Prajwal Kalpande

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Pursuing a **Minor** in **Computer Science and Engineering** from the Computer Science and Engineering Department

SCHOLASTIC ACHIEVEMENTS

- Secured a percentile of **98.86%** in **JEE Advanced** examination out of **150 thousand** candidates *(2020)*
- Achieved **All India Rank 466** in **JEE Main** out of **1.2 million** candidates *(2020)*
- Awarded the **Kishore Vaigyanik Protsahan Yojana (KVPY)** fellowship with **AIR 290** in the SX stream *(2019)*
- Ranked among national **top 1%** in **National Standard Examination in Chemistry** (NSEC) *(2019)*
- Secured **State Rank 5** in Stage 1 of **National Talent Search Examination** (NTSE) *(2017-18)*

PROFESSIONAL EXPERIENCE

Summer Associate Intern | FinMechanics India Pvt. Ltd. *May'23 - Jul'23*
Singapore-based Bank Treasury Solution Provider with offices in 8 Countries
- Transformed **Analytics module** of FM Converge software from **ExtJS** to **AGGrid** framework for **faster rendering** and **better grouping** of data leading to a reduction of **10X** in summary report loading time
- Added **custom charting** capabilities to deal summary reports and **handled** various **user events** on the frontend
- Implemented **live trade update** feature to **notify** users of real-time deals and update the deal summary report accordingly

KEY PROJECTS

Artizaar - A Bazaar for Artists *May'22 - Jul'22*
Self Project | App Development
- Developed a **cross-platform** mobile **e-commerce app** using Flutter SDK in integration with **Firebase and MongoDB** where users can **connect** with each other and **buy/bid & sell artworks** online
- Created a responsive UI using **Dart and Flutter**, and implemented **REST**ful **APIs** for CRUD operations such as **uploading artworks** for **sale**, saving artworks, **real-time bidding**, and following other users in **NodeJS** using ExpressJS
- Integrated the frontend with backend in compliance with the **Model-View-ViewModel (MVVM) architecture**

Wi-Fi 6 Performance Analysis and Optimization *Aug'23 - May'24*
BTP | Research Project *Prof. Jayakrishnan Nair, Prof. Nikhil Karamchandani*
- Working on validation and enhancement of OFDMA in Wi-Fi 6 networks using ns-3 network simulator in C++
- Improved existing codebase to provide more features and flexibility, and modelled scenarios involving haptic devices
- Implementing better scheduling schemes, and using online learning techniques to improve uplink flow latencies

Human Machine Interface System *Jan'23 - Apr'23*
Course Project | Electronic Design Lab *Prof.Siddharth Tallur*
- Worked in a group of 3 to develop a **handheld controllable device** with a **display** for a corrosion monitoring product
- Programmed a Raspberry Pi Pico using **C SDK** to manage **sensor data** and **control** a 240x320 pixel **LCD** via user inputs
- Implemented **software key debouncing** for error-free user interaction and used **interrupts** to reduce response time
- Assembled final device with features such as **navigation**, **simulation** mimicking rebar depth scanning, and **popup** screens

Reinforcement Learning *Aug'22 - Nov'22*
Foundations of Intelligent and Learning Agents | Course Project *Prof. Shivaram Kalyanakrishnan*
- Implemented and compared ϵ-greedy, **UCB**, **KL-UCB**, and **Thompson Sampling** for stochastic **multi-armed bandits**
- Modelled a situation in cricket as an **MDP** and derived optimal policy using **policy iteration** and **linear programming**
- Navigated the vehicle through obstacles via an algorithm based on **action-value function approximation** methods

Algorithm Visualizer *May'21 - Jul'21*
Seasons of Code | Web and Coding Club IITB
- Conceptualized and built the user interface for a **responsive** web application using **React** which allows **visualization** of multiple **Pathfinding Algorithms** along with both manual and automated maze generation
- Implemented smooth **animations** using **JavaScript** along with **React Hooks and Classes** to demonstrate how chosen algorithm finds a **path** from **start node** to **end node** avoiding walls with feature to vary animation speed

Deep Convolutional Generative Adversarial Networks *Mar'23 - Apr'23*
Course Project | Introduction to Machine Learning *Prof. Amit Sethi*
- Implemented **DCGAN** architecture from scratch for unsupervised representational learning and feature extraction
- Trained DCGAN models on various datasets such as LSUN, Human Faces, CIFAR-10, and Tiny Imagenet using **Tensorflow**
- Utilized trained DCGAN models as **feature extractors**, and achieved an **accuracy** of **84%** on CIFAR-10 and SVHN datasets

Wasserstein Generative Adversarial Networks *Mar'23 - Apr'23*
Course Project | Introduction to Machine Learning *Prof. Amit Sethi*
- Implemented **WGAN** architectures from scratch for stable training, and unsupervised representational learning
- Developed Conditional WGAN models on MNIST dataset to generate realistic images, and performed t-SNE for comparison
- Trained an Auxiliary Classifier WGAN model with residual connections on CIFAR-10 data for conditional image generation

Predictive Data Analysis of IPL *Dec'21 - Jan'22*
Winter in Data Science | Analytics Club | IIT Bombay
- Performed **Exploratory Data Analysis** on IPL dataset in Python and gained useful insights for **feature selection**
- Trained and performed extensive hyper-parameter tuning on **Linear, Random Forest, Support Vector Machine**, **Neural Network** and **Decision Tree** models along with **feature engineering** to predict final score and match winner
- Developed **forecasting** models with an accuracy of **99.67%** in **score prediction** and about **61.02%** in **winner prediction**

