

# KANISHKA MISRA

*PhD candidate interested in Natural Language Understanding and Cognitive Science*

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**Last Updated:** July 16, 2023

## Education

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### **Purdue University, West Lafayette**

Ph.D. in Computer Information Technology, 2018–2023 (expected)

**Dissertation:** *On Semantic Cognition, Inductive Generalization, and Language Models*

**Advisor:** Julia Taylor Rayz

**Committee:** Dr. Allyson Ettinger, Dr. Victor Raskin, Dr. Jin Wei Kocsis, Dr. John Springer

### **Purdue University, West Lafayette**

M.S. in Computer Information Technology, 2020

**Thesis:** *Exploring Lexical Sensitivities in Word Prediction Models: A case study on BERT* [[link](#)]

**Advisor:** Julia Taylor Rayz

**Note:** Work performed alongside requirements for Ph.D.

### **Purdue University, West Lafayette**

B.S. *with distinction*. Computer Information Technology, 2014–2018

Minor in Statistics

## Fellowships and Assistantships

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2023–2024	<b>Bilsland Fellowship.</b> Dissertation Fellowship awarded by Purdue University.
2022–2023	<b>Purdue Graduate Student Mentoring Fellowship.</b> Selected to understand and improve the advising relationship between faculty and students at Purdue University. <b>Award:</b> \$5,000 in research and travel funds.
2021–2022	<b>Research Assistantship</b> funded through NSF EAGER Grant number 2039605. <b>Title:</b> <i>AI-based Humor-integrated Social Engineering Training</i> . <b>Contribution:</b> Co-wrote the “Technical Contribution” section, and served as key personnel. <b>PI:</b> Julia Taylor Rayz, <b>Co-PI:</b> Ida B. Ngambeki
2018–2019	<b>Purdue Research Foundation (PRF) Fellowship.</b> <b>Title:</b> <i>Computational Analysis of Online Predatory Texts</i> . <b>Contribution:</b> Wrote the proposal in its entirety. <b>Mentor:</b> Julia Taylor Rayz.

## Industry Experience

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Fall 2022	<b>Google Research - Research Intern</b> <b>Project:</b> Triggering Multi-Hop Reasoning in LLMs with Soft-prompts. <b>Host(s):</b> Siamak Shakeri and Cicero Nogueira dos Santos.
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Summer 2021      **Pythonic AI - NLP Engineering/Research Intern**  
**Project:** Integrating Biomedical Commonsense into Language Models.  
**Host:** Baoqiang Cao, CTO and Co-founder.

## Work In Progress and Preprints

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- 2023    **Kanishka Misra** and Najoung Kim. On Lexical Category Abstraction in Pre-trained Language Models. *Work in Progress*.
- 2023    Mourad Heddaya, **Kanishka Misra**, and Allyson Ettinger. On Meaning and Prediction in Language Models and Humans. *Work in Progress*.
- 2022    **Kanishka Misra**. minicons: Enabling Flexible Behavioral and Representational Analyses of Transformer Language Models. Demo Paper. [[preprint](#)]

## Peer-reviewed Publications

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- 2023    **Kanishka Misra**, Cicero Nogueira dos Santos, Siamak Shakeri. Triggering Multi-hop reasoning in language models using soft-prompts and random walks. *Findings of ACL 2023*
- 2023    Koustuv Sinha, Jon Gauthier, Aaron Mueller, **Kanishka Misra**, Keren Fuentes, Roger Levy, Adina Williams. Language model acceptability judgments are not always robust to context. *ACL 2023*. **Recipient of Outstanding Paper Award**.
- 2023    Freda Shi, Xinyun Chen, **Kanishka Misra**, David Dohan, Ed Chi, Nathan Scharli, Denny Zhou. Large Language Models Can Be Easily Distracted by Irrelevant Context. *ICML 2023*.
- 2023    **Kanishka Misra**, Julia Taylor Rayz, Allyson Ettinger. COMPS: Conceptual Minimal Pair Sentences for Testing Robust Property Knowledge and its Inheritance in Pre-trained Language Models. *EACL 2023*. **Recipient of Best Paper Award**.
- 2022    **Kanishka Misra**, Julia Taylor Rayz, Allyson Ettinger. A Property Induction Framework for Neural Language Models. *44th Annual Conference of the Cognitive Science Society*.
- 2022    **Kanishka Misra**, Julia Taylor Rayz. LMs Go Phishing: Adapting Pre-trained Language Models to Detect Phishing Emails. *IEEE/ACM Web Intelligence Conference*.
- 2022    **Kanishka Misra**. On Semantic Cognition, Inductive Generalization, and Language Models. *AAAI 2022 Doctoral Consortium*, Vancouver, Canada. [[preprint](#)]
- 2021    **Kanishka Misra**, Allyson Ettinger, Julia Taylor Rayz. Do Language Models learn typicality judgments from text? *43rd Annual Conference of the Cognitive Science Society*. [[preprint](#)]
- 2021    **Kanishka Misra**, Julia Taylor Rayz. Finding fuzziness in Neural Network models of Language Processing. *Annual Meeting of the North American Fuzzy Information Processing Society 2021*. [[preprint](#)] **Honorable Mention for Best Student Paper**.
- 2020    **Kanishka Misra**, Allyson Ettinger, Julia Taylor Rayz. Exploring BERT's Sensitivity to Lexical Cues using Tests from Semantic Priming. *Findings of the Association for Computational Linguistics: EMNLP 2020*. [[link](#)]

