# NAOMI SAPHRA

## Curriculum Vitae



Education

2021 **Ph.D, Informatics**, *University of Edinburgh*, Edinburgh, UK.

Advisor: Adam Lopez

Thesis: Training Dynamics of Neural Language Models.

2015 MSE, Computer Science, Johns Hopkins University, Baltimore, MD.

Mentors: Adam Lopez, Sanjeev Khudanpur, Raman Arora Obtained as a PhD student before transferring to Edinburgh.

2013 B.Sc, Computer Science, Carnegie Mellon University, Pittsburgh, PA.

Mentors: Noah Smith and Chris Dyer Minor: Language Technologies

# Experience

#### Academia

2023—Present **Kempner Institute at Harvard University**, *Kempner Postdoctoral Fellow*, Boston, MA. Independent researcher at the Kempner Institute for the Study of Natural and Artificial Intelligence.

2021–2023 **New York University**, *Postdoctoral Researcher*, New York, NY.

Supervisor: Kyunghyun Cho.

Summer 2014 **Frederick Jelinek Memorial Workshop (JSALT)**, *Graduate Researcher*, Prague, Czech Republic. Project: Cross-language Abstract Meaning Representation.

Summer 2012 CLSP Summer Workshop at Johns Hopkins, Undergraduate Research Fellow, Baltimore, MD.

Mentor: Matthew Blaschko.

Project: Understanding Objects in Detail with Fine-grained Attributes.

2010–2013 Carnegie Mellon University, Undergraduate Research Assistant, Pittsburgh, PA.

Mentors: Chris Dyer and Noah Smith.

#### Industry

Winter 2020 Google, Research Intern, New York, NY.

Mentors: Dipanjan Das, Ian Tenney, Jasmijn Bastings, Thibault Sellam.

Topic: Variance in language model pretraining dynamics across random seeds.

Summer 2017 Koko, Intern, New York, NY.

Developed classifiers for informal text at abuse-detection startup.

Summer 2015 Google, Software Engineering Intern, Mountain View, CA.

Mentor: Marius Pasca (Common Sense Team, Machine Intelligence).

Topic: Unsupervised discovery of paraphrases from user data.

Summer 2013 **Google**, Software Engineering Intern, Mountain View, CA.

Mentor: Eric Altendorf (Common Sense Team, Machine Intelligence).

Topic: Integrating models of real-world knowledge into NLP entity linking systems.

Summer 2011 Facebook, Inc., Engineering Intern, Palo Alto, CA.

Topic: Improving the People You May Know model.

#### Consulting

- 2022 **MosaicML**, *Consultant*, New York, NY.

  Advised team improving the efficiency of pretraining large language models.
- 2022 **University of Southern California NSF grant**, Grant Advisory Board.

  Title: Convergence Accelerator Track H: Determining Community Needs for Accessibility Tools that Facilitate Programming Education and Workforce Readiness for Persons with Disabilities

#### Awards & Grants

- 2024 Rising Star, MIT Rising Stars in EECS Workshop.
- 2024 Best Reviewer, ICML.
- 2022 Outstanding Reviewer, ICLR.
- 2021 Outstanding Reviewer, ICLR.
- 2019 **Best Poster Runner Up**, NY Academy of Sciences Natural Language, Dialogue & Speech.
- 2019 **Daniella Sciama Award for Achievement through Adversity**, *University of Edinburgh*. Award of £1,000.
- 2017 Google Europe Scholarship for Students with Disabilities, *Alphabet Inc.* Award of €7,000.
- 2014 Best Paper (coauthor), LREC Workshop on Free/Open-Source Arabic Corpora.
- 2013 **Dragon Award**, *Carnegie Mellon School of Computer Science*.

  Offered by the undergraduate CS academic advisor to one graduate annually on idiosyncratic grounds.
- 2009 National Merit Semifinalist, National Merit Scholarship Corporation.
- 2009 Nannina Rasulo Memorial Scholarship Award for Technology, *Irvington High School*. Award of \$500.

