ROHAN DEB

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Homepage | Google Scholar | Linkedin

Interests: Reinforcement Learning, Bandits, Optimization, Active Learning, Deep Learning

EDUCATION

Doctorate of Philosophy | ***Major: Computer Science*** — Aug 2022 - now
MS in Mathematics (ongoing)
Graduate Minor in Statistics (ongoing)
University of Illinois, Urbana-Champaign — Urbana-Champaign, IL, USA
Advisor: Arindam Banerjee
GPA: 3.97/4

Master of Technology | ***Major: Computer Science*** — Aug. 2019 – May 2021
Indian Institute of Science, Bangalore — Bangalore, KA, India
Advisor: Shalabh Bhatnagar
GPA: 9.5/10

Bachelor of Technology | ***Major: Computer Science*** — Aug. 2015 – May 2019
National Institute of Technology, Silchar — Silchar, India
GPA: 9.38/10

WORK EXPERIENCE

Applied Science Intern — May 2024 – Aug 2024
Amazon, AWS-AI Lab — San Jose, CA,USA
Advisor: Branislav Kveton

Research Assistant — Aug 2022 – July 2023
University of Illinois, Urbana-Champaign — Urbana-Champaign, IL, USA
Advisor: Arindam Banerjee

Project Associate — Aug 2021 – July 2022
Indian Institute of Science, Bangalore — Bangalore, KA, India
Advisor: Gugan Thoppe

Research Intern — May 2017 – July 2017
Indian Institute of Technology, Madras — Chennai,TN, India
Advisor: Kamakoti Veezhinathan

PUBLICATIONS/PRE-PRINTS (*EQUAL CONTRIBUTION)

- **Conservative Contextual Bandits: Beyond Linear Representations.**
  Rohan Deb, Mohammad Ghavamzadeh, Arindam Banerjee
  *Accepted Submission at 13th International Conference on Learning Representations **(ICLR)**, 2025* | openreview

- **Contextual Bandits with Online Neural Regression.**
  Rohan Deb, Yikun Ban, Shiliang Zuo, Jingrui He, Arindam Banerjee
  *Accepted at 12th International Conference on Learning Representations **(ICLR)**, 2024* | arxiv | openreview

- **Think Before You Duel: Understanding Complexities of Preference Learning under Constrained Resources.**
  Rohan Deb, Aadirupa Saha, Arindam Banerjee
  *Accepted at 27th International Conference on Artificial Intelligence and Statistics **(AISTATS)**, 2024* | arxiv

- **Gradient Temporal Difference with Momentum: Stability and Convergence.**
  Rohan Deb, Shalabh Bhatnagar
  *Accepted at 36th **AAAI** Conference on Artificial Intelligence, 2022* | arxiv | AAAI

- **Does Momentum Help in Stochastic Optimization? A sample complexity Analysis.**
  Swetha Ganesh*, Rohan Deb*, Gugan Thoppe, Amarjit Buddhiraja
  *Accepted at 39th Conference on Uncertainty in Artificial Intelligence **(UAI)**, 2023* | UAI | arxiv

- **Schedule Based Temporal Difference Algorithms.**
  Rohan Deb*, Meet Gandhi*, Shalabh Bhatnagar
  Accepted at 58th Annual Allerton Conference on Communication, Control, and Computing, 2022 | IEEE | arxiv

- **N-Timescale Stochastic Approximation: Stability and Convergence.**
  Rohan Deb, Shalabh Bhatnagar
  Under Submission at Stochastic Systems | arxiv

Current Research Projects

Optimal Design for Large Language Models
Collaborators: Branislav Kveton, Kiran Koshy Thekumparampil

- We try to improve the statistical efficiency of fine tuning by selecting an informative subset of training examples. The key idea in our method is to select examples that maximize the Hessian of the log-likelihood of the LLM. We approximate it efficiently based on making a connection to uncertainty modeling in multinomial logistic regression models.
- Our approach is computationally efficient, analyzable, and performs well empirically. We demonstrate this on several problems, and back our claims with both quantitative results and an LLM evaluation.

Black-box Metric Optimization for Pre-trained Models
Collaborators: Gaurush Hiranandani

- Given a pre-trained model and access to a black-box metric, our objective is to post-shift the model to optimize the given metric. Such models find applications in domain adaptation, fairness, distribution shift etc.
- Unlike previous work, we focus on cases where the metric could be an arbitrary function of the entries of the confusion matrix. Further we also plan on extending the setup to auto-regressive tasks with a focus on language models.

