos Faloutsos, Shiqiang Yang. *Knowledge and Information Systems (KAIS)*, 2015.

BOOK  
CHAPTERS

**Network Anomaly Detection using Co-clustering**

Evangelos E. Papalexakis, Alex Beutel, Peter Steenkiste. *Springer Encyclopedia of Social Network Analysis and Mining*, 2012.

OTHER  
PAPERS

**Counterfactual Fairness in Text Classification through Robustness**

Sahaj Garg, Vincent Perot, Nicole Limtiaco, Ankur Taly, Ed H. Chi, Alex Beutel. *Pre-print*, 2018.

**User Behavior Modeling with Large-Scale Graph Analysis**

Alex Beutel. *Ph.D. Thesis, Carnegie Mellon University*, 2016.

**User Behavior Modeling and Fraud Detection**

Alex Beutel, Christos Faloutsos. *IEEE Intelligent Systems: Trends and Controversies*, 2016.

**Explaining reviews and ratings with PACO: Poisson Additive Co-Clustering**

Chao-Yuan Wu, Alex Beutel, Amr Ahmed, Alexander J. Smola. *Companion Proceedings of the 25th International Conference on World Wide Web (WWW)*, 2016.

**Detecting Suspicious Following Behavior in Multimillion-Node Social Networks**  
Meng Jiang, Peng Cui, Alex Beutel, Christos Faloutsos, Shiqiang Yang. *Companion Proceedings of the 23rd International Conference on World Wide Web (WWW)*, 2014.

**From Point Cloud to 2D and 3D Grids: A Natural Neighbor Interpolation Algorithm using the GPU**

Alex Beutel. *Senior Thesis - Graduation with Highest Distinction, Duke University*, 2011.

TUTORIALS

**Graph-Based User Behavior Modeling: From Prediction to Fraud Detection**

Alex Beutel, Leman Akoglu, Christos Faloutsos. *KDD*, 2015

**Fraud Detection through Graph-Based User Behavior Modeling**

Alex Beutel, Leman Akoglu, Christos Faloutsos. *ACM CCS*, 2015

TALKS

**ML for Data Systems**

Stanford EE380 Colloquium, Palo Alto, CA, October 2018

**Dynamics and Context in Neural Recommender Systems**

*LearnIR Workshop at WSDM*, Los Angeles, CA, February 2018

**Latent Cross: Making Use of Context in Recurrent Recommender Systems**

*WSDM*, Los Angeles, CA, February 2018

**Dynamics and Context in Neural Recommender Systems**

Pinterest, San Francisco, CA, February 2018

**A Machine Learning Approach to Databases Indexes**

*ML Systems at NIPS*, Long Beach, CA, December 2017

**Using Context when Modeling User Behavior: Improving Fraud Detection, Neural Recommenders, and Fairness**

M.I.T., Cambridge, MA, November 2017

**Using Context when Modeling User Behavior: Improving Fraud Detection, Neural Recommenders, and Fairness**

Brown University, Providence, RI, November 2017

**Beyond Globally Optimal: Focused Learning for Improved Recommendations**

Google Student Research Summit, Mountain View, CA, September 2017

**Beyond Globally Optimal: Focused Learning for Improved Recommendations**

*WWW*, Perth, Australia, April 2017

**Beyond Who and What: Answering How and Why by Modeling Large Graphs**

Northeastern University, Boston, MA, March 2016

**Beyond Who and What: Answering How and Why by Modeling Large Graphs**

Arnhold Institute for Global Health, Mount Sinai School of Medicine, New York, NY, March 2016

