

## EDUCATION

### Princeton University

M.S.E, Computer Science |

Princeton, NJ

August 2024-Present

Funded by the machine learning department under the supervision of Prof. Tom Griffiths in the computational cognitive science [lab](#).

**Relevant Coursework:** Machine Learning and Pattern Recognition, Foundations of Probabilistic Modeling, AI Safety, Cognitive Psychology

**Research Interests:** Relational reasoning, meta-learning, and human-like inductive biases in neural networks

### Columbia University

B.A, Applied Mathematics | GPA: 3.51 | Major GPA: 3.71

New York, NY

September 2017-May 2021

**Relevant Coursework:** Natural Language Processing, Applied Deep Learning, Data Structures, Discrete Math, Linear Algebra, Intro to Statistics, Discrete Math, Complex Variables, Analysis and Optimization, Calculus III & IV

## PRESENTATIONS & PAPERS

- **Gupta M.**, Rane S., McCoy T., Griffiths T. *Convolutional Neural Networks Can (Meta)-Learn the Same-Different Relation*: In the Proceedings of the 47<sup>th</sup> Annual Conference of the Cognitive Science Society
- Bencomo G., **Gupta M.**, Marinescu I., McCoy T., Griffiths T. *Teasing Apart Architecture and Initial Weights as Sources of Inductive Bias in Neural Networks*: In the Proceedings of the 47<sup>th</sup> Annual Conference of the Cognitive Science Society
- **Gupta M.** *Navigating High Dimensional Concept Space with Metalearning*: ICML 2025, Workshop on High-Dimensional Learning Dynamics
  - **Gupta, M.**, Franke M., Hawkins R., Wu C. *Pragmatic Vigilance Inoculates Social Networks Against Misinformation*, Presentation to the Computational Pragmatics Lab: University of Tübingen
- Azizi E., Azad T., **Gupta M.**, Nazaret A. *Ensembling in Variational Autoencoder Architectures for Effective Posterior Distribution of Cell State Estimation*. Pre-print and Azizi Lab Presentation: Columbia University
- **Gupta M.**, Nika J., Carsault T. [Multi-Step Chord Prediction for Human-AI Improvisation](#). Presentation: Columbia Undergraduate Research Symposium, New York, NY (Virtual): September 2020
- **Gupta M.**, Malt M. [Musical Markov Chains](#). Presentation: Reid Hall Research Seminar, Paris, France: May 2020

## AWARDS & HONORS

- Hackathon Winner: Cognitive Modeling of Humans vs. Large Language Models, University of Tübingen – 2023
  - Dean's List – Columbia University 2020-2021
    - Heinrich Research Fellowship, Columbia University (\$2500) - 2020
    - Spritz Family Research Grant, Columbia University (\$3000) – 2020
      - PSAT National Commended Scholar – 2017
  - Canadian Gold Medalist in both French (2016-2017) and Latin (2014-2017) National Language Exams
    - Greville Smith Scholarship, McGill University (\$48,000, not availed) – 2017
- Hugh M. Brock National Entrance Scholarship, University of British Columbia (\$30,400, not availed) - 2017

## RESEARCH EXPERIENCE

### Max Planck Institute – Center For Humans and Machines

Berlin, Germany

#### AI Behaviorist - Research Assistant

May-August 2024

- Engineered online JS experiments to simulate multi-generational human-Large Language Model (LLM) communications in transmission networks of varying sizes and types. Built for research published in human-AI interaction conferences.
- Contributed visualizations and NLP analyses of public sentiments on AI risks/rewards across 400 human participants from India and the US. Compared attitudes via sociological coding.

### University of Tübingen

Tübingen, Germany

#### Research Intern – Supervisors: Michael Franke, Robert Hawkins, Charley Wu

Oct 2023 - Present

- Built a multi-agent extension of the Rational Speech Act (RSA) framework to examine effects of persuasive social goals

on belief diffusion in social networks. Simulating RSA communications in a random network in Python and R and examining belief convergence with Bayesian inference over iterated dyadic communications.

- Led modeling, data generation, and experimentation; presented preliminary work to the Computational Pragmatics Lab

### **Columbia University Medical Center**

New York, NY

**Research Assistant** - Supervisor: Elham Azizi

Jan – August 2021

- Analyzed the effects of aggregating neural network outputs to form posterior distributions (ensembling). Compared deep ensembling and batch ensembling on variational autoencoders (VAE's) performing differential gene expression.
- Trained Bayesian neural networks and VAE's on single-cell data in PyTorch analyzed posteriors across random initializations. Presented methods and findings to the computational cancer biology lab.