Combinatorial Rotting Bandits
Collaborators: Nicolò Cesa-Bianchi, Aadirupa Saha

- We introduce combinatorial rotting bandits, a new extension of combinatorial multi-armed bandits where rewards decay as arms are repeatedly chosen, and we propose an algorithm that combines linear bandit techniques with arm elimination from to tackle this challenge.

Neural Contextual Bandits with Random Sketching
Collaborators: Arindam Banerjee

- Existing bandit algorithms with neural networks are computationally inefficient and incur large regret owing to a huge number of parameters. We are focusing on using random sketching along with properties of hessian of the neural networks to obtain tighter regret guarantees along with faster algorithms.

Safety in Reinforcement Learning and Contextual Bandits
Collaborators: Mohammad Ghavamzadeh, Arindam Banerjee

- We study bandit and reinforcement learning problems under different safety models. For the conservative bandit setup where the agent needs to maintain performance with respect to a baseline we prove sub-linear regret for general reward functions. We also provide first order regret bounds that significantly improve the performance.
- Subsequently we are focusing on other safety setups such as stage-wise constraints and knapsack budgeted constraints for general reinforcement learning problems.

Teaching Experience

Reinforcement Learning, Teaching Assistant — Jan 2024 – May 2024
University of Illinois, Urbana-Champaign — Urbana-Champaign, IL, USA

Introduction to Data Mining, Teaching Assistant — Aug 2023 – Dec 2023
University of Illinois, Urbana-Champaign — Urbana-Champaign, IL, USA

Reinforcement Learning, Teaching Assistant — Jan 2022 – Apr 2022
Indian Institute of Science, Bangalore — Bangalore, KA, India

Measure Theoretic Probability, Teaching Assistant — Jan 2022 – Apr 2022
Indian Institute of Science, Bangalore — Bangalore, KA, India

Topics in Stochastic Approximation Algorithms, Teaching Assistant — Aug 2021 – Dec 2021
Indian Institute of Science, Bangalore — Bangalore, KA, India

Linear Algebra and Probability, Teaching Assistant — Aug 2021 – Dec 2021
Indian Institute of Science, Bangalore — Bangalore, KA, India

Machine Learning, Instructor — Feb 2022 - July 2022
Innomatics Research Labs — Hyderabad, TL, India

Introduction to Data Science, Instructor — May 2021 - Aug2021
Technology for all — Hyderabad, TL, India

Honors and Awards

Computer Society of India Medal for Best Masters Student in Computer Science — 2022
Indian Institute of Science, Bangalore

Undergraduate Medal for highest GPA in Computer Science — 2020
National Institute of Technology, Silchar

All India Computer Science rank 52 — 2019
GATE (Graduate Aptitude Test in Engineering)

Summer Research Fellowship Programme — 2017
Indian Academy of Sciences

Letter of appreciation for outstanding performance in High School exam. — 2015
Ministry of Education

Selected Course Work

Deep Generative and Dynamic models, Statistical Reinforcement Learning, Online Learning and Bandits, Deep Learning Theory, Stochastic Processes, Queuing Theory, Stochastic Approximation Algorithms, Machine Learning, Statistical Learning Theory, Pattern Recognition, Introduction to Robotics, Stochastic Calculus, High Dimensional Probability, Game Theory, Optimal Control

Professional Service

- Co-Organizer, UIUC Machine Learning Seminar (CS 591 MLR)
- Organizer, Reading Group: Optimal Transport, Spring 2024, UIUC (Link)
- Organizer, Reading Group: Reinforcement Learning Theory, Winter 2023, UIUC (Link)
- Organizer, Reading Group: High Dimensional Probability, Fall 2023, UIUC (Link)
- Program Committee Member, 13th International Conference on Learning Representations, 2025
- Reviewer, 27th International Conference on Artificial Intelligence and Statistics (AISTATS), 2024, 2025
- Program Committee Member, 37th AAAI Conference on Artificial Intelligence, 2023, 2024, 2025
- Reviewer, European Control Conference (ECC), 2024
- Reviewer, IEEE Transactions on Automatic Control
- Reviewer, IEEE Control Systems Letters