Kanad Pardeshi

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Research Interests

Statistics, Online Learning, Game Theory, Machine Learning Theory, Machine Learning Algorithms

Education

Carnegie Mellon University — Pittsburgh, PA
Ph.D. in Machine Learning — *Present (Expected 2029)*
Advisors: Bryan Wilder, Aarti Singh | QPA: 4.04 / 4.00
Selected Coursework: Statistical Optimal Transport, Causal Inference, Advanced Statistical Theory, Convex Optimization

Carnegie Mellon University — Pittsburgh, PA
Master of Science in Machine Learning — *August 2024*
QPA: 4.11 / 4.00

Indian Institute of Technology Bombay — Mumbai, India
Bachelor of Technology (Honors) in Computer Science and Engineering, Minor in Statistics — *July 2023*
CGPA : 9.75/10 | Honors GPA: 10/10 | Minor GPA: 9.75/10

Publications

- Kanad Pardeshi, Bryan Wilder, and Aarti Singh. OEUVRE: Online Unbiased Variance-Reduced loss Estimation
  arXiv preprint, arXiv:2510.22744 (2025)

- Kanad Pardeshi, Itai Shapira, Ariel Procaccia, and Aarti Singh. Learning Social Welfare Functions
  *NeurIPS 2024 **Spotlight***

- Kanad Pardeshi, Shrey Singla, and Sunita Sarawagi. Staged Diffusion Models with Analytically Designed Hyperparameters
  NeurIPS 2023 Workshop on Diffusion Models

Research Experience

OEUVRE: OnlinE Unbiased Variance-Reduced loss Estimation — Pittsburgh, PA
Carnegie Mellon University | Guides: Bryan Wilder, Aarti Singh — *October 2024 - Present*

- Developed a novel online loss estimation technique using **algorithmic stability** to reduce the variance of loss estimates.
- Established first results on L^2 consistency, closed-form convergence rates, asymptotic convergence, and time-uniform bounds for online loss estimation, with rates closely related to stability properties of the underlying algorithm.
- Designed a method for adaptive estimation of constant factors, making the estimator **hyperparameter-free** in practice.
- Tested the estimator's performance against prior methods on diverse learning tasks (linear regression, prediction with expert advice, neural networks), with OEUVRE exhibiting competitive performance in RMSE and MAE w.r.t. **oracle-tuned baselines**.

Learning Social Welfare Functions — Pittsburgh, PA
Carnegie Mellon University | Guides: Aarti Singh, Ariel Procaccia — *September 2023 - Present*

- Demonstrated learnability of decision-making functions given feature vectors for actions and their output decision utilities.
- Established **PAC guarantees** for learning decision-making functions from pairwise action preferences with utility vectors, providing bounds for both equal and different decision weights on different features.
- Proved **convergence bounds** for learning decision-making functions for action preferences given noise from a logistic model.
- Designed a **practical learning algorithm** for the problem and conducted semi-synthetic experiments on food rescue data.

Efficient Hyperparameter Search in Subspace Diffusion Models — *August 2022 - July 2023*

- Investigated subspace diffusion models for unconditional generation with emphasis on improving hyper-parameter search.
- Formulated unified ELBO objective accounting for both within-subspace and across-subspace transitions during generation.
- Designed dynamic programming-based method for computation of ELBO objective, obtaining a hyper-parameter search speedup of up to **60×** over conventional search methods.

Research Internship, Adobe Research — *May 2022 - July 2022*

- Reviewed literature and devised a novel problem statement in image captioning as part of a team of four interns, defending relevance of problem, its proposed solution, and implemented solution in front of other lab members.
- Implemented BERT-based model with user-controllable detail for image captions, with detail as input on a scale of 1 to 5.
- Devised a metric to better capture extent of detail in image expressed by caption by making use of scene graph.
- Collaborated on patent application 'Image Description Generation with Varying Levels of Detail', filed as a US Patent.

Honors and Awards

- All India Rank **36** (of 935,000 candidates) in National JEE Mains, 2019.
- All India Rank **54** (of 161,000 candidates) in National JEE Advanced, 2019.
- Kishore Vaigyanik Protsahan Yojana (KVPY) fellowship, All India Rank **18**, 2017.