### **IRCAM, Centre Pompidou**

Paris, France

**Research Fellow** – Supervisors: Mikhail Malt, Jérôme Nika

Jan-Sep 2020

- Built language models (RNNs, LSTMs) trained in PyTorch on musical data from live jazz for human-AI improvisations.
- Authored, presented a report and poster on generative music with language models at Columbia's 2020 research symposium. Authored a manuscript on stochastic models in music, published at Reid Hall's research symposium.

## **PROFESSIONAL EXPERIENCE**

### **Weill Cornell Medical, Cornell University**

New York, NY

**Research Software Engineer**

May 2022 - Nov 2022

- Worked on efficiency and indexing of the main NLP pipeline, using OCR to parse doctor notes into machine-readable text.
- Built an AWS-hosted ETL pipeline with Docker, Python, Java, and SQL to securely geocode address data from hospital patients, increasing geocoding accuracy and runtime efficiency by 15%.

### **Infosys Consulting**

New York, NY

**Business Analyst – AI & Automation**

August 2021-May 2022

- Built and deployed an NLG model from open-source to automate 85% of credit loan risk report writing at a top 3 US bank.
- Engineered several NLP models for financial document classification, summarization, and generation in NLTK and JS.
- Assisted executive advising at 2 of the top 5 US banks in AI automation, chatbot implementation, and process mining. Wrote concise technical guides on each of the above topics, shared to clients and the firm at large.

## **TEACHING EXPERIENCE**

### **Assistant Instructor: COS 126, COS 240**

Princeton, NJ

**Princeton University**

Sep. 2024 – Present

- Weekly teaching and grading for a cohort of 20 Princeton undergraduates with coding and theory p-sets and exams. COS 126 is an intro to java class and COS 240 is a proof-based math class for CS majors.

### **Teaching Assistant: Reinforcement Learning for Language Model Training**

Tübingen, Germany

**University of Tübingen**

Nov. 2023 – Present

- Grading and coding support for 50+ Tübingen graduate students using Tensorflow for p-sets and RL research projects.

### **CompTIA**

New York, NY

**Head Data Science Instructor**

Jan 2022-Present

- Head instructor for an online data science and coding boot-camp for Python and SQL. Assistant teacher for web development with React JS: providing comprehensive grading, coding, and career support to students.
- Design and deliver all written and technical curriculum on computer science, statistics, and data analysis, focused on libraries like Pandas, NumPy and Matplotlib. I hand-write the content for the course in Python/Markdown.

### **Teaching Assistant: Calculus IV**

New York, NY / Remote

**Columbia University**

Jan - May 2021

- Graded assignments and held office hours for ~80 students in Professor Daniela De Silva's class. Coordinated grading across sections. Wrote technical guides and explanations on calculus-related concepts from the course textbooks.

## EXTRACURRICULAR EDUCATION

### **Journal Clubs: Meta-Learning and Mechanistic Interpretability**

Princeton, New Jersey

Organized journal clubs for post-doc and graduate students to come together bi-weekly to discuss topics in meta-learning and mechanistic interpretability (with support of the Natural and Artificial Minds initiative at Princeton).

### **National Deep Inference Fabric (NDIF) Pilot**

Virtual, Feb 2025

Running mechanistic interpretability analyses on Llama 405-B with NN-sight, an NDIF-run library for mech-interp.

### **IICSSS 2023 (Interdisciplinary Computational Cognitive Science Summer School)**

Tübingen, Germany

#### **1<sup>st</sup> Place: Hackathon for Cognitive Modeling**

September 2023

**Coursework:** Comparing language models to humans; Computational modeling for learning; Human language models

### **ESSLI 2023 (European Summer School in Language, Logic & Information)**

Ljubljana, Slovenia

**Coursework:** Probabilistic Language of Thought; Formal Language Theory and Neural Networks;

August 2023

Deep Language Learning from Raw Speech; Logic, Data, Examples, and Learning

### **Center for AI Safety**

Berkeley, CA (Remote)

#### **Intro to Machine Learning Safety Fellow**

June – August 2023

Grant-funded student. Coursework covering mechanistic interpretability, machine ethics, systemic AI safety, adversarial robustness, and preventing existential risk from future AI systems.

## SKILLS, LANGUAGES & INTERESTS

**Programming Languages:** Python, Java, R, SQL, JavaScript, HTML, Bash, MATLAB

**Technical Skills:** Machine learning, data visualization, data analysis and statistical insights, computational modeling, scientific communication, experimental design, web design, teaching and curriculum design

**Spoken Languages:** English (fluent); French (intermediate) **Interests:** Cognitive science, Running, Tennis, Literature