

# VIPUL RAMTEKKAR

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## INTERESTS

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- **Computer Vision, Machine Learning, Deep Learning, Robotics**
- **Key Courses:** Machine Learning, Deep Learning and Practices, Reinforcement Learning, Medical Image Computing, Optimization, Operating Systems, Data System and Security, Data Structure and Algorithms, Logic in CS

## EDUCATION

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**Indian Institute of Technology Bombay**  
*Bachelor of Technology, Department of Chemical Engineering*

Mumbai, India  
*July 2016 - June 2020*

- **GPA:** 8.81/10.0
- **Minor Degree:** Computer Science and Engineering

## PUBLICATION

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- [pyTAG: python-based interactive training data generation for visual tracking algorithms](#)  
*Geospatial Informatics X (Conference Presentation)*  
Ekincan Ufuktepe, **Vipul Ramtekkar**, Ke Gao, Noor Al-Shakarji, Joshua Fraser, Hadi AliAkbarpour, Guna Seetharaman, and Kannappan Palaniappan

## INDUSTRIAL RESEARCH EXPERIENCE

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**Computer Vision Research Engineer | Honda Research & Development, Japan**  
*Robot Development, Honda Life Creation*

*Winter 2020 - Present*  
Tokyo, Japan

- Worked in **collaborative research with leading universities** to improve **perception** for autonomous robots
- Achieved **drastic improvement** in the performance of semantic segmentation in adverse environment by developing novel framework to utilise the synthetic images using **Deep Generative Models** to **bridge the domain gap**
- Implemented localization and vision nodes in **ROS 2** to **accelerate performance** in unknown environments

## ACADEMIC RESEARCH EXPERIENCE

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**Video Object Tracking in UAVs | University of Missouri-Columbia, USA**

*Summer 2019*  
MU, USA

*Prof. Kannappan Palaniappan, Electrical Engineering & Computer Science Dept [LOR]*

- 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*  
UTokyo, Japan

*Prof. Shinichi Morishita, Computational Biology Dept*

- 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

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**Computer Vision Head | SeDriCa, Self Driving Car | UMIC IIT Bombay**

*Autumn 2018 - Spring 2020*  
IIT Bombay

*Prof. Amit Sethi, Electrical Engineering Dept*

- 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

## 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

## 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%) for performing exceptionally well in *Solid Mechanics*
- Recipient of the **UTSIP Scholarship** and JST Travel Fund to pursue research in University of Tokyo, Japan
- Awarded the **Institute Technical Color** for exceptional contribution towards the growth of tech in the Institute

## TECHNICAL SKILLS

<b>Programming</b>	Python, C/C++, JavaScript, Java, HTML
<b>Frameworks &amp; Tools</b>	Pytorch, Tensorflow, JAX, Keras, OpenCV, Matlab, L <sup>A</sup> T <sub>E</sub> X, Git, ROS

## POSITIONS OF RESPONSIBILITY

- Editorial Board Member | Insight | Official Student Media Body of IIT Bombay** Spring 2019 - Spring 2020  
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 - Spring 2020
  - 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 **4<sup>th</sup> out of 92** teams from IITB at **WorldQuant's International Quant Challenge-Stage 1** [2019]
- Achieved **2<sup>nd</sup> position** in Scientific Computation Blitz Competition participated by students institute-wide [2018]
- Ranked **1<sup>st</sup>** 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 (100+ cities in 9 countries spread across three continents), trekking, reading and chess