Vedant Zope

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Education

Indian Institute of Technology Kharagpur — Kharagpur, West Bengal
Major : B-Tech(Honours) Metallurgy and Materials Engineering — **CGPA : 8.62/10**
Minor : Mathematics and Computing

D.A.V Public School — New Panvel, Mumbai
All India Senior School Certificate Examination — **CBSE : 92%**

Publications

Proceedings of *The International Workshop on the Bees Algorithm and its Applications 2022* | **[Repository]**

[1] **Vedant Zope**, Asrul Harun Ismail, **"Utilizing the Bees Algorithm and Machine Learning to optimize the UAVs travel time in consideration of weather conditions."**

Research Experience

UAV Routing Optimization | Urban Robotics | Foreign Research Trainee — **University of Birmingham UK**
Under the guidance of : *Prof D.T. Pham* — *Apr' 22 - Nov'22*

- Cleaned, Processed and performed EDA on UAV data to assess the effects of wind parameters on the final UAV Velocity
- Predicted and analysed **Assymetric Route Time matrix** using Catboost Model and achieved an MSE Score of **0.68**
- **Discretized** Bees Algorithm(BA) into **Combinatorial Bees Algorithm** by changing the global and local search section with a discrete search operator; finally consolidated it with the machine learning model for UAV routing optimisation
- Optimised the hamiltonian cycle travel time by an average of **12.3%** as compared to other **Metaheuristic methods**

TeamKART | FSAE | Undergraduate Researcher — **IIT Kharagpur**
Under the guidance of : *Prof. D.K. Srivastava* — *Dec' 20 - Jul'22*

- Read several papers on powertrain, vehicle dynamics, and chassis of an automobile to thoroughly understand its working
- Developed a **MATLAB** program to calculate forces at suspension links for different force inputs on the contact patch.
- Performed **Computational Fluid Dynamics** study on the nose cone, to analyze the aerodynamic stability of the part
- Designed and modeled a tubular-spaceframe chassis using SolidWork. Performed iterative simulations during static and dynamic environment using **finite element analysis(FEA)** in Ansys and currently working on manufacturing the kart

Projects

Image Classification | CVPR 20 Plant Pathology FGVC7 Dataset | Github — **May 2022**

- Applied Transfer Learning using pre trained **ResNet50** model along with Data Augmentations to achieve **94 AUROC**.
- Tackled Dataset Imbalance problem by implementing **custom loss function** that assigns appropriate weights to classes
- Performed Hyper Parameter tuning using **Ray Tune** to increase the model accuracy and further validate the model.
- Developed an **interactive web-application** using Streamlit to deploy the model to a public URL using LocalTunnel.

Neuronal Cells Instance Segmentation — **June 2022**

- Developed a deep learning-based segmentation model in **PyTorch** from scratch to carry out detection of neuronal cells.
- Trained **Mask R-CNN**, **U-Net** and **EfficientNet** models on phase microscopy images for **instance segmentation**.
- Achieved a **mean average precision(mAP)** of **0.336** by using an ensemble of models trained using transfer learning.

Pose Estimation using Aruco Tags | Camera Calibration — **Dec 2021**

- Implemented pose estimation of object in webcam image using Aruco markers and studied up on camera calibration

Competition/Conference

Formula Bharat Virtuals (FBV 2021-2022) | *1st Position* — **September 2021**

- Designed and Simulated Tubular Spaceframe Chassis, and formulated Engineering Design concept on chassis subsystem.
- Achieved **Overall 1st Position** and **Best Engineering Design** Concept amongst **30+ teams** from all over India.

