Sri Mihir Devapi **Ungarala**

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Education

May 2023 **August 2019**	**Birla Institute of Technology and Science (BITS) Pilani** B.E. Electronics and Communications Engineering (ECE) - *CGPA: 8.2/10*	**Hyderabad, India**

Research Experience

Present **October 2024**	**Independent Reasearcher** *Collaboraters: PhD students from University of Manchester and Stanford University* Working on Disentangled Representations for better Genralization in Reinforcement Learning	
August 2024 **June 2023**	**IIIT Hyderabad | Robotics Research Center** [⊕] *Research Assistant* Worked on projects related to Representation Learning and its applications in Computer Vision and Robotics.	**Hyderabad, India**
January 2023	*Research Intern (Bachelor Thesis) | Advisors: Dr. K Madhava Krishna, Dr. Joyjit Mukherjee* Worked on creating a Multi-agent SLAM pipeline. And deployed it on hardware.	
September 2022 **March 2022**	**BITS Hyderabad** *Student Researcher | Advisors: Dr. Rajesh Kumar Tripathy* Worked on Retinal OCT Classification with image preprocessing techniques like Empirical Wavelet Transform(EWT) for Edge devices	**Hyderabad, India**

Publications

[C.1]   **DiffPrompter: Differentiable Implicit Visual Prompts for Semantic-Segmentation in Adverse Condition**[⊕]
Sanket Kalwar*,<u>Mihir Ungarala</u>*, Shruti Jain*, Aaron Monis, Krishna Reddy Konda, Sourav Garg, K Madhava Krishna
IEEE/RSJ International Conference on Intelligent Robots and Systems   [**IROS 2024 (Oral Pitch)**]

Select Research Projects

Differentiable Implicit Visual Prompts for Semantic-Segmentation in Adverse Condition [⊕]   August'23 - September'23
 Advisors: Dr K. Madhava Krishna, Dr Sourav Garg

> Extracted weather-related representations and used them to obtain values for different image processing operations which resulted in implicit differentiable visual prompts. These are used to make the foundational model robust to weather conditions.

> Worked on architectures of gated image processing modules and high-frequency component modules for better visual prompts leading to improvement in performance and generalization.

> Proposed using an auxiliary model (ViT) for faster experimentation, reducing fine-tuning time from 3 days(Foundational Model) to 30 minutes(auxilary model) per experiment.

> Achieved out-of-distribution performance when tested on Dark Zurich, ACDC, Wild dash datasets

> This work is presented in at IROS 2024 with myself as co-first author and was submitted to ZF Company

DepthDiff: Agnostic Noise Removal in Depth Images Using Diffusion [⌂]   March'24 - August'24
 Advisor: Dr K. Madhava Krishna

> Took lead of the project and formulated the idea.

> Used modified alpha scheduler to remove dependency on type of noise(Ex: gaussian noise) thereby providing ability to remove noise agnostically.

> Hypothesized that representations from Encoder-Decoder based Monocular Depth Estimation model contain shape related information and used them as condition for diffusion model.

> De-noises very well even when noised with Out-of-Distribution noise models.

> Created a synthetic monocular depth estimation dataset in AI2THOR

Distributed/Multi-Agent SLAM [⎇]

January'23 - June'23

Advisor: Dr K. Madhava Krishna, Dr Joyjit Mukherjee

> Conducted a thorough literature study to understand different SLAM as well as Multi-agent SLAM algorithms to understand the key differences between them and, the limitations, novelty, and scope of each algorithm.
> Coded 2 algorithms for inter robot loop closures each optimizing for space and time respectively. Integrated NetVLAD for robustness to illumination
> Replaced existing optimization framework with GTSAM which enabled usage of Graduated Non-Convexity as optimizer for robust outlier rejection during loop closure.
> Successfully tested in real-world and was submitted to DRDO.

Semantic Segmentation using Segment Anything Model(SAM) [⎇]

June'23 - August'23

Advisors: Dr K. Madhava Krishna, Dr Sourav Garg

> Worked independently on the project
> Experimented extensively on SAM's embedding space
> Exploited semantic property in SAM's embeddings to classify the output segments. Hence, the name
> Developed two classification pipelines based on clustering algorithms. One requires no training while another requires training a small MLP.

Koopman Theory in Deep Learning for Linearizing Drone Dynamics [⎇]

September'23 - January'24

Advisors: Dr K. Madhava Krishna, Dr Arun Kumar Singh

> Trained a neural network in accordance with Koopman Theory that can project state space vector of drone to higher dimensional space where drone dynamics are linear
> Worked on exploiting the linear characteristics of new state space for tracking and path planning using Convex Optimization.

Course Projects

Face Retrieval [⎇]

BITS F441: Sel Topics from CS - Computer Vision

> The idea of the project is to create an image retrieval pipeline based on faces which is inspired by a feature of Google Photos.
> Used Haar-cascade for quick face detection
> Implemented a Siamese network-based face recognition network that acts as a binary classifier saying whether query and target images are the same or not which is different from the general, Euclidean distance-based approach.

Image colorization[⎇]

BITS F312: Neural Networks and Fuzzy Logic

> Used Convolutional Auto-encoders for colorizing grayscale
> Instead of directly predicting in RGB color-space, predictions are done in Lab color-space i.e., given the L-channel of a grayscale image, predicting a,b channels of RGB image as the L channel of RGB image and the grayscale image is the same.

Relevant Courses and certificates

> **BITS F312: Neural Networks and Fuzzy Logic**: Grade(Letter grade/10 scale): A-/9
> **BITS F464: Machine Learning**: Grade(Letter grade/10 scale): A-/9
> **BITS F441: Sel Topics from CS - Computer Vision**: Grade(Letter grade/10 scale): B/8
> **Deep Learning Specialization in Coursera by Andrew Ng**: Certificate Link
> **Reinforcement Learning**: (MOOC) CS-285 Deep RL by Sergey Levine

Technical Skills

Languages	Python, C++, C, MATLAB
Frameworks	Pytorch, Tensorflow, ROS
Tools	Git, Github
Hardware	Arduino, RaspberryPi