**Caleb Belth**

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**Education**

PhD, Computer Science, University of Michigan, Ann Arbor, MI 2018-Present

Advisors: Andries Coetzee and Danai Koutra

M.S., Computer Science, University of Michigan, Ann Arbor, MI 2018-2019

4.0 GPA

B.S., Computer Science, Purdue University, West Lafayette, IN 2014-2018

Minors: Philosophy, Mathematics

Research Advisors: Jennifer Neville, Dan Goldwasser, Daisuke Kihara

3.84 GPA

**Research Interests**

Phonology, Linguistic Representations, Psycholinguistics, Language Acquisition, Natural Language Processing

**Awards and Honors**

Rackham Graduate School Travel Award 2022

Weinberg Institute of Cognitive Science Travel Award 2022

Rackham Graduate School Travel Award 2022

Weinberg Institute of Cognitive Science Travel Award 2021

Richard F. and Eleanor A. Towner Prize for Distinguished Academic Achievement 2021

Awarded to the outstanding graduate student in each degree program

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**

8. **Caleb Belth**. In Press. A Learning-Based Account of Local Phonological Processes. *Phonology.*

7. **Caleb Belth,** Alican Büyükçakır, and Danai Koutra. 2022. A Hidden Challenge of Link Prediction: Which Pairs to Check? *Knowledge and Information Systems.* 64(3), 743-771.

6. **Caleb Belth**, Sarah Payne, Deniz Beser, Jordan Kodner, and Charles Yang. 2021. The Greedy and Recursive Search for Morphological Productivity*. CogSci*.

5. **Caleb Belth,** Alican Büyükçakır, and Danai Koutra. 2020. A Hidden Challenge of Link Prediction: Which Pairs to Check? *IEEE International Conference on Data Mining (ICDM).*

Selected as one of the best papers at ICDM’20. Invited for publication at the KAIS Journal, Springer.

4. **Caleb Belth,** Xinyi Zheng, Danai Koutra. 2020. Mining Persistent Activity in Continually Evolving Networks. *ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)*.

3. **Caleb Belth,** Xinyi Zheng, Jilles Vreeken, and Danai Koutra. 2020. What is Normal, What is Strange, and What is Missing in a Knowledge Graph: Unified Characterization via Inductive Summarization. *ACM The Web Conference (WWW).*

2. Tara Safavi, **Caleb Belth**, Lukas Faber, Davide Mottin, Emmanuel Muller, and Danai Koutra. 2019. Personalized Knowledge Graph Summarization: From the Cloud to Your Pocket. *IEEE International Conference on Data Mining (ICDM).*

1. **Caleb Belth**, Fahad Kamran, Donna Tjandra, and Danai Koutra. 2019. 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).*

**Peer-Reviewed Academic Presentations**

9. **Caleb Belth**. 2023. A Learning-Based Account of Phonological Tiers. Penn Linguistics Conference.

8. **Caleb Belth**. 2022. Learning Non-Local Phonological Alternations via Automatic Creation of Tiers. *Linguistic Society of America.*

7. **Caleb Belth**. 2022. How a Proclivity for Adjacency can Drive the Learning of Non-Local Alternations*. MidPhon*.

6. **Caleb Belth**. 2022. Learning Non-Local Phonological Alternations via Automatic Creation of Tiers. 2022. *Cognitive Modeling and Computational Linguistics workshop at ACL.*

5. Sarah Payne, **Caleb Belth,** Jordan Kodner, and Charles Yang. 2022.Searching for Morphological Productivity.*Linguistic Society of America*.