#### **Publications**

#### Journals and Periodicals

- 2023 Naomi Saphra. Interpretability creationism. The Gradient, 2023.
- Dieuwke Hupkes, Mario Giulianelli, Verna Dankers, Mikel Artetxe, Yanai Elazar, Tiago Pimentel, Christos Christodoulopoulos, Karim Lasri, Naomi Saphra, Arabella Sinclair, Dennis Ulmer, Florian Schottmann, Khuyagbaatar Batsuren, Kaiser Sun, Koustuv Sinha, Leila Khalatbari, Maria Ryskina, Rita Frieske, Ryan Cotterell, and Zhijing Jin. State-of-the-art generalisation research in NLP: a taxonomy and review. Nature Machine Intelligence, 2023.
- 2023 Michael Hu, Angelica Chen, Naomi Saphra, and Kyunghyun Cho. Delays, detours, and forks in the road: Latent state models of training dynamics. Transactions of Machine Learning Research (TMLR), 2023.

#### Conference Publications

- 2024 Edwin Zhang, Vincent Zhu, **Naomi Saphra**, Anat Kleiman, Benjamin L. Edelman, Milind Tambe, Sham M. Kakade, and Eran Malach. Transcendence: Generative models can outperform the experts that train them. In *Neural Information Processing Systems (NeurIPS)*, 2024.
- 2024 **Naomi Saphra**, Eve Fleisig, Kyunghyun Cho, and Adam Lopez. First tragedy, then parse: History repeats itself in the new era of large language models. In *North American Association for Computational Linguistics (NAACL)*, 2024.
- 2024 Tom Sherborne, **Naomi Saphra**, Pradeep Dasigi, and Hao Peng. TRAM: Bridging Trust Regions and Sharpness Aware Minimization. In *International Conference on Learning Representations (ICLR)*, 2024. Spotlighted (top 5%).

- 2024 Michael Saxon, Ari Holtzman, Peter West, William Yang Wang, and **Naomi Saphra**. Benchmarks as microscopes: A call for model metrology. In *Conference on Language Modeling (COLM)*, 2024.
- 2024 Adir Rahamim, **Naomi Saphra**, Sara Kangaslahti, and Yonatan Belinkov. Fast forwarding low-rank training. In *Empirical Methods in Natural Language Processing (EMNLP)*, 2024.
- 2024 Victoria R. Li\*, Yida Chen\*, and **Naomi Saphra**. ChatGPT doesn't trust Chargers fans: Guardrail sensitivity in context. In *Empirical Methods in Natural Language Processing (EMNLP)*, 2024.
- Angelica Chen, Ravid Schwartz-Ziv, Kyunghyun Cho, Matthew Leavitt, and **Naomi Saphra**. Sudden drops in the loss: Syntax acquisition, phase transitions, and simplicity bias in MLMs. In *International Conference on Learning Representations (ICLR)*, 2024. Spotlighted (top 5%).
- 2024 Ian Berlot-Attwell, Kumar Krishna Agrawal, A. Michael Carrell, Yash Sharma, and **Naomi Saphra**. Attribute diversity determines the systematicity gap in VQA. In *Empirical Methods in Natural Language Processing (EMNLP)*, 2024.
- Zachary Ankner, Naomi Saphra, Davis Blalock, Jonathan Frankle, and Matthew L. Leavitt. Dynamic masking rate schedules for MLM pretraining. In *European Association for Computational Linguistics (EACL)*, 2024. Accepted as oral presentation.
- 2023 Jeevesh Juneja, Rachit Bansal, Kyunghyun Cho, João Sedoc, and Naomi Saphra. Linear Connectivity Reveals Generalization Strategies. In *International Conference on Learning Representations* (ICLR), 2023.
- 2022 Josef Valvoda, Naomi Saphra, Jonathan Rawski, Ryan Cotterell, and Adina Williams. Learning Transductions to Test Systematic Compositionality. In *International Conference on Computational Linguistics (COLING)*, 2022.
- Thibault Sellam, Steve Yadlowsky, Ian Tenney, Jason Wei, **Naomi Saphra**, Alexander D'Amour, Tal Linzen, Jasmijn Bastings, Iulia Raluca Turc, Jacob Eisenstein, Dipanjan Das, and Ellie Pavlick. The MultiBERTs: BERT Reproductions for Robustness Analysis. In *International Conference on Learning Representations (ICLR)*, 2022. Spotlighted (top 5%).
- 2021 Jennifer C. White, Tiago Pimentel, Naomi Saphra, Adina Williams, and Ryan Cotterell. A Non-Linear Structural Probe. In North American Association for Computational Linguistics (NAACL), 2021.
- 2020 **Naomi Saphra** and Adam Lopez. LSTMs Compose—and Learn—Bottom-Up. In *Findings of Empirical Methods in Natural Language Processing (EMNLP Findings)*, 2020.
- 2020 Mohammad Tahaei, Kami Vaniea, and **Naomi Saphra**. Understanding privacy-related questions on stack overflow. In *Conference on Human Factors in Computing Systems (CHI)*, 2020.
- 2020 Tiago Pimentel\*, **Naomi Saphra**\*, Adina Williams, and Ryan Cotterell. Pareto Probing: Trading Off Accuracy for Complexity. In *Empirical Methods in Natural Language Processing (EMNLP)*, 2020.
- 2019 **Naomi Saphra** and Adam Lopez. Understanding Learning Dynamics Of Language Models with SVCCA. In *North American Association for Computational Linguistics (NAACL)*, 2019.
- 2015 **Naomi Saphra** and Adam Lopez. AMRICA: an AMR Inspector for Cross-language Alignments. In *North American Association for Computational Linguistics (NAACL) (demos)*, 2015.
- 2014 Andrea Vedaldi, Siddharth Mahendran, Stavros Tsogkas, Subhransu Maji, Ross Girshick, Juho Kannala, Esa Rahtu, Iasonas Kokkinos, Matthew B. Blaschko, David Weiss, Ben Taskar, Karen Simonyan, **Naomi Saphra**, and Sammy Mohamed. Understanding Objects in Detail with Fine-grained Attributes. In *Computer Vision and Pattern Recognition (CVPR)*, 2014.