OTHER PROJECTS

Autonomous Driving - Car Detection
Winter in Data Science | Analytics Club | IIT Bombay   *Dec'21 - Jan'22*
- Implemented **Non-Max Suppression** using Intersection over Union (**IoU**) to process the YOLO encoder output for predicting **accurate bounding boxes** and class probabilities, achieving a final **mAP** score of **0.56**
- Applied **Transfer Learning** on YOLO for **fine-tuning** the pre-trained **CNN** model on Open Images dataset for vehicles

RISC 16 bit Processor
Course Project | Microprocessors   *Jan'22 - Apr'22*
                                                                       Prof. Virendra Singh
- Created an **8-register**, **16-bit**, multicycle RISC processor in VHDL for a **17-operation ISA** with 3 instruction formats
- Modelled the system as a **Finite State Machine** and optimized it to reduce the total number of states
- Designed and implemented **ALU**, **Memory unit**, **FSM controller**, and **Datapath** using Quartus Prime in **VHDL**

Real-time Alphabet Recognition
Web and Coding Club IITB | PyCK   *May'21 - Jul'21*
- Built an **interactive** and **real-time** alphabet recognition python application using **MLPs** and **CNNs**
- Integrated **Computer Vision** with trained **Convolutional Neural Network** to take input from user using webcam and allow user interaction with the feature of **movie/song suggestion** based on input

8051 Microcontroller Programming
Course Project | Microprocessors Lab   *Jan'22 - Apr'22*
                                                                       Prof. Saravanan Vijayakumaran
- Developed an interactive ATM emulator in **Embedded C** by designing a **Finite State Machine**(FSM) to take inputs from a computer terminal using **UART**, and display output and instructions on onboard LCD
- Designed a **Finite State Machine**(FSM) in VHDL that plays **musical notes** sequentially in a loop on Krypton board
- Verified designs by performing simulations on all possible inputs using scan-chain on **Krypton board**

Finsearch
Finance Club IITB | Research Project   *Jun'21 - Aug'21*
- Studied **Portfolio Management**, Cryptocurrencies, importance of **Emotion Based Trading** in Covid 19 like situations and compared the differences between the effect of **Covid 19** and **2008 Global Financial Crisis**
- Analysed the **Indian Pharmaceutical Industry** and came up with an **investment portfolio** consisting of securities like Indian Pharma Equities/Exchange Traded Funds using Portfolio Management and **Risk Management** techniques

Tinkerer's Lab (TL) Website
Tinkerers' Laboratory | IIT Bombay   *Apr'22 - Jul'22*
- Contributed in a team to design and develop a responsive frontend of the **official website of TL** in React

TECHNICAL SKILLS

Programming Languages	C++, Python, Dart, VHDL, Embedded C, Assembly (8051,8085)
Data Science	Numpy, Pandas, Matplotlib, Seaborn, TensorFlow, Keras, Sklearn, OpenCV
Web Development	HTML, CSS, JavaScript, React, NodeJS
Softwares	Git/Github, Flutter, Jupyter, LaTeX, Keil, Intel Quartus Prime, Eagle, LTspice

POSITIONS OF RESPONSIBILITY

IIT Bombay Racing | Electrical Subsystem   *Feb' 21 - Feb'22*
*A 3-tier cross-functional team of 70+ students that builds an **electric race car** for international and national competitions*

Junior Design Engineer |*Motor Controller - Power Electronics*   *Sept'21 - Feb'22*
- Implemented **'GLV'** protection circuitry and performed **simulations** in **LTspice** to prove its functionality
- **Tested** individual components on LTSpice and completed the design of the Power Electronic side of Motor Controller by **integrating** the Parent board, Gate Driver board, and Control card after carefully mapping the connections

Trainee   *Feb' 21 - Sept' 21*
- Gained theoretical insights into the **Motor Controller, High Voltage**, and **Low Voltage Safety** subsystems
- **Designed** and **simulated** various circuits using LTSpice and produced **PCB designs** for them on Eagle

KEY COURSES UNDERTAKEN

Computer Science	Data Structures & Algorithms, Design & Analysis of Algorithms, Logic for Computer Science, Foundations of Intelligent & Learning Agents, Principles of Data & System Security
Electrical Engineering	Microprocessors, Probability and Random Processes, Communication Networks, Information Theory & Coding, Markov Chains and Queuing Systems, Digital Systems, Control Systems, Communication Systems, Introduction to Machine Learning
Mathematics	Linear Algebra, Differential Equations, Complex Analysis, Calculus

EXTRACURRICULARS

- Conceptualized and created unique Artworks which were showcased in the **Kaladarshan** event organized by the **Photography and Fine Arts Club IITB**   *(2021, 2022)*
- Participated in the **Doodle Designing Competition 'Art To Emancipate'** organized by Abhyuday as a part of 'Sangharsh: Conquering Covid' campaign in collaboration with **UNICEF**   *(2021)*
- Attained **1ˢᵗ** rank in the **Energize Quiz** organized by the **Energy Club**, IIT Bombay   *(2021)*
- Successfully completed **year long training** at **National Cadet Corps**, IIT Bombay   *(2021)*