# Prakhar Ganesh

<u>Research Interests and Career Goals</u> : I am primarily interested in studying the challenges that arise in machine learning when moving from the sandbox to the real world, including fairness, privacy, adversarial robustness, compression, etc., by uncovering the learning dynamics of neural models. My long term goal is a career in research in the field of AI.

## CONTACT

Mail:// pganesh@comp.nus.edu.sg
Homepage:// prakharg24.github.io
Scholar:// **Prakhar Ganesh**
Github:// **prakharg24**
LinkedIn:// **prakharg24**
Medium:// **prakhargannu**
Phone:// **(+65)-98131519**

## EDUCATION

**National University of Singapore (NUS)**
**Master of Computing (AI specialisation)**
Aug 2021 - Dec 2022 (Expected)

**Indian Institute of Technology Delhi (IITD)**
**BTech in Computer Science and Engr.**
Aug 2015 - May 2019

## WORK EXPERIENCE

**Advanced Digital Sciences Center**
**Illinois at Singapore (UIUC)**
Research Engineer | June '19 - July '21

**Krida.AI**
**New Delhi, India**
Engineer (Intern) | Jan '19 - May '19

**WealthNet Advisors**
**New Delhi, India**
Analyst (Intern) | May '18 - July '18

## PEER REVIEWING

- Winter Conference on Application of Computer Vision (WACV 2021, 2022)
- AAAI Conference on Artificial Intelligence (AAAI 2021)
- Computer Speech and Language
- Signal, Image and Video Processing

## OTHER MINOR PROJECTS

- Restructuring Conversations for Abstractive Dialogue Summarization
- Automated Bio-Mechanical Analysis in Sports | Intern at Krida.ai
- Finding Influential Communities in Large Scale Networks : A Survey
- Audio Tactile Reader for the Visually Challenged
- Nucl2Vec : Local alignment of DNA sequences using Distributed Vector Representation

## PROJECTS

### A Loss Landscape Perspective of the Fairness-Privacy Trade-off
Nov'22-Present | National University of Singapore
- Investigating the evolution of loss landscape under privacy noise and fairness constraints.
- Searching for better trade-offs and the relationship between fairness and memorization.

### Training Non-Determinism and Group Fairness
Oct'21-Nov'22 | National University of Singapore

*P Ganesh, H Chang, M Strobel, R Shokri*, "**On The Impact of Machine Learning Randomness on Group Fairness**", Under Review

- Established high instability in minority predictions even across identical training runs.
- Uncovered an immediate and dominant impact of training data order on group fairness.
- Manipulated group accuracy and fairness scores by fine-tuning on custom data order.

### Compressing Large-Scale Transformer-Based Models
Jan'20-Jun'20 | Advanced Digital Sciences Center

*P Ganesh, Y Chen, X Lou, M Khan, Y Yang, H Sajjad, P Nakov, D Chen, M Winslett*, "**Compressing Large-Scale Transformer-Based Models: A Case Study on BERT**", Transactions of the Association for Computational Linguistics, 2021 [paper] [slides] [poster] [video]

- Performed an in-depth analysis of transformer models to uncover possible redundancies.
- Wrote a systematic experimental survey comparing the effectiveness of various BERT compression methods and their pros and cons, providing effective practical recommendations.

### Lightweight Object Detection on Edge Devices
Aug'20-May'21 | Advanced Digital Sciences Center

*P Ganesh, Y Chen, Y Yang, D Chen, M Winslett*, "**YOLO-ReT: Towards High Accuracy Real-time Object Detection on Edge GPUs**", WACV 2022 [paper] [code] [slides] [poster] [video]
*X Liu, Y Chen, P Ganesh, J Pan, J Xiong, D Chen*, "**HiKonv: High Throughput Quantized Convolution With Novel Bit-wise Management and Computation**", ASP-DAC 2022 [paper]

- Designed a lightweight detection model that runs real-time (>30 FPS) on Jetson Nano.
- Scrutinized the practise of complete backbone transfer learning with empirical results.
- Exploited multi-scale feature interaction to improve accuracy and execution speed.
- Assisted with the design of a generalized novel algorithm capable of executing highly parallelized low-bitwidth convolution in full-bitwidth multipliers.

### Protection against Time Delay Attacks
Jun'19-Jan'20 | Advanced Digital Sciences Center

*P Ganesh, X Lou, Y Chen, R Tan, D Yau, D Chen, M Winslett*, "**Learning-based Simultaneous Detection and Characterization of Time Delay Attack in Cyber-Physical Systems**", IEEE Transactions on Smart Grid, 2020 [paper] [code] [slides]
*X Lou, C Tran, R Tan, D Yau, Z Kalbarczyk, A Banerjee, P Ganesh*, "**Assessing and Mitigating Impact of Time Delay Attack: Case Studies for Power Grid Controls**", IEEE JSAC, 2019 [paper]

- Proposed a hierarchical LSTM capable of online processing to provide timely warnings.
- Improved upon existing postmortem data-driven approaches by providing quicker predictions and then gradually improve them with more data for accurate characterization.
- Achieved ∼68% decrease in error against the baselines with 1/3rd reaction latency.

### Deep Learning in High Frequency Trading
May'18-July'18 | WealthNet Advisors

*P Ganesh, P Rakheja*, "**VLSTM: Very Long Short-Term Memory Networks for High-Frequency Trading**", Preprint [arxiv]

- Proposed a hybrid LSTM to extract multi-context features from long sequences in HFTs.
- Achieved a ∼4% boost in F-score against existing SOTA sequence processing techniques.