Russel Shawn Dsouza

Contact Information

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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) *8.57*
Bachelor of Technology, Electronics and Communication Engineering *2017 – 2021*

Final-year Project

Low-light image enhancement on low power devices *19/20*
Advisor: Dr Ramesh Kini Aug 2020 – May 2021

- *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 Shyam 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 80000×50000) 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.js 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 scikit-learn, on a Raspberry Pi as a part of an 'employee attendance' system.

Relevant Scores

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

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 bi-temporal 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^{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.