**Beyond Who and What: Answering How and Why by Modeling Large Graphs**

IOMS, Stern School of Business, New York University, New York, NY, March 2016

**Beyond Who and What: Answering How and Why by Modeling Large Graphs**

Google Research, Mountain View, CA, March 2016

**Beyond Who and What: Answering How and Why by Modeling Large Graphs**

Microsoft, Redmond, WA, March 2016

**Beyond Who and What: Answering How and Why by Modeling Large Graphs**

Georgia Institute of Technology, Atlanta, GA, February 2016

**Beyond Who and What: Answering How and Why by Modeling Large Graphs**

New York University, Courant Institute, New York, NY, February 2016

**ACCAMS: Additive Co-Clustering to Approximate Matrices Succinctly**

University of Pennsylvania, Philadelphia, PA, November 2015

**Collaborative Bayesian Filtering: Patterns and Methods**

WIN, New York, NY, October 2015

**ACCAMS: Additive Co-Clustering to Approximate Matrices Succinctly**  
WWW, Florence, Italy, May 2015

**Distributed Machine Learning for User Behavior Modeling**  
Facebook, New York, NY, May 2015

**Distributed Machine Learning for User Behavior Modeling**  
Google Research, New York, NY, May 2015

**CoBaFi: Collaborative Bayesian Filtering**  
WWW, Seoul, South Korea, April 2014

**SGD on Hadoop for Big Data and Huge Models**  
Duke University, Durham, NC, 2014

**CopyCatch: Stopping Group Attacks by Spotting Lockstep Behavior in Social Networks**  
WWW, Rio de Janeiro, Brazil, May 2013

**Interacting Viruses on a Network: Can both survive?**  
KDD, Beijing, China, August 2012

**TerraNNI: Natural Neighbor Interpolation on a 3D Grid Using a GPU**  
ACM GIS, Chicago, IL, November 2011

**Natural Neighbor Interpolation Based Grid DEM Construction Using a GPU**  
ACM GIS, San Jose, CA, November 2010

TEACHING  
EXPERIENCE

**Guest Lecture: Intro to Data & Computational Science** (Brown DATA 1030) **Fall 2017**  
"Building Blocks of Neural Networks and Research Applications of RNNs"

**Guest Lecture: Machine Learning with Large Datasets** (CMU 10-805) **Spring 2015**  
"SGD on Hadoop for Big Data and Huge Models"

**Guest Lecture: Machine Learning with Large Datasets** (CMU 10-805) **Spring 2014**  
"SGD on Hadoop for Big Data and Huge Models"

**Teaching Assistant: Database Applications** (CMU 15-415/615) **Spring 2014**

**Teaching Assistant: Multimedia DB & Data Mining** (CMU 15-826) **Fall 2013**

PATENTS

**Elastic multi-resolution model-serving to compute inferences**, Christopher Olston, Noah Fiedel, Ed H. Chi, Alexander Beutel. Defensive Publication 668.

**Detection of Lockstep Behavior**, Alex Beutel and Wanhong Xu.  
Patent number 9077744; issued July 7, 2015.

STUDENTS  
MENTORED

Francois Belletti (2017, UC Berkeley; next position: Google Research)  
Konstantina Christakopoulou (2017, UMN; next position: Google Research)  
Stephen Macke (2018, UIUC)  
Candice Schumann (2018, UMD)  
Sahaj Garg (2018, Stanford undergraduate)

SERVICE

**PC Member: WSDM** 2018

**PC Member: ORSUM** 2018

**PC Member: KDD** 2017, 2018

**PC Member: SDM** 2017, 2018

**PC Member: WWW** 2017, 2018

**PC Member: SocInfo** 2016

**PC Member: IEEE DSAA Special Session on Big Behavioral Data Analytics** 2016

**PC Member: ACM/IEEE ASONAM** 2016

**Co-organizer: Workshop on Machine Learning Systems, NIPS** 2015

**PhD Forum Committee, *ICDM* 2015**

**Mentor at Doctoral Consortium, *WSDM* 2018**

**PC Member: Special Session on Big Behavioral Data Analytics, *IEEE DSAA* 2015**

**PC Member: Web Information System Engineering (WISE), 2014**

**PC Member: Diffusion Networks and Cascade Analytics Workshop, *WSDM* 2014**

**Reviewer: *TKDD*, *TKDE*, *NIPS*, *ICML*, *ICLR*, *INFORMS Journal on Computing*, *Neuro-computing***