VIPUL RAMTEKKAR

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Interests

- **Computer Vision, Machine Learning, Deep Learning, Robotics**
- **Key Courses**: Machine Learning, Deep Learning and Practices, Reinforcement Learning, Operating Systems, Data System and Security, Data Structure and Algorithms, Logic in Computer Science, Computer Programming

Education

Indian Institute of Technology Bombay — Mumbai, India
Bachelor of Technology, Department of Chemical Engineering — *July 2016 - Present*

- **GPA**: 8.74/10.0
- **Minor Degree**: Computer Science and Engineering

Research Experience

Video Object Tracking in UAVs | University of Missouri-Columbia, USA — *Summer 2019*
Prof. Kannappan Palaniappan, Electrical Engineering & Computer Science Dept — *MU, USA*

- Worked in **collaborative research** with the **US Army Research Lab** on embedded software and algorithm development for computer vision and machine learning applications for **Autonomous Unmanned Aerial Vehicle**
- Developed state-of-art video object tracker with **67% higher robustness & accuracy** compared to current trackers by fusing siamese deep network with motion flux and YOLO object detection for low-power embedded processing systems
- Worked on enhancing the tracking speed of **Spatial Pyramid Context Aware Tracker** by leveraging its multi-feature extractor and adding a deep learning component to it to achieve persistent detection and tracking of vehicles
- Developed a python based tool to **analyse trackers** and benchmarked them based on their accuracy and robustness

Transposon Classifier | University of Tokyo, Japan — *Summer 2018*
Prof. Shinichi Morishita, Computational Biology Dept — *UTokyo, Japan*

- Proposed a model to identify transposable elements by training a Support Vector Machine classifier with cosine similarity kernel. Achieving a **1.2x better** accuracy and **10x better** training time compared to the traditional classifier
- Implemented algorithms for sequence alignment and created data visualisations using JavaScript and D3 library
- Showcased the research project in the IIT Bombay's Research and Technology Symposium, ResTech 2018

Major Projects

Computer Vision Head | SeDriCa, Self Driving Car | UMIC IIT Bombay — *Autumn 2018 - Present*
Prof. Amit Sethi, Electrical Engineering Dept — *IIT Bombay*

- Leading a team of four students to implement various **deep learning methods** for **object detection, object classification** and **image segmentation** of the acquired visual input from the vehicle to achieve level 4 autonomy
- Amongst the top 11 teams out of 259 to be awarded Mahindra e2o car for the Mahindra Rise Driverless Car Challenge
- Implemented (in tensorflow) and analysed various encoder-decoder based CNN architectures for image segmentation
- Developed various python based tools to annotate, correct and remove incorrect instances from the datasets [news]

Chief Engineer | Matsya, Autonomous Underwater Vehicle (AUV) — *Autumn 2016 - Spring 2018*
Prof. Leena Vachhani, System and Control Dept — *RoboSub, AUVSI & US Office of Naval Research*

- Designed and developed a state-of-the-art unmanned **Autonomous Underwater Vehicle (AUV)** that localises itself and performs realistic missions based on feedback from visual, inertial, acoustic and depth sensor using thrusters/propellers
- Achieved **2nd position in the world** in **Robosub 2016** amongst 44 teams from 10 different countries and **National Winner** of Student AUV Competition, **SAVe 2017**, conducted by the National Institute of Ocean Technology (NIOT)
- Optimised and implemented design of pneumatically driven 2-DOF gripper picking a wide range of geometrical objects and enhanced the torpedo's design to create a locking mechanism for better pressure buildup
- Represented the team in various tech and research expositions and conducted interviews for the team recruitment [video]

Team Lead | Autonomous Strawberry Picking Bot | Inter IIT Technical Meet — *Autumn 2018-Winter 2018*
Led a team of 4 to build a prototype after conducting field surveys to identify automation solutions in farming to reduce labour

- Designed a bot which costs **84%** lower than annual labour cost & picks strawberries **6x faster** than manual picking
- Retrained a tiny yolo classifier with **transfer learning** to detect strawberries using Fruit-360 dataset and performed image augmentation using various computer vision methods like histogram equalization and linear transformations
- Awarded **Bronze Medal** based on prototype and pitch of the business model to a panel of professors and investors

User Mimicking ChatBot *Autumn 2018*
Prof. P Balamurugan, Industrial Engineering and Operations Research Dept *IIT Bombay*