- 2020 Qingyuan Hu, Yi Zhang, **Kanishka Misra**, Julia Taylor Rayz. Exploring Lexical Irregularities in Hypothesis-Only Models of Natural Language Inference. *2020 IEEE 19th International Conference on Cognitive Informatics & Cognitive Computing (ICCI\* CC)*. [[link](#)]
- 2020 **Kanishka Misra**, Julia Taylor Rayz. An Approximate Perspective on Word Prediction in Context: Ontological Semantics meets BERT. *Annual meeting of the North American Fuzzy Information Processing Society 2020*. Online. [[preprint](#)]
- 2019 **Kanishka Misra**, Hemanth Devarapalli, Tatiana Ringenberg, Julia Taylor Rayz. Authorship Analysis of Online Predatory Conversations using Character Level Convolution Neural Networks. *2019 IEEE International Conference on Systems, Man and Cybernetics (SMC)*., Bari, Italy. [[link](#)]
- 2019 Tatiana Ringenberg, **Kanishka Misra**, Julia Taylor Rayz. Not So Cute but Fuzzy: Estimating Risk of Sexual Predation in Online Conversations. *2019 IEEE International Conference on Systems, Man and Cybernetics (SMC)*., Bari, Italy. (**joint first author**) [[link](#)]
- 2019 Qiaofei Ye, **Kanishka Misra**, Hemanth Devarapalli, Julia Taylor Rayz. A Sentiment Based Non-Factoid Question-Answering Framework. *2019 IEEE International Conference on Systems, Man and Cybernetics (SMC)*., Bari, Italy. [[link](#)]
- 2019 **Kanishka Misra**, Hemanth Devarapalli, Julia Taylor Rayz. Measuring the Influence of L1 on Learner English Errors in Content Words within Word Embedding Models. *17th International Conference on Cognitive Modelling 2019*., Montréal, Canada. [[link](#)]
- 2019 Tatiana Ringenberg, **Kanishka Misra**, Kathryn C. Seigfried-Spellar, Julia Taylor Rayz. Exploring Automatic Identification of Fantasy-Driven and Contact-Driven Sexual Solicitors. *2019 Third IEEE International Conference on Robotic Computing (IRC)*., Naples, Italy. [[link](#)]
- 2019 Kathryn C. Seigfried-Spellar, Marcus K Rogers, Julia T Rayz, Shih-Feng Yang, **Kanishka Misra**, Tatiana Ringenberg. Chat analysis triage tool: Differentiating contact-driven vs. fantasy-driven child sex offenders. *Forensic Science International*, 2019. [[link](#)]

## Peer-reviewed Abstracts

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- 2020 **Kanishka Misra**, Allyson Ettinger, Julia Taylor Rayz. Exploring BERT's lexical relations using Semantic Priming. *CogSci 2020* [[poster](#)] [[link](#)]
- 2019 **Kanishka Misra**, Hemanth Devarapalli, Julia Taylor Rayz. L1 Influence on Content Word errors in Learner English Corpora: Insights from Distributed Representation of Words. *CogSci 2019*, Montréal, Canada. [[poster](#)] [[link](#)]

## Presentations and Invited Talks

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| Spring 2023 | <i>On the synthetic semantic cognition of language models</i> (Invited Talk)<br>EvLab and LINGO lab. MIT |
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	<i>Conceptual Minimal Pairs for testing Robust Property Knowledge and its Inheritance in Pre-trained Language Models</i> (Invited Talk) CompLing Lab, University of Chicago
Fall 2022	Human and Machine Learning Lab. New York University Computation and Psycholinguistics Lab. New York University CompLang/Ev Lab joint meeting. MIT Language Evolution, Acquisition and Processing Workshop. University of Chicago
Fall 2022	<i>Triggering Multi-Hop Reasoning in LLMs using Soft-Prompts</i> Prompt-tuning sync. Google Research.
Spring 2022	<i>On Semantic Cognition, Inductive Generalization, and Language Models</i> AAAI 2022 Doctoral Consortium. Vancouver (held online).
Fall 2021	<i>Finding fuzziness in Neural Network Models of Language Processing</i> NAFIPS 2021 (held online).
Summer 2021	<i>Do Language Models Learn Typicality Judgments from Text?</i> CogSci 2021 Main Conference (held online).

