# Mukund Varma T

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## Education

**Indian Institute of Technology Madras** 2018 - 2023*
Bachelors (B.Tech) in Mechanical Engineering, Masters (M.Tech) in Robotics
Minors in Artificial Intelligence, Computer Science

## Publications

[11] **U2NeRF: Unifying Unsupervised Underwater Image Restoration and Neural Radiance Fields**
*Mukund Varma T†, Vinayak Gupta†, Manoj S†, Kaushik Mitra*
Under Review at CVPR '23 (PDF)

[10] **GNT-MOVE: Generalizable NeRF Transformer with Mixture-of-View-Experts**
*Wenyan Cong, Hanxue Liang, Peihao Wang, Zhiwen Fan, Tianlong Chen, Mukund Varma T, S P Sharan, Yi Wang, Xuxi Chen, Zhangyang Wang*
Under Review at CVPR '23 (PDF)

[9] **Rethinking Domain Generalization using Invariant Representations**
*Amil V Dravid, K Vikas Mahendar, Yunhao Ge, Harkirat Behl, Mukund Varma T, Yogesh S Rawat, Aggelos Katsaggelos, Neel Joshi, Vibhav Vineet*
Under Review at CVPR '23 (PDF)

[8] **Is Attention All That NeRF Needs?**
*Mukund Varma T†, Peihao Wang†, Xuxi Chen, Tianlong Chen, Subhashini Venugopalan, Zhanyang Wang*
Under Review at ICLR '23 (Rated 8, 8, 6, 6) (PDF)

[7] **Sparse Winning Tickets are Data-Efficient Image Recognizers**
*Mukund Varma T, Xuxi Chen, Zhenyu Zhang, Tianlong Chen, Subhashini Venugopalan, Zhanyang Wang*
NeurIPS '22 (Spotlight) (PDF)

[6] **NL Augmenter: A Collaborative Effort to Transform and Filter Text Datasets**
*Kaustubh Dhole, Sebastian Gehrmann, Jascha Sohl-Dickstein, Varun Prashant Gangal, Tongshuang Wu, Simon Mille, Zhenhao Li, Aadesh Gupta, Samson Tan, Saad Mahmood, Ashish Shrivastav, Ondrej Dusek, Jinho D. Choi, Mukund Varma T, Tanay Dixit, .... (other authors)*
Under Review, also presented at GEM Workshop, ACL IJCNLP '21 (PDF)

[5] **Beyond the Imitation Game: Quantifying and extrapolating the capabilities of language models**
*Kristen Chiafullo, Ethan Dyer, Liam Fedus, Noah Fiedel, Daniel Freeman, Guy Gur-Ari, Jaehoon Lee, Aitor Lewkowycz, Rosanne Liu, Gaurav Mishra, Vedant Misra, Timothy Nyugen, Danielle Perszyk, Athelea Power, Ambrose Slone, Jascha Sohl-Dickstein, Mukund Varma T, Diganta Misra, ... (other authors)*
Under Review, also presented at Workshop on Enormous Language Models, ICLR '21 (PDF)

[4] **Exploring Attention-based Deep Learning methods for Classification, Retrieval and Shape Completion of ALS Roof Point Clouds**
*Dimple A Shajahan†, Mukund Varma T†, Ramanathan Muthuganapathy*
Doctoral Symposium, AI ML Systems '21 (PDF)

[3] **ShapeFormer: A Transformer for Point Cloud Completion**
*Mukund Varma T†, Kushan Raj†, Dimple A Shajahan, Ramanathan Muthuganapathy*
Under Review (PDF)

[2] **[Re]: On the Relationship between Self-Attention and Convolutional Layers**
*Mukund Varma T†, Nishanth Prabhu†*
Rescience-C Journal, also presented at NeurIPS Reproducibility Challenge, '20 (PDF)

[1] **Point Transformer for Shape Classification and Retrieval of Urban Roof Point Clouds**
*Dimple A Shajahan†, Mukund Varma T†, Ramanathan Muthuganapathy*
IEEE Geoscience and Remote Sensing Letters, '21 (PDF)

## Selected Experience

**Intern, Computational Imaging Lab @ IIT M** Nov 2022 - Present
(host: Prof. Kaushik Mitra)

- Developed methods to simultaneously render and restore novel views, in the context of underwater scenes (submitted to CVPR '23).

