ANUBHAV PRASAD | 19EC3AI15

ELECTRONICS & ELEC. COMM. ENGINEERING/ARTIFICIAL INTELLIGENCE MACHINE LEARNING AND APPLICATIONS

MICRO SPL. in EMBEDDED CONTROL, SOFTWARE, MODELLING AND DESIGN

EDUCATION

Year	Degree/Exam	Institute	CGPA/Marks
2023	M.TECH Dual Degree 5Y	IIT Kharagpur	9.13 / 10
2019	CBSE	Resonance International School	91.4%
2017	CBSE	Sainik School Sujanpur Tira	10 / 10

PROJECTS

Knowledge Fusion using weakly labeled datasets | Masters & Bachelors Thesis, Advisor : Prof. Debdoot Sheet **[Aug 2022 - Present]**

Objective: To develop a generalised framework for training deep learning models for semantic segmentation in federated learning setup
- Leveraged an **adversarial training** approach to train **SUMNet** model with pretrained **VGG16** weights as encoder in centralised setup
- Applied **CLAHE** and a 3x3 **median filter** for luminosity balancing and removing background noise in **DRIVE** and **IDRiD** datasets
- Achieved a **dice score** of **0.792** for retinal vessels and **jaccard index (IOU)** of **0.65** for optic disc through various hyperparameter tuning

Positive dialogue summarization using LLMs | Deeplearning.ai **[Jul 2023 - Aug 2023]**

Objective: To fine-tune a large languge model to generate human like summaries with a focus on eliminating toxicities
- Fine-tuned **FLAN-T5** on **DialogSum** dataset utilising **LoRA** technique and achieved **12.34%** improvement in **ROUGE-L-SUM** score
- Implemented **RLHF** technique along with **PPO** algorithm to further fine-tune the model to mitigate the model's **toxicity** in the output
- Achieved a **44%** reduction of in the model's toxicity by utilising META's **RoBERT**-based hate speech classifier as a **reward model**

Video Summarization | Prof. Jiaul Hoque Paik **[Feb 2022 - Apr 2022]**

Objective: To develop a LSTM based video summarisation model as a part of design lab project
- Developed **vsLSTM**, a bidirectional LSTM model, for video summarisation, as proposed in the paper "Video Summarisation using LSTM"
- Utilised pre-trained **GoogleNet** for extracting features of video frames and trained vsLSTM to predict **frame level importance** scores
- Achieved remarkable F-scores of **34.6 on SumMe** dataset and **51.2 on TVSum** dataset under a canonical data augmentation setting

Conditional Image Generation using VAE & GANs | Prof. Adway Mitra **[Sep 2022 - Nov 2022]**

Objective: To develop understanding of different generative models with their inmplementation as a part of course project
- Implemented **Variational Autoencoder** and **Wasserstein GAN-GP** to generate synthetic images based on the **STL-10** dataset
- Accomplished commendable **Frchet Inception Distance (FID) scores**: 122 for Variational Autoencoder and 117 for Wasserstein GAN-GP

Kharagpur Robosoccer Students Group (KRSSG) | Research Group, Advisor : Prof. Alok Kanti Deb **[Mar 2020 - Aug 2021]**

Objective: To develop a team of autonomous soccer playing robots for RoboCup small sized league
- Conceptualised, implemented and verified register transfer level modules that combine to form the system architecture of SSL robot
- Implemented ADC, PWM, UART, and other modules on Atmega328p micro controller which was used for verification of FPGA modules

INTERNSHIPS

MITACS GRI, University of Calgary | Machine Learning for Hardware Security **[May 2023 - Jul 2023]**

Objective: To develop a framework for hardware trojan insertion in a gate-level netlist | Advisor: Prof. Peng Seng Benjamin Tan
- Surveryed various deep learning and reinforcement learning based methods to **insert hardware trojans** in a gate-level netlist
- Implemented state and action space, reward function and search space pruning strategies as proposed in the paper "ATTRITION, 2022"
- Achieved **80%** success rate against MERO and an **84.5%** success rate against GA+SAT detection techniques by training a **PPO** agent

NVIDIA Corporation | ASIC Intern **[May 2022 - Jul 2022]**

Effective assertion coding to speed-up the simulations
- Interned with the **PCIE DV** Team, NVIDIA Corporation India working on verification of Peripheral Component Interconnect Express (PCIE)
- Analysed inefficient assertions, optimised them and created a **Performance Efficient SystemVerilog Assertion** library
- Achieved significant performance improvement reducing code redundancy by **88.5%** and **73%**, resulting in a faster verification process

AWARDS AND ACHIEVEMENTS

- Received the prestigious **MITACS Globalink Research Internship** a 12 weeks program at University of Calgary during the Summer 2023
- Received the **Talent Bursary** from Alberta Machine Learning Institute (**AMII**) to attend the **UPPER BOUND 2023** conference in Edmonton
- Part of the **winning** team in **NEXUS**, a computer vision based robotics event at **Kshitij 2020,** the annual techfest of IIT Kharagpur
- Amongst the top **1.5%** rank holders in **JEE Advanced 2019** and top **0.5%** rank holders in **JEE Mains 2019** out of all participants

SKILLS AND EXPERTISE

Programming Languages: Python | C++ | C | SystemVerilog | Verilog | MATLAB
Python Frameworks & Libraries: PyTorch | Keras | Scikit-Learn | Stablebaselines3 | NumPy | Pandas | Matplotlib

COURSEWORK INFORMATION

AI, ML and CS: Statistical Foundations for AI & ML | Deep Learning | Graphical & Generative Models for ML | Linear Algebra for AI & ML Machine Learning | Artificial Intelligence | Reinforcement Learning | Cyber Physical Systems | Programming & Data Structures
ECE: Digital Electronics | Microcontroller | Analog Electronics | Control Systems | VLSI | Network Theory | Digital Signal Processing

POSITIONS OF RESPONSIBILITY

InterHall Hockey Team Captain | Lal Bahadur Shashtri Hall of Residence **[Jan 2022 - Mar 2022]**
- Directed and mentored a 30-member squad for 3 months as coach of the InterHall hockey team for Lal Bahadur Shashtri Hall of Residence
- Led the team to semifinals, making a significant impact by improving their skills, teamwork and morale despite of a short training period

Mentor | Student Welfare Group **[Aug 2021 - Apr 2023]**
- Mentored a group of 8 freshers and sophomores, helping them naviagte through their academic journey and extra curricular activities

!Self declared by the student, CDC could not verify the relevant documents