

# Tejan Karmali

Research Interests: GANs, Diffusion models, Self-Supervised Learning

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## Education

**Indian Institute of Science, Bengaluru**

*Master of Technology (Research) in Computational and Data Sciences*

**GPA: 8.70/10**

2019 - 2022

**National Institute of Techonlogy, Goa**

*Bachelor of Technology in Computer Science and Engineering*

**GPA: 9.12/10**

2015 - 2019

## Work Experience

**Pre-Doctoral Researcher - Google Research**

Bengaluru, IN

*Mentors: Dr. Varun Gulshan ↗, Alex Wilson*

April 2022 - May 2023

- Addressed the problem of producing high-resolution segmentation maps of agricultural fields from their low-resolution satellite imagery.
- Built data export pipeline to export multi-temporal data from Earth Engine.
- Implemented Multi-frame super-resolution models, PIUNet and SPINet, for various use-cases: a) Image super-resolution b) Super-resolved Semantic segmentation c) Super-resolved Instance segmentation.
- Demonstrated the effectiveness of using multi-temporal low-resolution imagery over single low-resolution image for super-resolved instance segmentation, by improving the InstanceIoU from 0.26 to 0.47 (80% improvement).

*Mentor: Dr. Varun Jampani ↗*

- Addressed the problem of swapping objects in a given scene image by a user-specified subject image.
- Prototyped a method based on Stable Diffusion that can store the pose information of the object in the scene image, without the need to retrain the model. The method only modifies the inference stage of the diffusion model to transfer the pose into the identity of the object as defined in the subject image.

## Thesis

**Landmark Estimation and Image Synthesis Guidance using Self-Supervised Networks ↗**

*Advisor: Prof. R. Venkatesh Babu ↗*

- Proposed techniques to leverage pretrained networks trained using Self-Supervised Learning (SSL) on large data to improve performance on discriminative (landmark estimation) and generative (image synthesis) tasks.
- Discovered the emergence of correspondence tracking property in SSL networks and used it to solve few-shot landmark estimation. [WACV 2022 ↗]
- Identified the correlation between problem of unnatural image generation in StyleGAN and their PPL scores. Proposed distilling intermediate features from SSL networks into the generator to improve the naturalness. This led to 16% improvement on PPL score across datasets. [ECCV 2022 ↗]

## Publications

**Accepted and Published Papers**

- *Hierarchical Semantic Regularization of Latent Spaces in StyleGANs* ↗  
**Karmali T.**, Parihar R., Agrawal S., Rangwani H., Jampani V., Singh M., Babu R.V.  
Published at the 17th European Conference on Computer Vision (**ECCV 2022**)
- *LEAD: Self-Supervised Landmark Estimation by Aligning Distributions of Feature Similarity* ↗  
**Karmali T.\***, Atrishi A.\*, Harsha S.S., Agrawal S., Jampani V., Babu R.V.  
Published at the 2022 IEEE/CVF Winter Conference on Applications of Computer Vision (**WACV 2022**)

- *NoisyTwins: Class-Consistent and Diverse Image Generation Through StyleGANs* [↗](#)  
Rangwani H.\*, Bansal L.\*, Sharma K., **Karmali T.**, Jampani V., Babu R.V.  
Published at the IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2023 (**CVPR 2023**)
- *Improving GANs for Long-Tailed Data Through Group Spectral Regularization* [↗](#)  
Rangwani H., Jaswani N., **Karmali T.**, Jampani V., Babu R.V.  
Published at the 17th European Conference on Computer Vision (**ECCV 2022**)
- *Everything is There in Latent Space: Attribute Editing and Attribute Style Manipulation by StyleGAN Latent Space Exploration* [↗](#)  
Parihar R., Dhiman A., **Karmali T.**, Babu R.V.  
Published at the 30th ACM International Conference on Multimedia (**ACM MM 2022**)
- *Deep Implicit Surface Point Prediction Networks* [↗](#)  
Venkatesh R., **Karmali T.**, Sharma S., Ghosh A., Babu R.V., Jeni L., Singh M.  
Published at the 2021 IEEE/CVF International Conference on Computer Vision (**ICCV 2021**)

## Workshop Papers

- *Fashionable Modelling with Flux* [↗](#)  
Innes M., Saba E., Fischer K., Gandhi D., Rudilosso M.C., Joy N.M., **Karmali T.**, Pal A., Shah V.; **SysML at NIPS 2018**

## Awards, Grants, & Honours

Facebook AI Research International Scholarship for DPhil at Torr Vision Group, Oxford University (declined)	2023
Outstanding Reviewer at CVPR	2022
Travel grant for presenting poster at JuliaCon in London, UK	2018
2x Google Summer of Code recipient	2018-2019
Winner and Runner-up of premier business quiz, Tata Crucible Campus Quiz in Goa Region	2017, 2018
Winner of National Level Science Knowledge Talent Search Exam (JVPP), Pune	2010

## Select Projects

- Duckietown.jl** [↗](#) (as part of JuliaLang in **Google Summer of Code**) *May 2019 - Aug 2019*
- Developed a differentiable self-driving car simulator to train driving agent via differentiable programming.
- Differentiable Programming** [↗](#) *Jan 2019 - Mar 2019*
- Conducted experiments comparing Reinforcement Learning approach with Differentiable Programming approach for control problems. Differentiable Programming resulted in faster solution to problem along with giving higher reward.
- AlphaGo.jl** [↗](#) (as part of NumFOCUS in **Google Summer of Code**) *May 2018 - Aug 2018*
- Developed a Julia package to train and play zero-sum board games using Alpha(Go)Zero algorithm.

## Academic Service & Volunteering

<b>Reviewer</b>	NeurIPS 2023, CVPR 2023, CVPR 2022, WACV 2022, SPCOM 2022
<b>Volunteer</b>	ICML 2020, NeurIPS 2020, IISc EECS Symposium 2021
<b>Teaching</b>	Tutorials on Computer Vision in IISc-TalentSprint Executive M.Tech. programs in Deep Learning
<b>Mentorship</b>	Undergraduate Interns at Video Analytics Lab, IISc

## Skills

<b>Languages and Tools</b>	C++, Python, Julia, $\LaTeX$ , Git, Docker, Linux
<b>Libraries and Softwares</b>	Tensorflow, PyTorch, OpenCV, Diffusers