### Workshop Publications

2024 Rosie Zhao, Sham Kakade, and **Naomi Saphra**. Distributional scaling laws for emergent capabilities. In *NeurIPS Workshop on Scientific Methods for Understanding Deep Learning*, 2024.

- 2024 **Naomi Saphra\*** and Sarah Wiegreffe\*. Mechanistic? In *EMNLP BlackboxNLP Workshop*, 2024. Accepted as oral presentation.
- 2024 Divyansh Singhvi\*, Andrej Erkelens\*, Raghav Jain\*, Diganta Misra, and **Naomi Saphra**. Shapley interactions for complex feature attribution. In *NeurIPS Workshop on Scientific Methods for Understanding Deep Learning*, 2024. *Under submission to ICLR 2025*.
- 2024 Tian Qin, **Naomi Saphra**, and David Alvarez-Melis. Sometimes I am a tree: Data drives fragile hierarchical generalization. In *NeurIPS Workshop on Scientific Methods for Understanding Deep Learning*, 2024. *Under submission to ICLR 2025*.
- 2024 Victoria R. Li\*, Jenny Kaufmann\*, David Alvarez-Melis, and Naomi Saphra. Twin studies of factors in OOD generalization. In NeurIPS Workshop on Scientific Methods for Understanding Deep Learning, 2024.
- 2024 Jenny Kaufmann\*, Victoria R. Li\*, Martin Wattenberg, David Alvarez-Melis, and Naomi Saphra. Causation does not imply correlation: A study of circuit mechanisms and model behaviors. In NeurIPS Workshop on Scientific Methods for Understanding Deep Learning, 2024.
- 2024 Sara Kangaslahti, Elan Rosenfeld, and **Naomi Saphra**. Loss in the crowd: Hidden breakthroughs in language model training. In *ICML Workshop on Mechanistic Interpretability*, 2024. Spotlighted. *Under submission to ICLR 2025*.
- 2024 Sonja Johnson-Yu, Satpreet Harcharan Singh, Federico Pedraja, Denis Turcu, Pratyusha Sharma, Naomi Saphra, Nathaniel Sawtell, and Kanaka Rajan. Understanding biological active sensing behaviors by interpreting learned artificial agent policies. In Workshop on Interpretable Policies in Reinforcement Learning @RLC-2024, 2024. Accepted as oral presentation.
- 2023 Yash Gondhalekar, Sultan Hassan, **Naomi Saphra**, and Sambatra Andrianomena. Towards out-of-distribution generalization in large-scale astronomical surveys: robust networks learn similar representations. In *NeurIPS workshop on Machine Learning and the Physical Sciences*, 2023.
- 2022 Bingchen Zhao\*, Yuling Gu\*, Jessica Zosa Forde, and **Naomi Saphra**. One Venue, Two Conferences: The Separation of Chinese and American Citation Networks. In *NeurIPS Workshop on Cultures of AI and AI for Culture*, October 2022.
- 2019 **Naomi Saphra** and Adam Lopez. Sparsity emerges naturally in neural language models. In *ICML Workshop on Identifying and Understanding Deep Learning Phenomena (Deep Phenomena*), 2019
- 2016 **Naomi Saphra** and Adam Lopez. Evaluating Informal-Domain Word Representations with UrbanDictionary. In *ACL Workshop on Evaluating Vector Space Representations for NLP (RepEval)*, 2016.
- 2014 Nathan Schneider, Brendan O'Connor, **Naomi Saphra**, David Bamman, Manaal Faruqui, Noah A. Smith, Chris Dyer, and Jason Baldridge. A framework for (under) specifying dependency syntax without overloading annotators. In *ACL Linguistic Annotation Workshop*, 2014.
- 2014 Ryan Cotterell, Adithya Renduchintala, **Naomi Saphra**, and Chris Callison-Burch. An Algerian Arabic-French Code-Switched Corpus. In *LREC Workshop on Free/Open-Source Arabic Corpora*, 2014. Received best paper award.

