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RESEARCH INTERESTS Real-Time Computer Vision for Augmented Reality

Image and Video Retrieval, Neural Hashing

**EDUCATION** 

National Institute of Technology Karnataka (NIT-K)

Bachelor of Technology, Electronics and Communication Engineering

2017 - 2021

8.57

FINAL-YEAR

Low-light image enhancement on low power devices

19/20 Aug 2020 – May 2021

Project Advisor: Dr Ramesh Kini

- Objective: Design of hardware and software-optimized algorithms to capture vibrant and detailed low-light photos with inexpensive camera sensors without the use of obtrusive flashlights.

 Deployed serialised & optimised PyTorch model and developed image processing pipeline on edge device in C++ to work in Python-independent environments.

RESEARCH EXPERIENCE Research Intern, CSRE, IIT-Bombay Multi-modal Land-use Classification

Advisor: Prof Biplab Banerjee

May 2021 – Aug 2021

- Worked on multi-modal, pixel-wise land-use classification from hyperspectral & LiDAR satellite imagery.
- Iteratively designed & developed novel model variants with vision transformers & CNNs and Bayesian hyperparameter optimisation.

## Winter Research Intern, Deep learning lab, NIT-K Computational Histopathology

Advisor: Dr Shvam Lal

Jan 2020 - Mar 2020

- Implemented state of the art models and designed data pipelines for nuclear segmentation in histopathology images of kidney and liver tissues.
- Worked on the detection of Urothelial Carcinoma from whole slide images (average dimensions of  $80000 \times 50000$ ) of bladder tissues.
- Built an open-source project benchmarking segmentation models on histopathology datasets.
- Presented a report reviewing the different methods to perform nuclear segmentation.

# Summer Research Intern, Deep learning lab, NIT-K Image Processing and Deep Learning

Advisor: Dr Shyam Lal

May 2019 - Jul 2019

- Designed and debugged efficient implementations of classical image processing algorithms on large datasets.
- Developed and maintained data pipelines for deep learning based image segmentation and classification models.
- Worked on reproducing results from seminal papers in the field of automated histopathology.

Work Experience Frontend Developer and UI Designer IRIS, NIT Karnakata

Aug 2018 - Apr 2019

- Debugged and maintained parts of the frontend code at IRIS The official student portal.
- Designed a new UI system from the ground up in Figma.
- Developed the design system in Vue. is and worked on integration with the legacy Rails code.

### Python Developer

#### Pinnacle Media, Manipal

May 2018 - Jun 2018

 Built and deployed real-time face detection and recognition, using OpenCV, dlib, and scikitlearn, on a Raspberry Pi as a part of an 'employee attendance' system.

Relevant Scores GRE - 163V 168Q 5A TOEFL - 30R 30W 30L 25S

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SKILLS

Languages: Python, Go, C++, C, SQL, Rust, MATLAB, JavaScript, Verilog, SPICE

Frameworks and packages: PyTorch, Keras, OpenCV, scikit-learn, Numerical Python

Tools: git, Docker, bash/zsh, vim, Linux

Hardware: Raspberry Pi, Arduino, Xilinx Artix 7 FPGA

NOTABLE PROJECTS

## Fashion Discovery for Video Commerce

Sep 2021 – Present

 Solving the "Exact street-to-shop" i.e. matching products in consumer images to those in manufacturer catalogues - a cross-domain image-based image retrieval problem.

### Change detection in SAR images

Feb 2021 - May 2021

- Worked on developing a multi-sensor, multi-modal algorithm for change detection in bitemporal Synthetic Aperture Radar (SAR) images.
- Presented findings in a report as part of a course-project in *Image and Video Processing*.

### Multi-lingual speech enhancement

Feb 2021 - May 2021

- Worked on improving the quality and intelligibility of noisy speech recordings using deep neural networks that generalize over multiple out of sample languages.
- Presented findings that matched SOTA in certain areas and improved upon it in certain others.

#### Information extraction from PDFs

Apr 2021

 Developed a program to detect tables and extract information embedded in the table cells, as a part of a system to automate the summarisation of insurance policies.

Image Restoration Jul 2020

- Reproduced a very deep persistent memory network to perform image restoration by removing noise and predicting uncorrupted images; achieved results comparable to the original paper.

Muon Physics Mar 2020 - Jun 2020

 Designed a custom model to classify muon momenta trained on monte-carlo simulated data from the Cathode Strip Chambers at the CMS experiment of Large Hadron Collider at CERN.

#### Segmentation of brain tumours in MRI images

Dec 2019

- Reproduced state of the art semantic segmentation models in Keras/TFv1 to segment brain tumours and surrounding edema from MRI images
- Presented results on multi-class segmentation with a custom model variant on the BRATS dataset as part of a workshop on medical imaging.

#### Detecting Ponzi schemes in blockchain smart contracts

Aug 2019 - Sep 2019

- Designed a custom model to detect Ponzi smart contracts deployed on the Ethereum blockchain using CNNs and stacked auto-encoders, in under 48h as a part of a coding sprint.
- Trained the model on the raw bytecode of Ethereum smart contracts mined from the Ethereum blockchain using Google BigQuery, publicly available Solidity source code of popular smart contracts, and a publicly available dataset of known Ponzi schemes.

### Predicting truth level of news articles

Jul 2019 – Aug 2019

- Built a model to classify news articles into 6 different categories based on their truth level.
- Trained the model on the LIAR-PLUS dataset containing news articles and fact-checking justifications from trusted sources.

## Space Time Adaptive Processing Radar

Apr 2019

 Simulated a radar implementing STAP in Matlab and presented a report on the current state of STAP in Radar Signal Processing.

MISC.

Selected as a **full-time research intern** at the Robert Bosch Center for Cyber-Physical systems, IISc, Bangalore to work on "Simultaneous Localization And Mapping - SLAM". July 2020

– Offer refused due to conflicts with the university's schedule for the  $6^{\rm th}$  semester.

Selected for a **funded research internship** at HEPIA-Hesge, Geneva, Switzerland to work on "NavTrack: A portable obstacle tracker for the rehabilitation of spatial neglect" Mar 2020

- Offer rescinded due to pandemic-induced travel restrictions & lockdowns.