* expected to complete
† indicates equal contribution
representative papers are highlighted

**Student Researcher, Google Research** Jun 2022 - Oct 2022
(hosts: Subhashini Venugopalan, Shanqing Cai, Varun Gulshan)
- Developed methods to accelerate eye-gaze text entry using context-aware large language models (LAMDA). Improved performance on longer conversations, spanning multiple sentences.

**Research Intern, Adobe Research** Mar 2022 - May 2022
(hosts: Mayur K Hemani, Mausoom Sarkar, Balaji K)
- Developed methods to generate full-body person images conditioned on clothing garments, text prompt defining human pose and body attributes.

**Remote Intern, Visual Informatics Group (VITA) @ University of Texas at Austin** Nov 2021 - Present
(hosts: Prof. Zhangyang (Atlas) Wang, Tianlong Chen)
- Worked on ① lottery ticket hypothesis for data-efficient learning (accepted at NeurIPS '22) ② pure, unified transformer-based architecture that efficiently reconstructs Neural Radiance Fields (scored 8,6,6,8 at ICLR '23).

**Research Intern, Nvidia** Jan 2021 - Sep 2021
(host: Pallab Maji)
- Developed methods for an end-to-end trainable detection-tracking pipeline, by incorporating long and short-term context. Participated in the AOT Challenge, ICCV '21.

**Intern, Advanced Geometric Computing Lab @ IIT M** Jan 2020 - Jan 2021
(hosts: Prof. M. Ramanathan, Dimple A Shajahan)
- Developed fully attention-based methods for 3D point cloud ① classification and shape retrieval (accepted at IEEE GRSL '21), ② shape completion (to be submitted). Work done as a part of Dimple's doctoral thesis.

## Other Experience

- Working with **Prof. Balaraman Ravindran (IIT M)** on ① leveraging language cues to instruct reinforcement learning agents, ② novel paradigm for knowledge distillation.
- Working with **Subhashini Venugopalan (Google Research)** on ① studying properties of vision transformers, ② data-efficient image recognition, ③ text-to-3D diffusion models.
- Working with **Vibhav Vineet (Microsoft Research)** on ① localizing implicit function of occupancy networks, ② domain generalization.
- Interned at **MooVita, Singapore**, developed lightweight, efficient network for ① semantic segmentation, ② 3D object detection operating on BEV-projected images.
- Interned at **Caterpillar**, developed software toolkit to design, analyze and visualize mechanical components, more specifically proprietary engine components.

## Projects and Awards

- **Top 5 @ Datathon Challenge, Indian Symposium on Machine Learning '22**: Document classification in the presence of limited training samples.
- **National Winner @ Flipkart Grid 2.0 '20**: Real-time multi-speaker denoising, expected to generalize to multi-lingual e-commerce dialogues. (*Links: Project Page*)
- **Bronze ('21), Gold ('20), Silver ('19) @ InterIIT Tech Meet**: (in order) Data-free knowledge distillation (hosted by Bosch), processing multi-lingual social media content (hosted by BitGrit), data-science challenge (hosted by SoftBank)
- **Ranked $18^{th}$ @ International Data Analytics Olympiad**: Classify electron microscopy images based on particle type and regress emitted energy levels.
- **Silver Medal @ Coleridge Initiative - Show US the Data (Kaggle)**: Identify dataset entities from large scientific or government documents.
- **Eye in the Sky, IIT M**: Developed computer vision algorithms to operate on drone feed to assist rescue forces during disasters. Top 20 startups @ IIGP2.0, Microsoft AI for Earth Grant. (*Media Coverage: Live Mint*)
- **AISoft, IIT M**: Developed deep learning methods for engineering applications - steady state thermal, fluid, stress and turbulence analysis. (*Media Coverage: Indian Express; NDTV*)

## Service

**Teaching**
- **Courses**: EE5179: Deep Learning for Imaging (IIT M July-Nov '22);
- **Workshops**: Building Transformer-Based Natural Language Processing Applications (Nvidia GTC '21); Fundamentals of Deep Learning (TKM '22, IIT M '20); Python and Machine Learning (IIT M '20)

**Reviewing**
- **Conferences**: NeurIPS '22
- **Journals**: Computers and Graphics '21, '22