#### Preprints and Manuscripts Under Review

- Oskar van der Wal, Pietro Lesci, Max Müller-Eberstein, **Naomi Saphra**, Hailey Schoelkopf, Willem Zuidema, and Stella Biderman. Polypythias: Stability and outliers across fifty language model pre-training runs, 2024. *Under submission to ICLR 2025*.
- 2024 USVSN Sai Prashanth\*, Alvin Deng\*, Kyle O'Brien\*, Jyothir S V\*, Mohammad Aflah Khan, Jaydeep Borkar, Christopher A. Choquette-Choo, Jacob Ray Fuehne, Stella Biderman, Tracy Ke, Katherine Lee, and **Naomi Saphra**. Recite, reconstruct, recollect: Memorization in LMs as a multifaceted phenomenon, 2024. *Under submission to ICLR 2025*.

2017 Graham Neubig, Chris Dyer, Yoav Goldberg, Austin Matthews, Waleed Ammar, Antonios Anastasopoulos, Miguel Ballesteros, David Chiang, Daniel Clothiaux, Trevor Cohn, Kevin Duh, Manaal Faruqui, Cynthia Gan, Dan Garrette, Yangfeng Ji, Lingpeng Kong, Adhiguna Kuncoro, Gaurav Kumar, Chaitanya Malaviya, Paul Michel, Yusuke Oda, Matthew Richardson, Naomi Saphra, Swabha Swayamdipta, and Pengcheng Yin. DyNet: The dynamic neural network toolkit, 2017.

#### Talks

#### Invited plenary event talks

- Sept 2024 **Simons Institute Workshop: Transformers as a Computational Model**, Berkeley, CA. Language Acquisition in Language Models
- June 2022 **3rd Neural Scaling Laws Workshop (Keynote)**, Manoir Saint-Sauveur, Quebec. *Keynote*: Sources of Variance in Pretraining and Finetuning
- Nov 2020 **EMNLP QueerInAl Social**, Seattle, WA (Remote). Transparent, Hackable, Accessible
- June 2020 **Pydatafest Amsterdam (Keynote)**, Amsterdam, Netherlands (Remote). *Keynote*: Accessible Means Hackable
- Jan 2019 Understanding & Analyzing Neural Networks Workshop, Amsterdam, Netherlands.
  Understanding Learning Dynamics Of Language Models with SVCCA
  Invited event panels
- Oct 2024 **COLM MLR@Penn Workshop on Foundation Models (Panelist)**, Philadelphia, PA. Panel: Emerging Trends in Open Foundation Model Development Panelist
- July 2024 ICML Mechanistic Interpretability Workshop (Panelist), Vienna, Austria. Interpretability Panel Discussion Panelist
- July 2024 ICML Queer and {Dis}Ablity in Al Social (Panelist), Vienna, Austra.

