Neha Hulkund

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Education

Massachusetts Institute of Technology *Expected 05/2023*
Masters of Engineering, Electrical Engineering and Computer Science (GPA 5.0/5.0)
Advised by Professor Marzyeh Ghassemi

Massachusetts Institute of Technology *2018-2022*
B.S., Double Major in Computer Science and Mathematics (GPA 4.8/5.0)
Concentration in Ancient and Medieval Studies
SuperUROP Scholar, Kampf Prize Recipient

Research Interests

Aiming to build theoretically-motivated machine learning systems robust to real world distribution shifts. Interested in robustness, interpretability, optimal transport, foundations of ML, and applications in healthcare domains.

Experience

Research Assistant, *MIT CSAIL, Ghassemi Lab,* Cambridge, MA *09/2021-present*
- Led project utilizing **differential privacy** techniques to increase model robustness to distribution shifts, first co-author on resulting paper
- Expanded research into image domain for project exploring manifold smoothness as a measure of **out-of-domain generalization**

Research Intern, *Microsoft Research*, Redmond, WA *06 - 09/2022*
- Developed tools to test robustness of **clinical natural language processing** models to domain-specific adversarial examples as a part of MSR Health Futures team
- *Mentors:* Tristan Naumann, Hoifung Poon

Research Intern, *Microsoft Research*, Cambridge, MA *01 - 02/2022*
- Developed ML methods to identify class-level distribution shifts in datasets using **optimal transport** for increased interpretability
- *Mentors:* David Alvarez-Melis, Jenn Wortman-Vaughan, Nicolo Fusi
- Presented work at *ICML DataPerf Workshop 2022*

Research Intern, *Apple Machine Intelligence Group,* Seattle, WA *06 - 09/2021*
- Built multimodal **visual question-answering** (VQA) system, embedding external knowledge graph for complex encyclopedic questions on OK-VQA dataset
- Conducted baseline experiments with BERT models for comparison

Research Assistant, *MIT CSAIL, Guttag Lab,* Cambridge, MA *09 – 06/202*1
- Explored ML interpretability metric to quantify **out-of-distribution data** using variance of neural network gradients
- Improvements of over 10% over baseline max softmax metric under datasets with natural shifts (such as chest xrays and satellite imaging)

Publications

* = *equal contribution / co-first authorship.*

1. Detecting Out-of-Distribution Examples Using Manifold Smoothness (2022)
   Neha Hulkund*, Nathan Ng*, Marzyeh Ghassemi
   (in submission)
2. Limits of Algorithmic Stability for Distributional Generalization (2022)
   Neha Hulkund*, Vinith Suriyakumar*, Taylor W. Killian, Marzyeh Ghassemi
   (under review at ICLR)
   Will be presented at NeurIPS 2022 Women in Machine Learning Workshop
3. Predicting Out-of-Domain Generalization with Local Manifold Smoothness (2022)
   Nathan Ng, **Neha Hulkund**, Kyunghyun Cho, Marzyeh Ghassemi
   (under review at ICLR)
4. Interpretable Distribution Shift Detection using Optimal Transport (2022)
   Neha Hulkund, Jennifer Wortman Vaughan, Nicolo Fusi, David Alvarez-Melis
   Presented at ICML 2022 DataPerf Workshop
5. GAN-based Data Augmentation for Chest X-ray Classification (2021)
   Shobhita Sundaram*, **Neha Hulkund***
   Spotlight Talk at KDD 2021 DSHealth Workshop

Teaching experience

Teaching assistant: Linear Algebra and Optimization, MIT — *Fall 2022*
Teaching assistant: Linear Algebra and Optimization, MIT — *Fall 2021*
Lab assistant: Machine Learning, MIT — *Spring 2021*

Leadership experience

MITxHarvard Women in AI Executive Member — *2019-2020*

- Helped organize Women in AI Interview Series on YouTube, organizing and hosting interviews for leading female/non-binary scientists in AI

HackMIT Corporate Relations Director — *2019-2021*

- Head of Corporate Relations for HackMIT 2019, 2020, and 2021, MIT's premiere collegiate hackathon with 1000+ participants
- Raised $300k+, partnering with 50+ companies
- Partnered with organizations such as Black Girls Code and Society for Women Engineers, resulting in 50% of participants from an underrepresented minority in CS

Blueprint Outreach Director — *2019-2021*

- Reached out to underrepresented groups in Title III schools to encourage participation in MIT's high school hackathon Blueprint
- Organized and developed mentorship/intro to CS workshops for over 200 students prior to hackathons

Skills

Programming: Python (TensorFlow, PyTorch, Keras, HuggingFace) Java, JavaScript, React
Languages: English, Hindi, Marathi