The International Workshop on the Bees Algorithm and its Applications | BAA 2022 — **July 2022**

- Formulated and presented research at BAA 2022, where researchers from over **20+ nations** exchanged their findings.
- Invited to submit the complete chapter for publication in the book,**"Intelligent Production and Manufacturing Optimisation: The Bees Algorithm Approach."**

Open IIT Data Analytics | ***Gold Medal*** | **Presentation** **March 2022**

- Provided with monthly sales data for all warehouses from April 2018 to May 2021, with each product's unique SKU id labelled. Predicted sales using **MAPE** as a tool of assessment for the forthcoming month of June 2021.
- Performed EDA using visualizations and analyzed the effect of COVID on the sales. Observed that SKU pricing performs similarly every year so used a **stacked data approach** taking into account the yearly seasonality in the products.
- Clustered products with similar trends by experimenting with **KMeans, Hierarchical clustering, DTW clustering** and used the one with best MAPE score on validation set. Verified optimal no of clusters found using the elbow method
- Experimented with models like **SARIMAX, Catboost, LSTM, Panel Regression** on each cluster and got predictions using these models for that particular cluster. Reported final predictions using an **ensemble** of LSTM and Catboost.

Technical Skills

Skills & Tech	Python | C | C++ | JAVA | MySQL | MATLAB | Git | Microsoft Office | Solidworks | Ansys
Libraries	Numpy | Pandas | Matplotlib | Scikit-learn | Scipy | Tensorflow | Keras | Pytorch | OpenCV

Relevant Coursework

- Linear Algebra
- Design And Analysis Of Algorithms
- Probability and Statistics
- Deep Learning Specialisation (Andrew NG)(MOOC)
- Computer Vision (CS231n) (MOOC)
- Advanced Calculus
- Numerical and Complex Analysis
- Data Structures and Algorithms
- Programming and Data Structures
- Transform Calculus

- Deformation Behaviour of Materials
- Transport Phenomenon in Metallurgical Processes
- Mechanical Working of Materials
- Material Processing

Achievements

2020 : Amongst the **Top 0.5%** in MHTCET Examination (out of **350K** candidates)
2020 : Amongst the **Top 2%** in Joint Entrance Examination Mains (out of **1.2 Million** candidates)
2020 : Secured All India Rank **5946** in Joint Entrance Examination Advanced (out of **250K** shortlisted candidates)
2019 : Awarded with the **DAV Appreciation Trophy** for outstanding accomplishments in academics and sports

Teaching Experience

Chassis Subsystem Head **IIT Kharagpur**
TeamKART *May 2022 – present*

- Organised a technical workshop on the basics of automotive engineering and witnessed a participation of **250+** students
- Mentored a team of **40+** freshmen for training in fundamentals of automotive engineering and aspects of manufacturing
- Leading a team of **12** members responsible for the design, analysis, and simulation of the formula student prototype.

Computer Vision Mentor **IIT Kharagpur**
IEEE Winter Workshop *March 2021*

- Mentored **150+ freshmen** by teaching them about Image processing techniques and **Computer Vision** algorithms.

Position of Responsibility

Social and Cultural Committee | **RP Hall** **IIT Kharagpur**
Secretary *August 2021 – April 2022*

- Responsible for managing various So-cult event and auditing bills of the **800+** borders which sum up to INR **1,00,000**.
- Coordinated with the General Secretaries and other Secretaries to and bring in active participation from the hall.
- Contributed to the overall winning of the prestigious Social-Cultural General Championship in Gymkhana Championship

UG Council Student Mentorship Programme **IIT Kharagpur**
Student Mentor *Aug 2021 – Present*

- Selected out of **300+** applicants based on holistic performance via a rigorous procedure of peer reviews, and interview.
- Guiding **4 freshmen students** in making informed decisions pertaining to their academics and holistic development.

Extracurricular Involvements

- Been an Active Trader and Investor in Indian Stock Market(Equity and Derivative) for the past **2+ years**.
- Part of the **Institute's Athletics Team**, participated in various track and field Events at Institute and State Level, also was a part of the school Athletics team, won several medals and trophies in various track events.
- Selected among the **top 36 debaters** to represent the IIT Kharagpur after multiple rounds of selection.
- Active member of **Quiz club**, IIT Kharagpur - participated in several inter-college and intra-college quizzing