  Human-Al Interactions and Underrepresented Communities Panelist
- May 2024 ICLR Interpretability Social (Panelist), Vienna, Austria. Interpretability Panel Discussion - Panelist
- Dec 2023 NeurIPS Negative Results Workshop (Panel Moderator), New Orleans, LA.
  Negative Results Panel Discussion Moderator
- June 2020 **NAACL D&I Sessions (Panelist)**, Remote. D&I Session: Inclusivity in Conferences Panelist
- Aug 2019 ACL Blackbox NLP Workshop (Panelist), Florence, Italy.
  Blackbox NLP Panel Discussion Panelist

#### Other invited talks

- Oct 2024 **Spotify, Inc.**, Boston, MA.
- May 2024 **Stanford University**, Palo Alto, CA (Remote). Stanford NLP Seminar
- March 2024 Massachusetts Institute of Technology, Cambridge, MA.

  MIT Embodied Intelligence Seminar Series
  - Feb 2024 **University of Massachusetts Amherst**, Amherst, MA. UMass NLP Seminar Series
  - Nov 2023 **Carnegie Mellon University**, Pittsburgh, PA. Machine Learning Faculty / Duolingo Seminar Series
  - Aug 2023 Microsoft Research, Montreal, Canada (Remote) and New York, NY. MSR Montreal Seminar Series

June 2023	Heriot-Watt University, Edinburgh, UK (Remote). Lab for AI Verification Speaker Series
March 2023	University of Edinburgh, Edinburgh, UK.  NLP Seminar Series
March 2023	University of Copenhagen, Copenhagen, Denmark. University of Copenhagen NLP Seminar Series
Feb 2023	Georgetown University, Washington, DC. Nathan Schneider lab
Jan 2023	Massachusetts Institute of Technology, Boston, MA (Remote). The Center for Biological & Computational Learning speaker series
July 2022	Oracle, Boston, MA (Remote). Machine Learning Seminar
June 2022	<b>Stanford University</b> , Palo Alto, CA (Remote). Stanford NLP Seminar
June 2022	UC Irvine, Irvine, CA. Sameer Singh lab
June 2022	University of Southern California - Information Sciences Institute, Irvine, CA. USC ISI Natural Language Seminar
Feb 2022	University College London, London, UK.
Nov 2020	UC Berkeley, Berkeley, CA (Remote). Berkeley NLP Seminar
May 2020	<b>Brown University</b> , Providence, RI (Remote). Brown NLP Seminar
Sept 2019	Element AI, London, UK.
Aug 2019	Allen Institute for AI, Seattle, WA.
May 2019	City University of New York, New York, NY. Kyle Gorman lab
	Outreach
July 2023	HackNY Fellows Speaker Series, New York, NY.
Jan 2023	Westchester Public Libraries speaker series, Tuckahoe, NY (Remote). Hacking Disability: Accessible and Adaptable Tech
March 2020	!!Con West, Santa Cruz, CA. Get Hooked on Pytorch Hooks!
Sept 2019	Challenging the Work Society, London, UK. Carbon AI and the Concentration of Computational Work (jointly presented with Kate McCurdy)
Feb 2019	The Stand Edinburgh Comedy Club, Edinburgh, UK. Paying the Panopticon (standup comedy)
Oct 2012	Carnegie Mellon TechNights, Pittsburgh, PA.  ML and NLP Guest Lectures (program for middle school girls)
	Teaching
2021, 2023	Center for Data Science Capstone, New York University.  Project Mentor
2019	Probabilistic Modeling & Reasoning, University of Edinburgh. Tutor (Teaching recitations)

2017–2019 Machine Learning & Pattern Recognition, University of Edinburgh.

Tutor (Teaching recitations)

2016 Informatics Research Review, University of Edinburgh.

Tutor (Teaching recitations)

2013 Natural Language Processing, Johns Hopkins University.

Course Assistant (Grading)

2008–2009 Ancient Greek, Irvington High School.

Teacher's Assistant (Grading)

**Guest Lectures** 

Nov 2024 Korea Advanced Institute of Science & Technology (KAIST), Daejeon, South Korea.