## Honors and Awards

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- 2023 **Outstanding Paper Award.** *ACL 2023.*
- 2023 **Best Paper Award.** *EACL 2023.*
- 2022 **Best Student Poster (runner-up)** *PPI Holistic Safety and Security Research Impact area.* **Amount:** \$250.
- 2022 **Fellow,** *Purdue Graduate Student Mentoring Fellows Program.* **Amount:** \$5,000 in research funds.
- 2021 **Honorable Mention for Best Student Paper,** *North American Fuzzy Information Processing Society.* **Amount:** \$100.
- 2019 **Holistic Safety and Security Research Travel Grant,** *Purdue Polytechnic Institute.* **Amount:** \$500.
- 2019 **CIT Research Travel Grant Award,** *Purdue CIT.* **Amount:** \$1200 (CogSci 2019), \$600 (IEEE-SMC 2019).
- 2019 **Best HSS Poster Presentation,** *CERIAS Symposium.* Award presented by committee on Holistic Safety and Security (HSS) research impact area. [[link](#)].
- 2019 **Conference Travel Award,** *Chicago R Unconference.* **Amount:** \$150.
- 2018 **PRF Fellowship,** *Purdue Research Foundation.* Covered two semesters worth of graduate school, in addition to stipend.
- 2018 **Best Poster Award - PPI,** *Purdue Office of Undergraduate Research Expo.* **Amount:** \$250. [[link](#)]
- 2018 **Research Scholarship,** *Purdue Office of Undergraduate Research.* **Amount:** \$500.

2017 **First Place.** *Indy Civic Hackathon.* **Amount:** \$2000 split across 4 team members.

## Teaching

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### Teaching Assistant - *Database Fundamentals* (CNIT 272)

**Timeline:** Fall 2019, Spring 2020, Fall 2020

**Course Professor:** Dr. Dawn D. Laux

Developed lecture videos and taught fundamentals of relational databases and SQL to three lab sections ( $\approx 70$  students on average across three semesters).

**Instructor Rating:** 4.8 (on average across three semesters)

### Guest Lecturer - *Natural Language Technologies* (CNIT 519)

**Timeline:** Fall 2019, Fall 2020, Spring 2022

**Course Professor:** Dr. Julia Taylor Rayz

- Two lectures on Neural Network models of Natural Language Processing
- Developed two assignments on language model interpretability and evaluation.

## Mentorship

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- 2022** Sam Huang (UChicago Undergraduate). **Topic:** *Assessing reasoning behavior in LMs in presence of distraction.*
- 2020** Qingyuan “Carol” Hu and Yi Zhang (Undergraduates). **Topic:** *Exploring Lexical Irregularities in Hypothesis-only Models of Natural Language Inference.* **Outcome:** Publication in *IEEE ICC\* CI 2020*, and a presentation at *PURC 2020*, which was awarded second place across all students from the Purdue Polytechnic Institute.
- 2018–19** John Phan (Undergraduate). **Topic:** *Gender Bias in Word Embeddings.* Awarded NSF REU scholarship. **Outcome:** Two poster presentations.

## Reviewing

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- Conference** ACL (2023); EACL (2023); CogSci (2020, 2021, 2022); CoNLL (2021, 2022); ARR (2021, 2022); \*SEM 2022; EMNLP 2020; IJCAI 2020; \*SEM 2019; IEEE-IRC 2019.
- Journal** *Cognitive Science* (2023)
- Book** Chapman & Hall/CRC Press Statistics Series (2020, 2021).

## Service

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- **Session Chair**, *Linguistic Theory, Cognitive Modeling, and Psycholinguistics.* ACL 2023 (on-site).
- **Organizer**, *Neural Nets for Cognition.* Discussion group at CogSci 2022.
- **Local Arrangements Chair**, *Annual Meeting of the North American Fuzzy Information Processing Society 2021 (NAFIPS 2021) held at Purdue University.*

- **Program Committee:** CoNLL (2021, 2022).
- **Volunteer,** *36th AAAI Conference on Artificial Intelligence.*
- **Graduate Student Advisor,** *Purdue CIT Student Council.*
- **Organizer,** *Undergraduate Research Panel,* Purdue CIT.

## Skills

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<b>Programming</b>	Python, R, pytorch, jax, SQL, $\LaTeX$
<b>Natural Languages</b>	English, Hindi, Gujarati, Odiya

## Software Developed

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**minicons** A toolkit to facilitate behavioral and representational analyses of transformer-based language processing models. [[github](#)]

## Professional Affiliations

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- Association of Computational Linguistics (ACL)
- Cognitive Science Society (CogSci)
- Institute of Electrical and Electronic Engineers (IEEE)
- Center for Education and Research in Information Assurance and Security (CERIAS)
- Society for Mathematical Psychology (MathPsych)

## References

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**NLP Research:** Dr. Julia Taylor Rayz, Dr. Allyson Ettinger, Dr. Victor Raskin

**Teaching:** Dr. Dawn Laux

**Industry:** Dr. Cicero Nogueira dos Santos, Dr. Baoqiang Cao.