SAURABH MISHRA

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INSTRUMENTATION ENGINEERING/ARTIFICIAL INTELLIGENCE MACHINE LEARNING & APPLICATIONS

EDUCATION

Year	Degree/Exam	Institute	CGPA/Marks
2024	M.TECH Dual Degree 5Y	IIT Kharagpur	9.29 / 10
2019	All India Senior School Certificate Examination	Sanskar International School	95.0%
2017	All India Secondary School Examination	MPVM Ganga Gurukulam	10 / 10

AWARDS AND ACHIEVEMENTS

- Attained **Department Rank 1** among more than 30 students in the dual-degree specialisation of Artificial Intelligence and Machine Learning Applications
- Recipient of **Mitacs GRI**, a highly competitive research internship program providing opportunities to undertake research at top Canadian universities
- Acquired a **top 3%** rank in JEE Advanced 2019 and **top 1%** rank in JEE Mains 2019 among 165 thousand and 1.2 million applicants from all over India
- Recipient of **Ramanujan Award** 2018-19, awarded by Sanskaar International School in recognition of outstanding academic performance and excellence

PUBLICATIONS

*J.Jothi Balaji, **Saurabh Mishra**, Nihar Yatin Moghe, Vishal Maheshbhai Sindhi, Rajiv Raman, Vasudevan Lakshminarayanan. Morphological Characteristics of Central Retinal Blood Vessels in Myopia: Analysis of Ultra-Wide Field Images Using Image Processing. (**Poster at ARVO India 2023**)*

INTERNSHIPS AND PROJECTS

MathWorks | Software Development Intern [May'22 - Jul'22]

Objective: To integrate Highway Lane Change Planner, a key component for safe lane changes in autonomous vehicles to Roadrunner
- Led integration of **planner** with **Roadrunner** (an automated driving systems simulator), transitioning from Simulink co-simulation to standalone setup
- Modified the **Simulink** architecture of the planner and replaced the API calls with relevant functions to facilitate the code generation for the integration
- Developed the feature of setting **vehicle behaviour parameters** during simulation using the Graphical User Interface (**GUI**) of the Roadrunner platform

University of Waterloo | Mitacs Globalink Research Intern [May'23 - Aug'23]

Objective: To investigate changes in the morphological features of retinal blood vessels in myopia in collaboration with Sankara Nethralaya
- Applied luminosity balancing, **CLAHE**, **TopHat** operation and **Otsu thresholding,** followed by area thresholding for the blood vessel segmentation task
- Used **fractal dimension** (Df), a statistical index of complexity in a pattern, as a quantitative measure for the branching pattern of retinal blood vessels
- Employed **domain adaptation** with a pre-trained **W-Net** architecture trained on the **DRIVE** dataset to improve vessel segmentation on the fundus images
- The mean ±SD Df values for emmetropia and myopia were found to be **1.28 ± 0.02** and **1.27 ± 0.02,** respectively, indicating a subtle decreasing trend

Culinda Inc. | Computer Vision Intern [Dec'22 - Feb'23]

Objective: To improve the performance of Melanoma detection module with a focus on having high sensitivity and low latency during prediction
- Developed pipeline for detecting **Melanoma** (a type of skin cancer) from images of skin lesions using deep learning-based algorithm **EfficientNet B6**
- Trained the models on the **SIIM-ISIC Melanoma Classification** dataset with **five-fold cross-validation** for better generalisation ability and robust learning
- Employed **upsampling**, **pseudo labelling** and **RandAugment** to reduce the class imbalance in the training set, thereby mitigating the majority class bias
- Achieved F1 score of **84.8 %** and sensitivity of **89.08 %** on the UoW skin cancer dataset, a significant **60.4 %** improvement over previously deployed model

Saliency Analysis of Multiple Instance Learning for Whole Slide Image Classification | Bachelor's Thesis Project [Aug'22 - Apr'23]

Objective: To utilise Multiple Instance Learning for the detection and localisation of breast cancer tumor cells in collaboration with ICMR
- Developed a pipeline for the automated **detection** and **localisation** of **breast cancer** metastasis in **whole slide image** (WSI) of lymph node tissue sections
- Utilised **Deep Multiple Instance Convolutional Neural Networks** with pre-trained **VGG16** as the foundational encoder backbone for the task of detection
- Generated **saliency map** from the trained classification model to localise cancer tumors in input WSI, thus eliminating the need of WSI **segmentation**
- Achieved a notable F1 score of **82.63 %** and **91.55 %** on **Camelyon 16** and **BreakHis** dataset, respectively, for the slide-level breast cancer classification

Sign Language Recognition and Intent Classification | NLP Term Project [Jan'23 - Apr'23]

Objective: To perform Intent classification from the video input of a person communicating in American Sign Language (ASL)
- Employed **YOLOv4-Tiny** architecture, trained on the combined CMU Hand and Egohands dataset, for real-time hand detection across video streams
- Leveraged pre-trained **ResNet18** model, fine-tuned with **Sign Language MNIST** dataset for robust character classification from detected hand frames
- Integrated **wordsegment** library for character sequence segmentation and achieved an F1 score of **0.98** by fine-tuning **RoBERTa** model on **SNIPS** dataset

COMPETITION/CONFERENCE

National Winner | American Express Campus Super Bowl Challenge [Aug'23]

- Developed an end-to-end ML pipeline to increase the incremental activations by recommending merchants personalised to each credit card holder
- Performed exploratory data analysis and feature engineering on a dataset having **70+** features and **10 Million+** data points of credit card holders
- Employed an ensemble of **XGBoost** and **LightGBM** algorithms with 5-fold cross-validation approach, attaining an incremental activation score of **0.001**

ML Reproducibility Challenge 2020 [Sep'20 - Mar'21]

- **Authored** a review paper on the publication **Fourier Domain Adaptation for Semantic Segmentation** and reproduced the results reported in it
- Verified the proposed claims and **optimised** the data pre-processing pipelines, thus reducing the memory consumption by **62.5 %** during model training

COURSEWORK INFORMATION

Computer Science: Algorithms-I | Computer Architecture and Operating Systems | Programming and Data Structures | Machine Learning
Machine Learning: Machine Learning Foundations | Deep Learning Foundations | Natural Language Processing | Secure and Dependable AI
Mathematics: Probability and Stochastic Processes | Linear Algebra for AI and ML **Electrical:** Signals and Networks | Digital Electronics Circuits | DSP

SKILLS AND EXPERTISE

Languages: C++ | Python | LaTeX | C | MATLAB | HTML | SQL | CSS **Libraries/Frameworks**: Numpy | Pandas | Matplotlib | Pytorch | Wandb | Tensorflow | Tensorboard | OpenCV | Pillow | Openslide | STL | Git **Softwares:** Visual Studio | MS Office | LTspice | Roadrunner | Solidworks

EXTRA CURRICULAR ACTIVITIES

- Mentoring five freshmen each from the batch of 2021 and 2022, providing them guidance in academics, career pursuits and extracurricular activities
- Volunteer at National Service Scheme, taught under-privileged children, performed street play to spread awareness against excessive tree-cutting

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