Caleb Belth

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Positions

Assistant Professor of Linguistics, University of Utah, Salt Lake City, UT 2023-Present

Education

PhD, Computer Science, University of Michigan, Ann Arbor, MI 2018-2023
Advisors: Andries Coetzee, Danai Koutra
Thesis: *Towards an Algorithmic Account of Phonological Rules and Representations*
Committee: Andries Coetzee (LING), Danai Koutra (CS), Charles Yang (LING, UPenn), Richard Lewis (Psychology), Lu Wang (CS)

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

B.S., Computer Science, Purdue University, West Lafayette, IN 2014-2018
Minors: Philosophy, Mathematics
Research Advisors: Jennifer Neville, Dan Goldwasser, Daisuke Kihara

Research Interests

Phonology, *Linguistic Representations*, *Language Acquisition*, *Psycholinguistics*, *Linguistic Variation*

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 2019

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

Dean's List, Purdue 2015-2018

Semester Honors, Purdue 2015-2018

Journal Publications

3. **Caleb Belth**. Accepted. A Learning-Based Account of Phonological Tiers. *Linguistic Inquiry*.
2. **Caleb Belth**. In Press. A Learning-Based Account of Local Phonological Processes. *Phonology*.

1. **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.

Peer-Reviewed Conference and Workshop Papers and Presentations

19. **Caleb Belth**. Accepted. Experimental Evidence that Learning of Morphophonological Alternations Starts Local. *North East Linguistics Society.*
18. **Caleb Belth**. 2023. A Learning-Based Account of Non-Productivity in Dutch Voicing Alternations. *Boston University Conference on Language Development.*
17. **Caleb Belth**. 2023. A Learning-Based Account of Non-Productivity in Dutch Voicing Alternations. *Morris Halle Centenary Conference.*
16. **Caleb Belth**. 2023. Towards a Learning-Based Account of Underlying Forms: A Case Study in Turkish. *Society for Computation in Linguistics*.
15. **Caleb Belth**. 2023. A Learning-Based Account of Phonological Tiers. *Penn Linguistics Conference.*
14. **Caleb Belth**. 2022. Learning Non-Local Phonological Alternations via Automatic Creation of Tiers. *Linguistic Society of America*.
13. **Caleb Belth**. 2022. How a Proclivity for Adjacency can Drive the Learning of Non-Local Alternations. *MidPhon*.
12. **Caleb Belth**. 2022. Learning Non-Local Phonological Alternations via Automatic Creation of Tiers. 2022. *Cognitive Modeling and Computational Linguistics workshop at ACL*.
11. Sarah Payne, **Caleb Belth,** Jordan Kodner, and Charles Yang. 2022. Searching for Morphological Productivity. *Linguistic Society of America*.
10. **Caleb Belth**, Sarah Payne, Deniz Beser, Jordan Kodner, and Charles Yang. 2021. The Greedy and Recursive Search for Morphological Productivity. *CogSci*.
9. {**Caleb Belth,** Sarah Payne}, Jordan Kodner, and Charles Yang. 2021. Searching for Morphological Productivity. *Boston University Conference on Language Development*.
8. Sarah Payne, **Caleb Belth**, Jordan Kodner, and Charles Yang. 2021. The Recursive Search for Morphological Productivity. *American International Morphological Meeting.*
7. **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.
6. **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)*.
5. **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).*
4. **Caleb Belth**, Xinyi Zheng, Danai Koutra. 2020. Mining Persistent Activity in Continually Evolving Networks. *ACM SIGKDD Workshop on Mining and Learning with Graphs (MLG).*
3. 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).*
2. **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).*
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

(Upcoming) LING 6300: Graduate Computational Linguistics — Spring 2024
Head Instructor; seminar on comp. phonology, focusing on contributions to Phonological Theory

LING 5981/6080: Python for Linguists — Fall 2023
Head Instructor; teaching programming in Python to linguistics students

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 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 and Service

Department of Linguistics Undergraduate Committee Member — 2023-Present

Diversity Initiative in Graduate Applications, University of Michigan — 2022-2023
Founder, program to connect students from underrepresented communities to UM research groups

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

Mohammed Al-Ariqy — 2023-Current
Dissertation Committee Member

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

The Interaction Between Learning Algorithms and Formal Language Theory — 2024
LSA Conference Organized Session on Formal Language Theory in Morphology and Phonology

Historical Contingency in Language, College of Humanities, University of Utah — 2023

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

Guest Lectures

In Charles Yang's Graduate Seminar on Discovery Procedures, UPenn — 2023

In Kyle Gorman's Graduate Seminar on Computational Linguistics, CUNY — 2022

Non-Peer-Reviewed Poster Presentations

MIDAS Symposium Poster Session, University of Michigan — 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 2019
When to remember where you came from: Node representation learning in higher-order networks

Purdue Undergraduate Research & Poster Symposium 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

Grants

Facebook Research Award 2020
$50,000; Based on my research, and contributed to writing.

Industry Experience

Applied Science Intern, Amazon, Seattle, WA (Remote; COVID-19) Summer 2020
Created an approach for discovering product attributes

Software Engineer Intern, Sift, San Francisco, CA Summer 2018
Developed and deployed a gradient tree-boosting algorithm for automated fraud detection

Software Engineer Intern, Handshake, San Francisco, CA Summer 2017
Developed a web platform for university students to find their ideal employers

Software Engineer Intern, Iris, Owosso, MI Summer 2016
Developed Android code to run computer vision inference on mobile

Software Engineer Intern, Iris, Owosso, MI Summer 2015
Developed Android code

Software Development Intern, Enspire Software, Fort Wayne, IN Summer 2014
Developed Android code

Programming Languages in order of Proficiency

Python (expert), Java (proficient), C (proficient), C++ (proficient), Bash (proficient), Scala (familiar)

Professional Membership

Linguistic Society of America (LSA) Member	Present
Association of Computing Machinery (ACM) Student Member 2018	Graduate School
Institute of Electrical and Electronics Engineers (IEEE) Student Member	Graduate School

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
Used deep learning to predict protein binding ligands for drug design