ML for NLP (CS475) guest lecture

Jan 2022 **NYU AI School**, New York, NY (Remote).

Mathematical Fundamentals of Al

Thesis Supervision

2021 University of Amsterdam MSc., Sylke Gosen.

Understanding Language Models through Perturbed Datasets.

Co-advised with Dieuwke Hupkes and Jaap Jumelet.

2018 University of Edinburgh MSc., Alp Ozkan.

Combined Application of Pruning and Growing Approaches for Neural Networks.

Co-advised with Adam Lopez.

2018 University of Edinburgh MSc., Yekun Chai.

Discovering Spelling Variants on Urban Dictionary. Co-advised with Adam Lopez.

#### Service

General

- 2024 **Organizing committee**, 2nd Workshop on High-dimensional Learning Dynamics (HiLD): The Emergence of Structure and Reasoning at ICML, Vienna, Austria.
- 2023 **Organizing committee**, 8th Workshop on Representation Learning for NLP (RepL4NLP) at ACL, Toronto, Canada.
- 2022 **Organizing committee**, Analyzing and interpreting neural networks for NLP (BlackboxNLP) at EMNLP, Abu Dhabi, United Arab Emirates.
- 2021 **Organizing committee**, 6th Workshop on Representation Learning for NLP (RepL4NLP) at ACL, Remote.
- 2014 **Social co-chair**, Association for Computational Linguistics (ACL), Baltimore, MD.
- 2012–2014 NACLO volunteer, Johns Hopkins University and Carnegie Mellon University.

Tested puzzles for the national North American Computational Linguistics Olympiad. Organized local high school competition.

Diversity, Equity, & Inclusion

- 2023 Project Mentor, ACL Student Research Workshop, Toronto, Canada.
- 2020 Accessibility Subcomittee, Association for Computational Linguistics (ACL), Remote.
- 2019-2020 **Disability representative**, *University of Edinburgh Staff Pride Network*, Edinburgh, UK.

Refereeing

Senior Area Chair

2025-Present North American Association for Computational Linguistics (NAACL), 2025.

	Area Chair / Action Editor
2025–Present	International Conference on Learning Representations (ICLR), 2025.
2024–Present	Association for Computational Linguistics (ACL) Rolling Review.
	Includes service for EMNLP, ACL, NAACL, AACL, and EACL.
2024–Present	Conference on Language Models (COLM), 2024.
2024	Workshop on Interpretable AI: Past, Present and Future, NeurIPS, 2024.
2021-2024	Empirical Methods in Natural Language Processing (EMNLP), 2021–2024.
2024	Language Resources and Evaluation Conference (LREC), 2024.
2022	Asian Association for Computational Linguistics (AACL), 2022.
	Journal Reviewing
2023	Journal of Machine Learning Research (JMLR).
	Conference Reviewing
2020-Present	International Conference on Machine Learning (ICML), 2020, 2023–2024. 2024 Best Reviewer
2021-Present	Neural Information Processing Systems (NeurIPS), 2021–2024.
2021–2024	International Conference on Learning Representations (ICLR), 2021–2024.
	2022 Outstanding Reviewer 2021 Outstanding Reviewer
2024	COGSCI, 2024.
	Association for Computational Linguistics (ACL) Rolling Review.
	European Association for Computational Linguistics (EACL), 2021, 2023.
	Association for Computational Linguistics (ACL), 2019–2021, 2023.
	North American Association for Computational Linguistics (NAACL), 2019, 2021.
	Empirical Methods in Natural Language Processing (EMNLP), 2017–2020.
2011 2020	Workshop and Competition Reviewing
2024	
	Mechanistic Interpretability Workshop, ICML.
2018-2023	Widening NLP (WiNLP), ACL.

2019–2023 Analyzing and interpreting neural networks for NLP (BlackboxNLP), ACL.

2020 The SIGNLL Conference on Computational Natural Language Learning (CoNLL), ACL.

2021–2023 Negative Results Workshop, NeurIPS.

2017–2019 Learning With Limited Data Workshop (LLD), ICLR.

2017 Representation Evaluation for NLP (RepL4NLP), ACL.

2017 Women in Machine Learning, NeurIPS.

2022 Inverse Scaling Prize.