Rahul Vigneswaran

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Research Intern
Indian Institute of Technology Hyderabad
Advisors : Dr Makarand Tapaswi & Dr Vineeth N Balasubramanian

rahulvigneswaran@gmail.com
rahulvigneswaran.github.io
rahulvigneswaran

Selected Publications[†]

- **Rahul Vigneswaran**, Marc T Law, Vineeth N Balasubramanian, Makarand Tapaswi. **Feature generation for Long-tailed Classification**. **(ICVGIP 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**. **(AAAI 2021)** [arXiv]

Research Experience

Indian Institute of Technology Hyderabad - Research Intern India
Advisors : Dr Makarand Tapaswi & Dr Vineeth N Balasubramanian *July'19 - August'21*

- 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**.

Research Projects

Useful Feature Generation for Long-tailed Visual Recognition *Oct'20 - August'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 under review.

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.

[†]For full list of publications, kindly check the website.

Research Interests

Major Interests[‡]	Deep learning, Computer Vision
Others	Natural Language Processing

Education

Amrita University India

Bachelor of Technology in Mechanical Engineering - CGPA: (8.34/10) - Graduated with Distinction (Top 5%)

Relevant skills

Languages	Python, C, C++
Frameworks	PyTorch, Keras, Scikit-learn, MATLAB

Extras

- *Teaching Assistant* to Dr Vineeth N Balasubramanian for the course : Advanced Topics in Machine Learning (CS6360) at Indian Institute of Technology, Hyderabad.
- *Teaching Assistant* to Dr Vineeth N Balasubramanian for the course : Deep Learning for Computer Vision at NPTEL.
- *Sub-reviewer:* IJCAI'20, ICLR'21, SDM'21.
- *Student volunteer*: ICML'20.

References

- *Dr Makarand Tapaswi*, ML scientist - Wadhwani AI / Assistant Professor - Computer Vision group at IIIT Hyderabad, India.
- *Dr Marc T Law*, Senior research scientist - NVIDIA, Canada.
- *Dr Vineeth N Balasubramanian*, Head of Department - Department of Artificial Intelligence / Associate Professor - Department of Computer Science and Engineering, IIT Hyderabad, India.

[‡]In no particular order.