Kunjal Panchal

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Skills

Programming Python [PyTorch, Tensorflow, Flower (Federated Learning Framework), Hugging Face, scikit-learn, Numpy, Pandas], C/C++.

Machine Learning Federated Learning, Distributed ML, Optimization, Meta Learning, Natural Language Processing, Generative AI, Statistics.

Education

University of Massachusetts Amherst   *Amherst, MA*

Doctor of Philosophy in Computer Science (3.7/4.0 GPA)   *Sep 2021 - Expected May 2026*

- Advisors: Dr. Hui Guan and Dr. Adam O'Neill.
- Research Area: Heterogeneity across data and time & Personalization in Federated Learning, Meta Learning, In-Context Learning in Transformers.
- James Kurose Scholar (scholarship given for systems in machine learning project, Spring 2022).
- Jumpstart Fellow (fellowship given to top 5 research proposals by new PhD students, Fall 2021).

University of Massachusetts Amherst   *Amherst, MA*

Master of Science in Computer Science Research Track (3.6/4.0 GPA)   *Sep 2019 - May 2021*

- Advisor: Dr. Adam O'Neill.
- Research Area: Relaxed Cryptography for Digital Signatures and Message Authentication Codes.
- **Courses:** Machine Learning, Computer Vision, Natural Language Processing, Reinforcement Learning, Robotics, Optimization in Computer Science, Advanced Algorithms, Modern Computer Architecture, Advanced Cryptography.

Work Experience

Adobe Research   *San Jose, CA*

Research Scientist/Engineer Intern   *May 2023 - Aug 2023*

- Achieved an increase of 4.74 units for Rouge score and 3.60% for Accuracy@1 improvements for few-shot learning in Flan-T5 transformer, by expanding their capacity to be able to process more in-context example within the same context window length through sub-batching.
- Inched closer to finetuning-like performance through pure in-context learning (ICL) by 2.16 units of Rouge score and 3% for Accuracy@1 through mesa-optimization where the transformer acts like an optimizer itself during inference.
- Improved the cross-domain transfer capabilities of a transformer (Flan-T5) by 1.68 units for Rouge score and 1.3% for Accuracy@1 through incorporating both cross- and within domain question-answer samples within a limited context window length of 512 tokens.
- Evaluated and verified the effectiveness of both sub-batched ICL and mesa-optimization during inference on both Adobe and public datasets.

Adobe Research   *Bangalore, India*

Research PhD Intern   *May 2022 - Aug 2022*

- Built a federated solution of personalized recommendation systems and classifiers for real-time on-device learning, by using early-stopping for client-side updates and drift adaptation at server-side, to achieve robustness against concept drift (distribution change with respect to time).
- Presented a drift-aware adaptive optimization strategy that can quickly adapt to various concept drift patterns (sudden, incremental, and re-current), by taking into account historical gradient updates and identifying change in gradient magnitude as drifts, to achieve lowest accuracy drop and fastest recovery from the said drifts.
- Evaluated the proposed algorithm on benchmark computer vision and natural language processing tasks, achieving the lowest accuracy dip difference (the lower, the better) of 1.48%-2.99%, while the best performing baselines exhibit 3.15%-9.22%.

Research

Flash: Concept Drift Adaptation in Federated Learning

Kunjal Panchal, Sunav Choudhary, Koyel Mukharjee, Subrata Mitra, Somdeb Sarkhel, Saayan Mitra, and Hui Guan

Published @ ICML, 2023.

Flow: Per-instance Personalized Federated Learning

Kunjal Panchal, Sunav Choudhary, Nisarg Parikh, Lijun Zhang, and Hui Guan

Published @ NeurIPS, 2023; Preliminary Presentation @ CrossFL, MLSys 2022.

CommunityBots: Creating and Evaluating A Multi-Agent Chatbot Platform for Public Input Elicitation

Zhiqiu Jiang, Mashrur Rashik, **Kunjal Panchal**, Mahmood Jasim, Ali Sarvghad, Pari Riahi, Erica DeWitt, Fey Thurber, and Narges Mahyar

Published @ ACM CSCW 2023.

Robust Indistinguishability

Monica Moniot, **Kunjal Panchal**, Amir Houmansadr, and Adam O'Neill *Fall 2022*

Work In Progress.

Leadership/Volunteering

Aug 2023 **Program Committee Member**, AAAI 2024 Conference reviewer for Federated Learning area
Jun 2023 **Research Mentor for Undergraduates**, UMass Amherst CS department program to cultivate interest & understanding in research
Jan 2023 **Applied Deep Learning Head Mentor**, Teaching applied deep learning to undergradutes at SureStart
Dec 2022 **Research Mentor for Undergraduates**, UMass Amherst CS department program to cultivate interest & understanding in research
Jan 2022 **Coding Gym Leader**, SureStart winter bootcamp to teach coding interview strategies
Oct 2021 **PhD Applicant Support Program**, Mentoring prospective PhD applicants
Mar 2021 **Machine Learning Mentor**, Virtual AI Learning Program hosted by SureStart
Aug 2020 **Emotion AI Program Mentor**, EMPath Program hosted by Affectiva
Dec 2019 **Campus Leader**, Google Developer Students Club India

Achievements

2022 **James Kurose Scholarship**, Manning College of Info and Comp Sci, UMass Amherst
2021 **CICS Jumpstart Fellowship**, College of Info and Comp Sci, UMass Amherst
2019 **Gold Medalist**, The Maharaja Sayajirao University of Baroda, B.Engg. in Computer Science
2019 **Student of the Year**, The Maharaja Sayajirao University of Baroda, B.Engg. in Computer Science
National Talent Search Examination, Top 100 in Science and Mathematics in India
All India Essay Writing Event, Honorable Mention in a state-level essay competition
Community Science Center, Winner of Conmat Cosmopolitan Tree Garden Award at state-level

Presentations

Voices of Data Science Poster Presenter *Spring 2023*
- Showcased "Flash: Concept Drift Adaptation in Federated Learning" (ICML '23) in an interdisciplinary poster session hosted across computer science, engineering and social/behavioral science departments. Winner of the poster presentation competition.

Computer Science Department Homecoming Poster Presenter *Fall 2022*
- Presented my research to the department alumni, faculty, dean, and current students, as one of the two presenters.

Computer Science Research Night Poster Presenter *Fall 2022*
- Introduced my lab and research to undergraduate and graduate students looking to understand and participate in the ongoing research works.

Cryptography Honors Seminar Speaker *Fall 2022*
- Discussed federated learning, differential privacy, applications, and why confidentiality of data is important in the world which is shifting towards data-rich artificial intelligence.

AI4ALL Summer Program Speaker *Summer 2021*
- Presented detailed pointers on how to read, understand, write research papers in AI and ML.
- Explained how to figure out unsolved yet solve-able problems, conduct research through creative solutions, evaluate results derived of the proposed approach, and discussed ethics and biases in AI.
- Encouraged 20+ undergraduate students from Boston University, Columbia University, and University of California Berkeley to pursue artificial intelligence research.