4. {**Caleb Belth,** Sarah Payne}, Jordan Kodner, and Charles Yang. 2021. Searching for Morphological Productivity.*Boston University Conference on Language Development.*

3. Sarah Payne, **Caleb Belth**, Jordan Kodner, and Charles Yang. 2021. The Recursive Search for Morphological Productivity. *American International Morphological Meeting.*

2. **Caleb Belth**, Xinyi Zheng, Danai Koutra. 2020. Mining Persistent Activity in Continually Evolving Networks*. ACM SIGKDD Workshop on Mining and Learning with Graphs (MLG).*

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

**Teaching**

LING 111: Lenses into Language Winter/Spring 2023

Graduate Student Instructor for undergraduate, introductory linguistics course

LING 347 / PSYCH 349: Talking Minds Fall 2022

Graduate Student Instructor for undergraduate, 300-level course in psycholinguistics

International Summer School on Data Science 2020

Tutorial Instructor

MIDAS Data Science Summer Camp for High School Students, University of Michigan 2019

Instructor, week-long summer camp

**Outreach**

M-DICE, City of Detroit, World Economic Forum, The Knight Foundation 2019-2021

Graduate student lead, project to make access to transportation more equitable

CSEG Wellness, University of Michigan 2019-2021

Co-founder, organization to improve graduate student wellness

Explore Graduate Studies, University of Michigan 2019

Volunteer, workshop to broaden participation in computer science graduate programs

**Student Mentoring**

Xueming Xu, Undergraduate, University of Michigan 2020-2021

Now: M.S. student, University of Michigan CSE

Xinyi Zheng, Undergraduate, University of Michigan 2019-2020

Now: PhD student, Carnegie Mellon University CS

**Invited Talks**

*ThinkB1G: Your Roadmap to Landing a Role at a Startup,* Purdue University 2017

**Poster Presentations**

*MIDAS Symposium Poster Session,* University of Michigan November 2019

*What is Normal, What is Strange, and What is Missing in a Knowledge Graph:*

*Unified Characterization via Inductive Summarization*

*Michigan AI Symposium Poster Session,* University of Michigan October 2019

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

*Purdue Undergraduate Research & Poster Symposium* April 2017

*Deep Learning for Protein Binding Ligand Prediction*

**Reviewing**

CogSci Conference 2021

Reviewer

ACM The Web Conference (WWW)2021

Subreviewer

ACM International Conference on Information and Knowledge Management (CIKM) 2020

PC member, posters and demos session

SIAM Workshop on Network Science (NS20) 2020

Subreviewer

ACM The Web Conference (WWW)2020

Subreviewer

ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD) 2019

Subreviewer

IEEE International Conference on Data Science and Advanced Analysis (DSAA) 2019

Subreviewer

**Funding**

Facebook Research Award 2020

*Persistent Activity Mining in Continually Evolving Networks*

$50,000

Based on my research, and contributed to writing

**Industry Experience**

*Applied Science Intern,* Amazon, Seattle, WA (Remote; COVID-19) May-Aug 2020

Created an approach for discovering product attributes

*Software Engineer Intern,* Sift, San Francisco, CA May-Aug 2018

Developed and deployed a gradient tree-boosting algorithm for automated fraud detection

*Software Engineer Intern,* Handshake, San Francisco, CA May 2017-Aug 2017

Developed the university-facing side of a web platform for university students to find their ideal employers

*Software Engineer Intern,* Iris, Owosso, MI May-Aug 2016

Developed Android code to run computer vision inference on mobile

*Software Engineer Intern,* Covenant Eyes, Owosso, MI Jun-Aug 2015

Developed Android code

*Software Development Intern,* Enspire Software, Fort Wayne, IN May-Aug 2014

Developed Android code

**Programming Languages in order of proficiency**

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

**Professional Membership**

Linguistic Society of America (LSA) Student Member

Association of Computing Machinery (ACM) Student Member

Institute of Electrical and Electronics Engineers (IEEE) Student Member

**Other Projects**

Machine Learning Text and Network Joint Embeddings, Purdue University 2017-2018

Researched jointly embedding text and social network nodes into the same embedding space

Deep Learning for Protein Binding Ligand Prediction, Purdue University 2015-2018

Researched using deep learning to predict protein binding ligands for drug design