

AZAL AHMAD KHAN

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Research Interests

Alignment in LLMs, Reasoning Capabilities in LLMs, LLM Inference, Prompting Techniques in LLMs

Education

Indian Institute of Technology Guwahati

11/2020 – 05/2024

Bachelor of Technology in Chemical Science and Technology

Guwahati, Assam

Thesis Advisor: [Dr. Debanga Raj Neog](#), School of Data Science and Artificial Intelligence

Thesis Title: Trustworthy Language Models and Optimized Text-to-Image Synthesis via Direct Preference Optimization [[Thesis](#)] [[Presentation](#)]

Publications & Pre-prints

- [1] **Direct Preference Optimization for Prompt Engineering in Text-to-Image Synthesis**
[Azal Ahmad Khan](#), Xinran Wang, Ahmad Faraz Khan, Ali Anwar, Debanga Raj Neog
Conference on Language Modeling 2024 (under review) [COLM 2024]
- [2] **Mitigating Sycophancy in Large Language Models via Direct Preference Optimization**
[Azal Ahmad Khan](#), Sayan Alam, Xinran Wang, Ahmad Faraz Khan, Ali Anwar, Debanga Raj Neog
Conference on Language Modeling 2024 (under review) [COLM 2024]
- [3] **FLOAT: Federated Learning Optimizations with Automated Tunnings** 📄
Ahmad Faraz Khan, [Azal Ahmad Khan](#), Samuel Fountain, Ahmed M. Abdelmoniem, Ali Butt, Ali Anwar
In Proceedings of The European Conference on Computer Systems (Acceptance Rate: 16%) [EuroSys 2024]
- [4] **PI-FL: Personalized and Incentivized Federated Learning** 📄
Ahmad Faraz Khan, Xinran Wang, Qi Le, [Azal Ahmad Khan](#), Haider Ali, Jie Ding, Ali Anwar, Ali Butt
Advances in Neural Information Processing Systems (under review) [NeurIPS 2024]
- [5] **A quantum-inspired predator-prey algorithm for discrete optimization** 📄
[Azal Ahmad Khan](#), Salman Hussain, Rohitash Chandra
Recent Advances in Algorithms for Swarm Systems 2024 [RAASS 2024]
- [6] **Personalized Federated Learning Techniques: Empirical Analysis**
[Azal Ahmad Khan](#), Ahmad Faraz Khan, Ali Anwar
IEEE Transactions on Parallel and Distributed Systems 2024 (under review) [IEEE TPDS 2024]
- [7] **A review of ensemble learning and data augmentation models for class imbalanced problems: combination, implementation and evaluation.** 📄
[Azal Ahmad Khan](#), Omkar Chaudhari, Rohitash Chandra
Expert Systems With Applications 2024 [Elsevier ESWA 2024]

Experience

Research Intern, University of Minnesota

01/2022 – Present

Advisor: [Dr. Ali Anwar](#), Computer Science and Engineering, University of Minnesota

Remote

- Conducted empirical analysis on 10 personalized PFL across heterogeneous settings, providing valuable insights.
- Developed an incentivization approach in PFL, outperforming other algorithms in performance in non-IID settings.
- Improved federated learning efficiency by employing reinforcement learning to minimize staleness for non-IID clients.
- Leading research project at the intersection of parallelization and LLM to enhance inference speed and scalability.

Research Intern, University of New South Wales

01/2022 – 12/2023

Advisor: [Dr. Rohitash Chandra](#), School of Mathematics and Statistics, University of New South Wales

Remote

- Co-authored 3 research papers and worked on quantum chemistry, computer optimization, and deep learning
- Developed a metaheuristic optimization algorithm that outperformed 8 SOTA methods in best solution and speed.
- Conducted computational analysis of data augmentation and ensemble learning to address class imbalance challenges.

Research Intern, Yale University

06/2022 – 08/2022

Advisor: [Dr. David Van Dijk](#), Computer Science, Yale University

Remote

- Applied Deep Learning to model mesoscopic calcium imaging data, illuminating cognitive processes in brain dynamics.
- Applied Vision Transformers, Neural Ordinary Differential Equations, and Continuous Transformers on mice brain data.

Other Research Projects

QCMBO: Quantum Cat and Mouse Based Optimization Algorithm

08/2022 – 11/2022

Instructor: [Dr. Prakash Kotecha](#), Department of Chemical Engineering



- Developed a novel optimization algorithm inspired by quantum chemistry and natural laws.
- Evaluated the algorithm on 14 objective functions and applied it to production planning problems.
- QCMBO outperformed famous pre-developed algorithms like PSO, s-TLBO, and real-coded GA.
- Performed statistical analysis(t-test) and sensitivity analysis to show algorithms performance.

DynamicNet: LC Detection with BiLSTM for Dynamic Environments in VSLAM

08/2023 – 11/2023

Instructor: [Dr. Arijit Sur](#), Department of Computer Science and Engineering



- Developed DL model using CNN and BiLSTM methods for Visual SLAM to improve accuracy in loop closure detection.
- Employed novel framework with ResNet-50 and Cosine Similarity Metric on New College and City Center Dataset.
- Outperformed SOTA methods by incorporating Dynamic Object Handling and Adaptive Thresholding Strategies.

Grants

Research Week with Google 2024 Received a travel grant to attend Research Week 2024 at Google Research, India.

Services

2024: Reviewer COLM 2024, SetLLM-ICLR 2024, Tiny Papers-ICLR 2024

2023: Reviewer GenBio-NeurIPS 2023

Positions and Volunteer Works

Coordinator, Coding Club IITG: Participated in conducting various events, courses, and projects. 06/2021-04/2022

Associate, Consulting and Analytics Club: Contributed to organizing various club events. 06/2021-04/2022

Volunteer, NSS(National Service Scheme): Participated in campaigns for student awareness. 08/2022-11/2022

City Representative, Technothon: Represented Technothon IIT G in multiple schools in the city. 06/2021-08/2021

Technical Skills

Programming: Python, C/C++

ML Tools: Pandas, Numpy, Scipy, Matplotlib, Seaborn, Scikit-learn, Keras, Tensorflow, Pytorch, OpenCV, Hugging Face

Miscellaneous: Jupyter Notebook, Google Colab, Git, GitHub, SQL, L^AT_EX

Web Technologies: HTML, CSS, Bootstrap, Django

Operating Systems: MacOS, Windows

References

[Dr. Ali Anwar](#)

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University of Minnesota
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[Dr. Debanga Raj Neog](#)

Assistant Professor
IIT Guwahati
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[Dr. Rohitash Chandra](#)

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University of New South Wales
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