

Kunal Pattanayak

[LinkedIn](#) | [Personal Webpage](#) | [Google Scholar](#) | [GitHub](#)

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EDUCATION

Cornell University

Ph. D., Electrical and Computer Engineering (Research Areas: Machine Learning, Information Economics)

Ithaca, New York, US

August 2018 - present

Indian Institute of Technology, Kharagpur

Bachelors and Masters of Technology, Electronics and Electrical Communication Engineering

Kharagpur, WB, India

July 2013 - May 2018

RESEARCH INTERESTS

Preference Learning | Human-Robot Collaboration | Marketplace Pricing Strategy

RESEARCH CONTRIBUTIONS BY AREA (WITH HYPERLINKS)

A. Information Economics

- Proved the equivalence between probabilistic (attention) and non-probabilistic (action) tests for economic rationality using partial order theory for ranking probability distributions
- Bridged 2 active research areas in microeconomics and information economics and opened the door for designing robustness metrics for measuring human attention irrationality

B. Inverse Reinforcement Learning for Sequential Bayesian Decision Processes

- Devised necessary and sufficient conditions to identify optimal Bayesian sequential decision-making behavior
- Novel IRL approach utilizes problem structure and achieves 2 objectives simultaneously - analytical performance guarantees and no dependence on the decision maker's model dynamics
- Research accepted at *Journal of Machine Learning Research (JMLR)*, 2023 with minor revision

C. User Engagement Prediction for Online Multimedia Platforms

- Identified optimal human decision model parameters that rationalize YouTube commenting behavior and predicted average comment sentiment of YouTube videos in 18 video categories with accuracy exceeding 83%
- Followed a 4-step procedure for comment sentiment prediction: dimension reduction (t-SNE, PCA), data analysis of video metadata (video thumbnail and title), NLP for sentiment analysis (GloVe) and non-convex optimization
- Invited speaker at the 2020 Sloan-NOMIS Conference for published work in *Journal of Machine Learning Research (JMLR)*, 2020

D. Economics-based Interpretable Models for Machine Learning Algorithms

- Constructed a novel economics-based human decision-making model for interpretable deep learning that predicts high-level image classification performance of architectures like ResNet, VGG16 and Network-in-network with accuracy exceeding 90%
- Predictive performance based on Tensorflow-based training and testing of neural networks for 200 epochs and 10 noise variance levels

E. Identification and Mitigation of Adversary Radar Systems (Joint collaboration with Air Force Research Lab)

- Developed a 3-pronged approach for mitigating adversarial radars using inverse Bayesian filtering, testing for fraudulent activity and engineered interference design through chance-constrained programming
- Research paper appeared in *IEEE Transactions in Aerospace and Electronic Systems (TAES)*, 2021 and extended to a [book chapter](#)

F. Privacy Protection against Adversarial Inverse Reinforcement Learning (Joint collaboration with Lockheed Martin)

- Led the collaboration and formulated robust meta-strategies that safeguard decision policies from eavesdroppers by optimally balancing performance degradation and privacy maximization
- Presented 3 research papers at top conferences (ICASSP, FUSION, CDC) and mentored 2 early-stage Ph. D. students for collaborative research
- Ensured seamless collaboration through regular update meetings, timely research moderation and rapid prototyping

GRADUATE COURSEWORK

Bayesian Inference: Bayesian Estimation and Stochastic Optimization | Stochastic Processes

Machine Learning: Advanced Machine Learning | Statistical Learning Theory

Mathematics: Graduate Probability Theory | Financial Engineering with Stochastic Calculus

INDUSTRY INTERNSHIPS

RADAR | Research Intern: RFID-based Store Inventory Tracking | May 2022 - August 2022

New York, USA

- Identified and documented 6 key features for improving RADAR's inventory tracking accuracy and robustness
- Delivered a simulation-based look-up table that aggregates the effects of over 10 ground-level parameters to provide logistic and engineering insights for achieving specific business KPIs
- Prototyped a customer behavior simulator in retail stores (customer movement-in-store, customer trying out apparel and customer check-out) for backtesting inventory algorithm variants before deployment

Qualcomm India | Firmware Intern: Downlink Multi-threading Optimization | May 2017 - July 2017

Hyderabad, India

- Unified 3 downlink signal processing blocks for increased debugging transparency on Qualcomm's QDSP6 processor
- Reduced signal processing latency variance by 20% by developing an adaptive downlink processing schedule

Gunpoint Technologies | Dev. Intern: Wireless communication protocols | March 2015 - April 2016

Kharagpur, India

- Developed a real-time wireless communication network with the capacity to concurrently support 12+ player suits
- Combined team effort resulted in India's first (and world's third) commercial battlefield simulation prototype

SKILLS

Languages: Python | C (MATLAB) | C++ | C# | SQL (Hive) | Latex | R | ARM/AVR coding

Analytical Tools: Machine Learning (PyTorch, Keras, TensorFlow, Pandas, Sklearn) | Bayesian Inference | Deep Learning

Softwares/Platforms: Version control - Git, GitHub | Cloud Computing - AWS EC2, SageMaker | MLOps - Docker, Kubernetes