Pratik Ramesh

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RESEARCH INTERESTS: Computer-Vision, Representation Learning, Model Merging, Multimodality, LLMs

My research focuses on understanding and editing the behaviour of deep neural networks, with a recent emphasis on fusing, aligning, and modifying fine-tuned models to enable multi-task capabilities and enhance generalization.

EDUCATION

Georgia Institute of Technology, Atlanta, GA — Jan 2023 – Dec 2027 (expected)
Ph.D. in Machine Learning — CGPA 3.9/4.0
Advisor: Prof. Judy Hoffman

Georgia Institute of Technology, Atlanta, GA — Aug 2020 – May 2022
M.Sc. in Electrical and Computer Engineering — CGPA 3.9/4.0
Advisor: Prof. Rishikesan Kamaleswaran

PES University, Bangalore, India — Aug 2015 - May 2019
Bachelor of Technology in Electronics and Communication Engineering| Minor in Computer Science — CGPA 8.2/10.0

PUBLICATIONS

[5] **Model Merging with SVD to tie the KnOTS** [Pre-Print]
G. Stoica*, **P. Ramesh***, B. Ecsedi, L. Choshen, J. Hoffman
International Conference on Learning Representation (ICLR) 2025
*** Equal contribution**

[4] **ZipIt! Merging Models From Different Tasks without Training** [ICLR'24]
G. Stoica, D. Bolya, J. Bjorner, **P. Ramesh**, T. Hearn, J. Hoffman
International Conference on Learning Representation (ICLR) 2024
(Also presented as an Oral at Workshop on Unifying Representations in Neural Models, NeurIPS 2023)

[3] **FACTS: First Amplify Correlations and Then Slice to Discover Bias** [ICCV'23]
S. Yenamandra, **P. Ramesh**, V. Prabhu, J. Hoffman
International Conference on Computer Vision (ICCV) 2023

[2] **Locally Aggregated Hierarchical Decomposition based Ensemble Learning for Robust Face Recognition** [SUSCOM' 19]
A Vinay, R. Ragesh, N. Rao, **Pratik R**, Natarajan S et al.
International Conference on Sustainable Computing in Science, Technology and Management, 2019

[1] **Face Recognition using Interest Points and Ensemble of Classifiers** [RAIT '18]
A Vinay, P. Sampat, S. Balavadi, **R Pratik**, B S Nikitha et al.
4th IEEE International Conference on Recent Advances in Information Technology, 2018

PATENTS

[P2] "Reliable wireless DALI controller with extended addressing"
Pratik Ramesh, Sreeharsha Srinivas
US Patent, *(APD7142US02 / SLW Ref: 3867.781US1)*

[P1] "Haptic Glove – Sense of touch and feel in Virtual Reality"
Pratik Ramesh, Rahul Ragesh, Pratik Rajesh Sampat
Indian Patent, *(Application Num: IN 201841036867)*

AWARDS

- *Herbert P. Haley Fellowship* by **Georgia Tech** — 2023 - 2024
- *Merit-Based Scholarship* by **Georgia Tech** (2-semesters) — Aug 2020- May 2021
- 1st Place in Endeavour'18 by Entrepreneurship Cell, **PES University** (40+ team) — 2018
- 2nd Place in Power of Connected Hackathon by **Honeywell** (590 teams) — 2017
- 3rd Place in Re-Imagine Waste Hackathon at **Indian Institute of Science** (50+ teams) — 2017
- 1st Place in National level Digital India Hackathon by **ACM** (7000+ participants) — 2016

EXPERIENCE

Microsoft Research, Bangalore — June 2024 – Aug 2024
Ph.D. Research Intern
Worked with Arun Iyer on developing training strategies to improve model alignment and merging.

Georgia Institute of Technology, Atlanta
Graduate Research Assistant with Judy Hoffman — Jan 2023 - Present
Worked on fusing and editing fine-tuned models within multi-task learning, federated learning, and continual learning contexts.

Graduate Research Assistant with Prof. Rishikesan Kamaleswaran Aug 2021–Dec 2021
Temporal modelling of PPG signals for Arterial Blood Pressure estimation (in collaboration with Medtronics).

Analog Devices Inc., Bangalore
Applications Engineer Jul 2019 - April 2020
Developed embedded firmware for 6TiSCH based wireless battery management system.

Intern Jan 2019 – June 2019
Developed wireless lighting control systems.
Filed for a US patent on the design of an extended wireless addressing using DALI protocol.

Microsoft Mobile Innovation Lab, PES University, Bangalore May 2016 – Jul 2016
Research Intern
Designed firmware of a Haptic Feedback Glove.

SKILLS

Languages: Python, C, MATLAB
Frameworks: PyTorch, TensorFlow, Numpy
Tools: Visual Studio, Git, Github, JIRA
Libraries: OpenCV2, Open AI GYM, Stable-Baseline3, NumPy, Pandas, Matplotlib
Relevant Courses: Efficient Machine Learning, Deep Learning, Computer Vision, Statistical Machine Learning, Speech Processing, Convex Optimization, Data Structures and Algorithms, Design and Analysis of Algorithms, Operating Systems

NEWS COVERAGE

- "How can young entrepreneurs make a difference", interviewed Evan Carmichael [3.2 Million subs on YT], 23rd Feb 2017 [link].
- "Ideas to better waste pickers' lives", by Rasheed Kappan, *Deccan Herald*, 4th April 2016 [link]

PROJECTS

Machine Unlearning
- Implemented a LoRA based forgetting algorithm using fisher importance reweighting of task vectors.
- Implemented unstructured pruning to in order to perform task-arithmetic on sparse task-vector.

Loss function search
- Implemented an RL environment for an objective way to search for an optimal loss function for vision-based tasks.
- Used Twin Delayed DDPG and Soft Actor-Critic algorithm for the loss function search.

Denoising traffic signs under adversarial conditions using the CURE-TSR dataset
- Designed a CNN-based gating network, to identify the type of noise infecting an image.
- Designed noise-specific autoencoders for denoising.

Image segmentation for autonomous vehicles
- Implemented camera calibration and fundamental matrix estimation using RANSAC.
- Implemented PSPNet and VGG-19 for Image segmentation using egocentric vision.

Reproducibility Challenge: "Not All Labels Are Equal: Rationalizing Labelling Costs for Training Object Detection"
- Implemented a lighter SGD300 object detector model with 500x reduced computation time.
- Implemented an active learning strategy using consistency and multi-box loss aided by a pseudo-labeling module.

OpenMP based library to emulate PyTorch layers like package with C++
- Implemented backpropagation for dense layer in C++ using a basic matrix library.

Used OpenMP library to multithread batch-wise training using SGD optimization.