

## Caleb Belth

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### Education

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PhD, Computer Science, University of Michigan, Ann Arbor, MI Advisors: Andries Coetsee, Danai Koutra	2018-Present
M.S., Computer Science, University of Michigan, Ann Arbor, MI 4.0 GPA	2018-2019
B.S., Computer Science, Purdue University, West Lafayette, IN Minors: Philosophy, Mathematics Research Advisors: Jennifer Neville, Dan Goldwasser, Daisuke Kihara 3.84 GPA	2014-2018

### Research Interests

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Phonological Learning, Representations, Natural Language Processing, Information Theory

### Awards and Honors

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Weinberg Institute of Cognitive Science Travel Award	2021
Richard F. and Eleanor A. Towner Prize for Distinguished Academic Achievement Awarded to the outstanding graduate student in each degree program	2021
Best paper candidate, IEEE ICDM	2020
NSF Graduate Research Fellowship	2020
NDSEG Fellowship (declined for NSF GRF)	2020
Rackham Graduate School Travel Award, University of Michigan	2019
ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD) Travel Award	2019
Dean's List, Purdue	Fall 2015, Spring 2016, Fall 2016, Spring 2017, Fall 2017
Semester Honors, Purdue	Spring 2015, Fall 2015, Spring 2016, Fall 2016, Spring 2017, Fall 2017

### Publications

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#### Conference

6. **Caleb Belth**, Sarah Payne, Deniz Beser, Jordan Kodner, Charles Yang  
*The Greedy and Recursive Search for Morphological Productivity*. CogSci, 2021.
5. **Caleb Belth**, Alican Büyükçakır, Danai Koutra  
*A Hidden Challenge of Link Prediction: Which Pairs to Check?* IEEE International Conference on Data Mining (ICDM), November 2020.  
Selected as one of the best papers at ICDM'20. Invited for potential publication at the KAIS Journal, Springer.
4. **Caleb Belth**, Xinyi Zheng, Danai Koutra  
*Mining Persistent Activity in Continually Evolving Networks*. ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), August 2020.
3. **Caleb Belth**, Xinyi Zheng, Jilles Vreeken, Danai Koutra

*What is Normal, What is Strange, and What is Missing in a Knowledge Graph: Unified Characterization via Inductive Summarization.* ACM The Web Conference (WWW), April 2020.

2. Tara Safavi, **Caleb Belth**, Lukas Faber, Davide Mottin, Emmanuel Muller, Danai Koutra. *Personalized Knowledge Graph Summarization: From the Cloud to Your Pocket.* IEEE International Conference on Data Mining (ICDM), November 2019.
1. **Caleb Belth**, Fahad Kamran, Donna Tjandra, and Danai Koutra. *When to remember where you came from: Node representation learning in higher-order networks.* IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM), August 2019.

## Workshop

2. **Caleb Belth**, Xinyi Zheng, Danai Koutra. *Mining Persistent Activity in Continually Evolving Networks.* ACM SIGKDD Workshop on Mining and Learning with Graphs (MLG), August 2020.
1. **Caleb Belth**, Fahad Kamran, Donna Tjandra, and Danai Koutra. *When to remember where you came from: Node representation learning in higher-order networks.* ACM SIGKDD Workshop on Mining and Learning with Graphs (MLG), August 2019.

## Outreach

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International Summer School on Data Science Tutorial Instructor	September 2020
M-DICE, City of Detroit, World Economic Forum, The Knight Foundation Graduate student lead, project to make access to transportation more equitable	2019-2021
CSEG Wellness, University of Michigan Co-founder, organization to improve graduate student wellness	2019-present
Explore Graduate Studies, University of Michigan Volunteer, one-day workshop that aims to prepare undergraduates for the graduate school application process and broaden participation in computer science	October 2019
MIDAS Data Science Summer Camp for High School Students, University of Michigan Instructor, week-long summer camp	July 2019

## Student Mentoring

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Xueming Xu, Senior, University of Michigan Now applying to top tier PhD programs	2020-2021
Xinyi Zheng, Senior, University of Michigan PhD student, Carnegie Mellon University CS	2019-2020
Mark Jin, Senior, University of Michigan Now applying to top tier MS programs	2018

## Invited Talks

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<i>ThinkBIG: Your Roadmap to Landing a Role at a Startup</i> , Purdue University	September 2017
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## Poster Presentations

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<i>MIDAS Symposium Poster Session</i> , University of Michigan <i>What is Normal, What is Strange, and What is Missing in a Knowledge Graph: Unified Characterization via Inductive Summarization</i>	November 2019
<i>Michigan AI Symposium Poster Session</i> , University of Michigan	October 2019

*When to remember where you came from: Node representation learning in higher-order networks*

*Purdue Undergraduate Research & Poster Symposium  
Deep Learning for Protein Binding Ligand Prediction*

April 2017

## Reviewing

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ACM The Web Conference (WWW) Subreviewer	2021
ACM International Conference on Information and Knowledge Management (CIKM) PC member, posters and demos session	2020
SIAM Workshop on Network Science (NS20) Subreviewer	2020
ACM The Web Conference (WWW) Subreviewer	2020
ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD) Subreviewer	2019
IEEE International Conference on Data Science and Advanced Analysis (DSAA) Subreviewer	2019

## Funding

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Facebook Research Award <i>Persistent Activity Mining in Continually Evolving Networks</i> \$50,000 Contributed to writing	2020
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## Industry Experience

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<i>Applied Science Intern</i> , Amazon, Seattle, WA (Remote; COVID-19) Created an approach for discovering product attributes	May-Aug 2020
<i>Software Engineer Intern</i> , Sift, San Francisco, CA Developed and deployed a gradient tree-boosting algorithm for automated fraud detection	May-Aug 2018
<i>Software Engineer Intern</i> , Handshake, San Francisco, CA Developed the university-facing side of a web platform for university students to find their ideal employers	May 2017-Aug 2017
<i>Software Engineer Intern</i> , Iris, Owosso, MI Developed Android code to run computer vision inference on mobile	May-Aug 2016
<i>Software Engineer Intern</i> , Covenant Eyes, Owosso, MI Developed Android code	Jun-Aug 2015
<i>Software Development Intern</i> , Enspire Software, Fort Wayne, IN Developed Android code	May-Aug 2014

## Programming Languages in order of proficiency

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Python, Java, C, C++, Bash Scripting, Ruby, Scala

## Professional Membership

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Association of Computing Machinery (ACM) Student Member	2019-Present
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Institute of Electrical and Electronics Engineers (IEEE) Student Member

2020-Present

### **Other Projects**

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Machine Learning Text and Network Joint Embeddings, Purdue University Researched jointly embedding text and social network nodes into the same embedding space	2017-2018
Deep Learning for Protein Binding Ligand Prediction, Purdue University Researched using deep learning to predict protein binding ligands for drug design	2015-2018