Devaganthan S S

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Research Interests

Computer Vision, Machine Learning Theory

Education

Indian Institute of Technology Madras *Aug 2019 - Jun 2024*
Dual Degree (Bachelor's+Master's) in Electrical Engineering

Politecnico Di Milano, Italy *Jan 2022 - May 2022*
Master's in Computer Science and Engineering (Semester Exchange)

Professional Experience

Computational Imaging Lab, IIT Madras Chennai, India
Dual Degree Thesis | Guide: Dr. Kaushik Mitra *Aug 2023 - Present*

Extreme Low Light Stereo Image Enhancement

- Collaborating with a team to publish Extreme Stereo Paired Low Light Images with ground truth in outdoor and indoor settings, along with analysis and results on depth estimation and enhancement
- The project aims at benchmarking the dataset using state-of-the-art enhancement techniques and harnessing stereo information to perform enhancement in both sRGB and RAW formats
- Leveraging the Vanilla UNet architecture, enhanced low-light outdoor images in sRGB space, captured at 1/25, 1/50, and 1/100 exposure levels, resulting in the average test set PSNR values of 25.86, 25.57, and 23.78 respectively

OptimML Lab, MBZUAI Abu Dhabi, UAE
Undergraduate Research Internship | Guide: Dr. Martin Takac *May 2023 - Aug 2023*

Renewable-Powered Battery Optimisation

- Collaborated and developed an RL based approach for optimising energy storage and consumption from energy grids
- Used real-world data from Greece to validate the proposed methodology and provided open-source code implementation
- Created an optimal benchmarking solution by outlining a problem framework, formulating equations, and specifying initial conditions and constraints for evaluation. The optimal action values saw a 27.39% money saved in contrast to 11% saving by our best-performing RL algorithm

Electrical Engineering Department, IIT Madras Chennai, India
Mini Research Project | Guide: Dr. Mansi Sharma *Aug 2022 - Nov 2022*

Unsupervised Extreme Low Light Image Enhancement

- Studied existing literature and various approaches to Low Light Image Enhancement, with a focus on using GAN
- Implemented and analyzed the impact of integrating an Amplification Module into the enhancement pipeline to assess its influence on performance

Key Courseworks

Artificial Intelligence	**Mathematics and Computing**	**Miscellaneous**
Machine Learning	Probability and Statistics	Internet of Things
Modern Computer Vision	Linear Algebra	Communication Systems
Deep Learning for Imaging	Multi-variable Calculus	Data Structures and Algorithms
Natural Language Processing	Numerical Linear Algebra	Advanced Computer Architecture
Speech Technology*	Detection Theory*	Principles of Neuroscience*

- Ongoing

Scholastic Achievements

- Selected for a Summer Research Internship Role at TATA Consultancy Service 2022
- Ranked in the top 1% in the Joint Engineering Entrance Advanced exam out of 0.15 million shortlisted students 2019
- Secured 7th rank in Mathematical Genius Award (A state level competition) 2014
- Cleared District and School level, qualified for State-level in Wordsworth International Spell Bee 2013
- Awarded with Meritorious Certificates in school for academic excellence

Skills

- **Programming/Scripting Languages:** Python, MatLab, C, C++, HTML | **Technologies:** Git, Linux, LaTeX
- **Libraries:** PyTorch, Matplotlib, NumPy, OpenCV, Gekko

Course Works

Information Retrieval System for Cranfield Dataset IIT Madras
Natural Language Processing *May 2023*

- Developed an Information Retrieval (IR) System using the Cranfield Dataset, employing the Vector Space Model
- Achieved a precision of 39%, recall of 29%, F-score of 30%, MAP of 69% and nDCG of 44%
- Improved the IR System by employing Latent Semantic Analysis (LSA) algorithm handling synonym and polysemy and also implemented a bottom-up approach for stop-word removal, explored and studied different similarity measures

Panoramic Stitching IIT Madras
Modern Computer Vision *Nov 2021 - Dec 2021*

- Developed an algorithm for stitching a panorama from overlapping photos by estimating a transformation by computing features using Speeded Up Robust Features algorithm (SURF) in both images and matching them to obtain correspondences
- A homography is estimated from these correspondences to stitch these in a common coordinate system
- Extended this algorithm to stitch multiple images

Hardware Accelerator for Image Compression IIT Madras
Computer Organization *Nov 2021 - Dec 2021*

- Implemented a Hardware Accelerator in Verilog for JPEG Decoding algorithm for Image Compression
- Reduced the number of clock cycles from 5100 to 18 Cycles for an iteration of row/column Inverse Discrete Cosine Transform

Smart Bracelet Politecnico Di Milano
Internet of Things *Jan 2022 - May 2022*

- Designed and implemented a software prototype for a smart bracelet that is to be worn by a child that allows her/his parent to keep track of the child's position and trigger alerts when a child goes too far goes too far
- Loaded a TinyOS application in a simulated node in Cooja, sent data periodically to a ThinkSpeak Server via MQTT

Miscellaneous IIT Madras
Computer Vision, Python Programming, Microprocessor, Computer Organization| Course Assignments *Jan 2020 - July 2023*

- *Hybrid Images*: Created a hybrid image by blending a low-pass filtered version of a first image and a high-pass filtered version of another image. The resultant hybrid image is perceived differently at different distances
- *Circuit Solver*: Developed a Python Script that accepts a liner circuit as a .netlist file and outputs the Nodal Voltages and Current
- *Bandpass FIR Filter:* Implemented 5-Tap and 32-Tap versions of bandpass FIR filter in AVR Atmega8 microcontroller, using Atmel AVR Studio 7 for design and debugging
- Implemented all instructions of the RV32I in Verilog set to make a *Synthesizable single-cycle CPU*

Professional Involvements and Extra Curriculars

Associate, Case Club - IIT Madras *Nov 2021 - Aug 2022*

- Was part of the Student Club aimed at fostering a problem-solving culture within the Institute
- Aided fellow students in their preparations for Consultation and Product Management roles

Teaching Assistantship and Mentorship *Aug 2023 - Nov 2023*

- Assisted the instructor in conducting a course to develop students' soft skills and general well-being
- Facilitated group discussions among students and clarified doubts inside and outside of class hours
- Mentored and provided academic guidance to 2 first-year undergraduate students, as part of AcadBuddy Program, IIT Madras

Sports Endeavours

- *Beginner Runner:* Developed a recent interest in endurance running. Completed Chennai City Half Marathon 2024, in 2:16 hrs
- *Football:* Represented my district as forward in State Level Football Championship in 2012
  One amongst 30 students selected for the National Sports Organization Football Program amongst first-year undergraduates
- *Amateur Chess Enthusiast:* Peak Rapid *Chess.com* rating of 1322, Puzzle Rating of 2087