Japneet Singh

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Education

Purdue University — **Aug 2022 - May 2026 (Expected)**
Ph.D. in Electrical and Computer Engineering, West Lafayette, IN, USA — *GPA: 4.0 / 4.0*

Indian Institute of Technology Kanpur — **Jul 2017 - May 2022**
B.Tech-M.Tech (Dual Degree) in Electrical Engineering, Kanpur, India — *B.Tech GPA: 9.6/10.0, M.Tech GPA: 10.0/10.0*

Professional Experience

Purdue University | Graduate Research Assistant — **Aug 2022 - present**

- Developed a testing framework to evaluate the goodness of fit of comparison data to a Bradley-Terry-Luce(BTL) model.
- Established the minimax optimality of the test and conducted evaluations on real-world datasets using Python.
- Extended the testing framework to generalized Thurstone models based on maximum likelihood based techniques.
- Evaluated how accurately real-world datasets, such as NFL matches, LMSYS LLM leaderboard, and preference datasets for LLM and RL reward models, etc, conform to an underlying BTL or a Thurstone model based on the hypothesis test.
- Working on extending the framework to contextual BTL models used for modeling preferences in fine-tuning of LLMs.

Indian Institute of Technology Kanpur | Researcher (Master's Thesis) — **Jan 2021 - Apr 2022**

- Researched on weighted matrix completion and analyzed the impact of subspace information on the reconstruction error.
- Designed a weighted nuclear-norm minimization algorithm, provided its convergence analysis and Python simulations.
- Quantified performance gains in multi-user wireless networks, demonstrating a 20% increase in per-user data rate.

University of California Santa Cruz | Research Intern — **May 2021 - Jul 2021**

- Introduced two new architectures that achieve a 1000x reduction in storage costs and a 200x decrease in communication costs associated with blockchain's historical data and simultaneously provide the confidentiality of the stored data.
- Developed a construction of the secret sharing scheme satisfying the requirements of the protocol.

Indian Institute of Technology Kanpur | SURGE Research Fellow — **May 2019 - Jul 2019**

- Trained conditional generative models in *TensorFlow* to combat slowing down of MCMC algorithm near criticality.
- Used trained generative adversarial network models for unsupervised phase transition detection.
- Proposed a hybrid conditional GAN & MCMC algorithm adapting to distribution errors and improving accuracy by 10%.

Projects

Testing for Ranking Models | *Python*

- Developed a test to validate the common contextual BTL model assumptions in preference datasets used for LLM training with RLHF. The test justified using a mixture of reward models for RLHF as it better fits the preference data.

IEEE Signal Processing Cup 2021 | *MATLAB, Python*

- Developed channel estimation techniques for frequency selective channels through Dictionary Learning.
- Optimized IRS configuration for maximizing spectral efficiency using gradient ascent and Newton's Algorithm.

BAJA SAE, IIT-K Motorsports | *MATLAB, Solidworks*

- Designed and implemented a multi-link suspension system for both the front and rear of an All-Terrain vehicle.
- Utilized MATLAB for kinematic analysis, optimization, and graphical insights into dynamic suspension parameters.

Technical Skills

Languages: Python, Java, C, C++, SQL, LaTeX, MATLAB
Software's/Libraries: Git, TensorFlow, PyTorch, DSPy, Solidworks

Selected Publications

- *Hypothesis Testing for the Generalized Thurstone model.* Under review at NeurIPS 2024.
- *On Doeblin Curves and Their Properties.* Proceedings of IEEE ISIT 2024. [Link]
- *Doeblin Coefficients and Related Measures.* IEEE Transactions on Information Theory, Feb 2024. [Link]
- Testing for the Bradley-Terry-Luce model. Proceedings of IEEE ISIT 2023. [Link]
- *Conditional generative models for sampling and phase transition indication in spin systems.* SciPost Phy., 2021. [Link]

Awards

- **2022**: Recipient of the **Dr. Vijay K. Varma Talent Award**, graduation award at IIT-Kanpur.
- **2021**: **Qualcomm Innovation Fellowship 2022**, India.
- **2017-21**: **Academic Excellence Award**, for 4 consecutive years at IIT-Kanpur,
- **2016**: **KVPY scholarship Awardee**, India.