

JASRAJ SINGH

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RESEARCH STATEMENT

My objective is to advance our understanding of under investigated techniques and phenomena in deep learning using dynamical systems theory, probabilistic modeling and approximate methods.

Keywords – Learning dynamics of neural nets, probabilistic ML, approximate inference for deep learning

EDUCATION

University College London, England Sep 2023 – Dec 2024

M.Sc. in Machine Learning

- **Grade** – 84.59% (Highest Distinction, Dean's List Award)
- **Thesis Title** – On the Effects of DropEdge on Over-squashing in Deep GNNs
- **Supervisors** – Prof. Laura Toni and Prof. Brooks Paige

Nanyang Technological University, Singapore Aug 2019 – May 2023

B.Sc. in Mathematical and Computer Sciences

- **Grade** – 4.58/5.00 (Highest Distinction)
- **Thesis Title** – Training-Free Neural Active Learning with Initialization-Robustness Guarantees
- **Supervisors** – Prof. Bryan Kian Hsiang Low and Prof. Ping Tong

Venkateshwar International School, India Mar 2015 – May 2019

All India Senior School Certificate

- **Grade** – 96.4%

MANUSCRIPTS

Effects of Random Edge-Dropping on Over-Squashing in Graph Neural Networks. *J. Singh, K. Jiang, B. Paige, L. Toni.* In preparation for *NeurIPS*, 2025. URL.

- Theoretically characterized the detrimental effects of 6 dropout-like algorithms for graph neural networks
- Empirically showed their limitations in modeling long-range dependencies, challenging conventional wisdom

LingML: Linguistic-Informed Machine Learning for Enhanced Fake News Detection. *J. Singh, L. Fang, X. Hong, B.C. Ng, W. Zhang.* URL.

- Developed LingML, a novel linguistics-informed ML approach for enhanced fake news detection
- Achieved an 18% average improvement in COVID-19 fake news detection across 11 large language models

Training-Free Neural Active Learning with Initialization-Robustness Guarantees. A. Hemachandra, Z. Dai, *J. Singh*, S.K. Ng, B.K.H. Low. In *ICML*, 2023. PMLR 202:12931-12971. URL.

- Developed EV-GP, a data-efficient algorithm for training neural networks in low-data settings like healthcare
- Outperformed competing approaches across UCI ML datasets while eliminating surplus model training needs

EMPLOYMENT EXPERIENCE

Indeed Inc., Singapore May 2022 – Aug 2022

Product Science Intern

- Analyzed ~5M job applications in large-scale A/B tests using Python and SQL with PySpark and the Imhotep analytics platform, driving strategic model deployment across APAC
- Developed interpretable minimum viable criteria for resumes using Decision Trees, XGBoost and SHAP, enabling job seekers optimize applications across industries and markets, boosting callback rates by 10%
- Spearheaded refinement of SQL-based data pipelines, improving resume processing efficiency by 15% and ensuring reliable end-to-end data flow for advanced analytics

Shopee Pte. Ltd., Singapore Jan 2022 – May 2022

Machine Learning Engineering (Recommendation) Intern

- Optimized the AI-driven product recommendation model using Tensorflow in C++ and Python
- Engineered ML features for recommendation model using MapReduce with Apache Hadoop and PySpark for ETL processes, increasing total orders by 11.79% and orders-per-user by 12.48% in Brazil
- Designed a multi-task learning approach to address data imbalance, boosting click-rate in Malaysia by 2%

Navtech Pte. Ltd., Singapore	Jul 2020 – Aug 2020
Full Stack Data Science Intern	
<ul style="list-style-type: none"> Designed and built a B2B product recommendation service for jewelry retailers, using Keras in Python Led the model deployment on AWS SageMaker, using Docker and Dask for scalable real-time inference 	

TEACHING EXPERIENCE

Division of Mathematics, NTU, Singapore	Jan 2023 – Apr 2023
Teaching Assistant – MH3500, Statistics	
Division of Mathematics, NTU, Singapore	Aug 2022 – Nov 2022
Teaching Assistant – MH2500, Probability and Introduction to Statistics	
Center for Computational Brain Research, IIT Madras, India	Sep 2021 – Dec 2021
Head Tutor – Machine Intelligence and Brain Research Winter School	

VOLUNTEERING EXPERIENCE

• Reviewer – International Conference on Learning Representations (ICLR)	2024
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HONORS & AWARDS

• Dean's List Award – UCL, England	2024
• 1st Prize in Integration Bee – NTU, Singapore	2023
• 3rd Prize in IET-Cup Hackathon – NTU, Singapore	2022
• 1st Prize in Integration Bee – NTU, Singapore	2022
• 1st Prize in Electronic Trading Challenge – Jane Street Capital	2021
• 3rd Prize in International Mathematics Competition – UCL, England	2021
• President Research Scholar – NTU, Singapore	2021
• JEE Advance Scholarship (National Rank 200, 99.98 percentile) – FIITJEE, India	2019-23
• KVPY Scholarship (National Rank 868) – DST, Government of India	2019
• KVPY Scholarship (National Rank 126) – DST, Government of India	2018
• NTS Scholarship (State Rank 28) – NCERT, Government of India	2017

EXTRA CURRICULAR

• Education Officer of the Sikh Society at NTU – Led Sikh cultural awareness initiatives	2021-22
• Machine Learning and Data Analysis Club at NTU – Led 3 week-long crash-courses	2020-21
• Inter-Hall Games at NTU – Represented Hall of Residence 13	2020
• Inter-School Games at NTU – 3 rd Prize representing School of Mathematical Sciences	2019
• Youth National Basketball Championship in India – Represented NCT of Delhi	2017
• Youth National Basketball Championship in India – Represented NCT of Delhi	2016
• Sub-Junior National Basketball Championship in India – Represented NCT of Delhi	2014

CERTIFICATIONS

• Applied Social Network Analysis in Python – University of Michigan	2021
• Deep Learning Specialization – DeepLearning.AI	2021
• AI Engineering Specialization – IBM	2020
• Algorithms: Design and Analysis – Stanford University	2020

TECHNICAL SKILLS

• Programming Languages – Python, C++, SQL, R, MATLAB
• DevOps and Cloud – CI/CD, Agile, Git, Docker, Kubernetes, AWS (SageMaker, Lambda, EC2, S3)
• ETL Tools for Big Data – Hadoop (HDFS, YARN), Hive, Spark, Airflow
• ML Engineering – PyTorch, Tensorflow, JAX, Scikit-learn, NLTK, OpenCV, Kaldi, Dask,, Numpy, Pandas
• ML Theory – Non-convex, Numerical and Bayesian Optimization, Probabilistic Modeling, Kernel Methods
• Data Science – Simulation, A/B Testing, Causal Inference, Predictive Modeling, Optimization