Rahul Vigneswaran

Masters in Computer Science & Engineerning (By Research)
Indian Institute of Technology Hyderabad
Advisor : Dr Vineeth N Balasubramanian

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Education

Indian Institute of Technology, Hyderabad — India
Master of Technology in Computer Science & Engineering (By Research) - CGPA: (9.0/10) — *Jan'23 - Dec'25*

Amrita University — India
Bachelor of Technology in Mechanical Engineering - CGPA: (8.32/10) — *July'15 - July'19*

Publications

- **ICVGIP 2021: Rahul Vigneswaran**, Marc T Law, Vineeth N Balasubramanian, Makarand Tapaswi. **Feature generation for Long-tailed Classification**. [Paper] [Code] [Video]
- **AAAI 2021:** Adepu Ravi Shankar, Yash Khasbage, **Rahul Vigneswaran**, Vineeth N Balasubramanian. **A Deeper Look at the Hessian Eigen spectrum of Deep Neural Networks and its Applications to Regularization**. [Paper]

Research Experience

Indian Institute of Technology Hyderabad - Research Intern — India
Advisors : Dr Makarand Tapaswi & Dr Vineeth N Balasubramanian — *July'19 - now*

- Explored ways to generate meaningful features for categories that have limited labelled data in a Long-tailed image classification setting while simultaneously preventing degradation in performance for the categories with higher sample count.
- Worked on understanding the various properties of loss landscapes of Deep Neural Networks through the lens of Hessian's Eigen Spectrum (Hessian Decomposition). Along the way, explored its unique inherent properties like mode connectivity, flatness, and how they affect the generalization properties for image classification tasks.
- Explored ways to exploit the properties of loss landscapes to minimize catastrophic forgetting in continual learning.

★ Published 1 work at **AAAI** and 1 work at **ICVGIP**.

Research Projects

Useful Feature Generation for Long-tailed Visual Recognition — *Oct'20 - Sept'21*
Advisors : Dr Makarand Tapaswi (IIIT), Dr Marc T Law (NVIDIA) & Dr Vineeth NB (IIT)

- In this work, instead of re-sampling the same features repeatedly, we explore a direction that attempts to generate meaningful features by estimating the tail category's distribution. Inspired by ideas from a recent work[2] on few-shot learning, we are able to create calibrated distributions to sample additional features that are subsequently used to train the classifier.
- Through several experiments on the CIFAR-100-LT (long-tail) dataset with varying imbalance factors, we show the efficacy of our approach, and establish a new state-of-the-art on this dataset.

★ Work accepted at **ICVGIP** 2021.

Layer-wise Hessian Analysis — *July'19 - Oct'20*
Advisor : Dr Vineeth N Balasubramanian, IIT Hyderabad

- Recent works[3,4] have demonstrated a bulk and outlier trend in their Hessian's Eigen Spectrum. In this work, we have discovered a similar trend in the layer-wise spectrum, too, which indicates an implicit similarity between the overall loss landscape and layer-wise loss landscape, which is a community first.

- We leverage this observation and formulate a regularizer that forces the optimizer to converge to a minima of better generalization properties. Further, through this analysis, we have substantiated that studying the layer-wise loss landscape is worth the community's efforts.

★ Work accepted at **AAAI** 2021.

Extras

- *Scholarships:*
  - Reliance Foundation Postgraduate Scholarship (2023 - 2025)
- *Reviewerships:*
  - *Reviewer:* ECCV'22.
  - *Sub-reviewer:* CVPR'23, ICLR'21, IJCAI'20, WACV'23, SDM'21.
- *Student volunteer*: ICML'20.
- *TA-ships:*
  - Effective Teaching of "Machine Learning" (CSEDU IIIT Delhi) ('22, '21)
  - AI and Emerging Technologies (TalentSprint + IIT Hyderabad) ('23, '22)
  - Reinforcement Learning (AI 3000 / CS 5500) (IIT Hyderabad) ('22)
  - Advanced Topics in Machine Learning (AI 2100 / CS 6360) (IIT Hyderabad) ('21)
  - Deep Learning for Computer Vision (NPTEL) ('20)

References

- *Dr Vineeth N Balasubramanian*, Associate Professor in CSE, IIT Hyderabad, India.
- *Dr Makarand Tapaswi*, Senior ML scientist, Wadhwani AI / Assistant Professor in Computer Vision group, IIIT Hyderabad, India.
- *Dr Marc T Law*, Senior research scientist - NVIDIA, Canada.