- Created a chatbot by using a Sequence to Sequence Model that learns to converse like the user inspired from the popular show Black Mirror by training on his/her data from various social media accounts like Facebook, WhatsApp & LinkedIn
- Improved the model by adding Cornell Movie-Dialogs Corpus and used adaptive optimizers to reduce training time

Predicting Stock Market using Sentiment Analysis *Spring 2018*
Prof. Preethi Jyothi, Computer Science and Engineering Dept *IIT Bombay*

- Proposed a method to predict the closing price of a stock by training a LSTM Model incorporating the sentiment value
- Evaluated the sentiment value of the market, by carrying out sentiment analysis of the tweets related to the company extracted from twitter using Tweepy API, and categorised them into positive, negative and neutral

Autonomous Sanitation and Cleanliness Bot *Autumn 2017-Winter 2017*
Inter-IIT Technical Meet *IIT Madras*

- Designed a state of the art, light weight & compact toilet cleaning bot with 1-DOF arm to clean stains and a rotation flap to pick trash. Minimized the cost by **57%** and improved the cleaning time by **2.5x** against manual controlled machines
- Trained a **Haar Cascade Classifier** to detect the toilet, and detected the stains and trash using edge detection and colour thresholding, implemented communication between arduino & raspberry pi using pySerial to establish arm control

Modelling of Biological Phenomenon | Student Undergraduate Research Program *Summer 2017*
Prof. Ambarish Kunwar, Biosciences and Bioengineering Dept *IIT Bombay*

- Simulated motor proteins and achieved **90%** accuracy when detachment rate was compared to the simulated rate
- Implemented Monte-Carlo Simulations and Gillespie algorithm achieving **35%** reduction in time for simulation

Scholastic Achievements

- Selected for HPAIR'19 conference at Havard University in Cambridge, Massachusetts from a pool of 10,000+ applicants
- Awarded an **Academic Proficiency** grade (Top 1% in 152) for performing exceptionally well in *Solid Mechanics*
- Awarded the **UTSIP Scholarship** to pursue research in UTokyo amongst **30 students across the world**
- Awarded the **Institute Technical Color** for exceptional contribution towards the growth of tech in the Institute

Technical Skills

Programming	C/C++, Python, JavaScript, Java, HTML
Tools	keras, OpenCV, Tensorflow, Matlab, Gnuplot, LaTeX, Git, ROS, Solidworks, Android Studio, Ansys, Autocad

Key Courses Undertaken

Maths & Statistics	Calculus, Linear Algebra, Differential Equations I & II, Numerical Analysis, Data Analysis
Miscellaneous	Computational Biology, Product Research and Development, Process Control, Electrical and Electronics Circuits, Operations Analysis, Accounting and finance, Psychology, Basics of electricity and Magnetism, Quantum Physics

Positions of Responsibility

- **Editorial Board Member | Insight | Official Student Media Body of IIT Bombay** *Spring 2019 - Present*
  1 of the 20 editors heading 200+ journalists | 160+ articles | 50+ videos | 350k+ web views | 1.5 million+ online reach
  - Spearheading myriad of projects like analyzing research in the institute, reportage and worked on various initiatives like University Series blogs to help students make a more informed decision for graduate & post graduate programs
  - Surveyed **10k+** students to understand their inclination towards politics during the 2019 Lok Sabha elections
- **Academic Mentor | Department Academic Mentorship Program** *Spring 2018 - Present*
  - Selected as a Mentor (1/24 of 108) based on academics, ethics and peer reviews to guide sophomores to accelerate their performance by leveraging the resources in the department and to help them cope with the curriculum
  - Assisting academically weak students clear their backlogs by closely monitoring their performance & progress

Extracurriculars

- Ranked **4th out of 92** teams from IITB at **WorldQuant's International Quant Challenge-Stage 1** [*2019*]
- Achieved **2nd position** in Scientific Computation Blitz Competition participated by students institute-wide [*2018*]
- Ranked **1st** in Stock Market Game conducted by E-Cell, IIT Bombay in which 50+ teams participated [*2016*]
- Completed **80+** hours social work under NSS which involved conducting events for underprivileged children in collaboration with different NGOs and spreading awareness regarding various social issues [*2016-17*]
- Hobbies: travelling (60+ cities in 16 countries spread across three continents), trekking, reading and writing