

# KUNAL AGARWAL

+91 9820536577 ✉ [kunalagarwal1072002@gmail.com](mailto:kunalagarwal1072002@gmail.com) [in LinkedIn](#) [GitHub](#)

## EDUCATION

**Veermata Jijabai Technological Institute** 2020 – 2024  
*Bachelor of Technology in Computer Engineering; CGPA: 8.6/10* Mumbai, India

**Thakur College of Science and Commerce** 2018 – 2020  
*HSC: 93.54%* Mumbai, India

## RELEVANT COURSEWORK

- Data Structures
- Database Management
- OOPs
- Software Engineering
- Operating Systems
- Computer Networks
- Computer Architecture
- Parallel Computing
- Artificial Intelligence
- Linear Algebra
- Machine Learning
- Internet of Things

## EXPERIENCE

**Multi-Robot Autonomy Lab, IISER Bhopal** [🔗](#) | *Path Planning, Computer Vision* Dr. P. B. Sujit  
*Research Intern* Dec 2022 – Present

### *Path Planning of UAVs using CFD and MPC*

- The changing wind patterns around obstacles can increase the **turning radius** for **Unmanned Aerial Vehicles (UAVs)**
- Studied and designed a **Model Predictive Controller (MPC)** using the Multiple Shooting Method to move the UAV from one point to another along an optimized trajectory against a constant wind flow and implemented obstacle avoidance using the MPC controller.
- Working on developing a **machine learning model** to predict these wind patterns around obstacles
- Working on **generating flow fields** around random points in the UAV's workspace

### *Collision avoidance of UAVs using NERFs*

- Working on implementing **Dynamic Collision Avoidance Algorithms for UAVs using Neural Radiance Fields(NeRF)**
- Researched and understood about **Signed Distance Fields(SDF)** and **Incremental Signed Distance Fields(iSDF)** and how they can be used for perception in UAVs
- Currently understanding and trying to modify the code of iSDF for our use case
- Doing a Literature Survey on **dynamic obstacle avoidance** algorithms

**Google Summer of Code with libcamera** [🔗](#) | *C++, OpenGL, Raspberry Pi* Mr. Laurent Pinchart  
*Open Source Developer* June 2022 – Nov 2022

- Implementing **GPU-based software ISP**(Image Signal Processor) within libcamera framework to make it compatible with devices that doesn't have a hardware ISP
- Used **Generic Buffer Management(GBM)** utility of Mesa to export buffers for GPU to be used as framebuffer for rendering textures including use of dmabufs to achieve zero-copy of data in memory
- In the Software ISP, All Image processing algorithms like **Demosaicing, Auto-white balance, Auto-contrast** and so on are implemented using **OpenGL Compute Shaders** to perform all the computations in GPU
- This GPU-based software ISP is further integrated with the **Simple Pipeline handler** of libcamera, which supports a range of simplistic platforms with a common generic handler

## PROJECTS

**Functional Weeder** [🔗](#) | *Elixir, Raspberry Pi* Oct 2021 – Mar 2022

- This project was built for **e-Yantra Robotics Competition 2021-22** conducted by IIT Bombay
- Modified and implemented **path finding and obstacle avoidance algorithms like A\*** in functional programming language(**Elixir**) to make the robot reach its goal position while avoiding obstacles
- Used **Phoenix Web framework** to establish communication between client and server using **Websockets** and **Pubsub** for creating a Liveview of robot's arena to show its movement on a webpage
- Implemented **Line Following** algorithm using **PID control** on the alphanbot and designed **arm mechanisms** for Sowing and Weeding tasks

**Street Racer** [↗](#) | *HTML, CSS, Phaser.js, Python, OpenCV, Socket.io, Flask*

**Nov 2021 – Jan 2022**

- Made a **Gesture-controlled** 2D Car Racing game using **phaser.js**
- Implemented steering control using hand gestures with help of **OpenCv** library of Python
- Used **Socket.io** and **flask** to incorporate client-server mechanism and link gesture control with game over server

**Sketch-2-Paint** [↗](#) | *Python, Deep Learning, Neural Networks, CGANs, Tensorflow*

**Aug 2021 – Oct 2021**

- Built a **Conditional Generative Adversarial Network** which accepts a 256x256 px black and white sketch image and predicts the colored version of the image without knowing the ground truth
- Learnt and implemented concepts of **Linear Algebra**, Neural networks, Activation functions, **Convolutional Neural networks**, U-net, Res-net and **optimization of model** based on different parameters
- Learnt about **semi-supervised learning** and implemented GANs using **Tensorflow** and **keras** libraries of Python
- Trained our model on **Anime Sketch Colorization Pair** consisting of 14k images

**AirMouse** [↗](#) | *Python, OpenCV, Mediapipe, NumPy, Mouse*

**July 2021**

- A virtual mouse system using Web camera to interact with the computer in a more user friendly manner that can be an alternative approach to touch screen
- Implemented mouse control (without touching) with the help of **Mouse**, **OpenCV** and **Mediapipe** libraries of Python

## TECHNICAL SKILLS

---

**Languages** : Python, C, C++, Elixir, OpenGL

**Web Developer Tools** : HTML, CSS, Javascript, Phaser.js, Flask, WebSockets

**Technologies/Frameworks** : Linux, Git, Github, ROS, ROS2, Gazebo, Coppeliassim, Rviz, MATLAB, CasADi, Tensorflow, Keras, Phoenix, Raspberry Pi

**Domains Explored** : Robotics, Control Systems, SLAM, Computer Vision, Image Processing, Web Development

## ACHIEVEMENTS

---

**e-Yantra Robotics Competition by IIT Bombay** [↗](#)

- Secured **4th rank out of 250+ teams** in the e-Yantra Robotics Competition (**Theme: Functional Weeder**), an **international level competition** held by **IIT Bombay**

**Digital Campus Hackathon by VJTI, Mumbai** [↗](#)

- Secured **2nd position** in the **Administrative track** of the Digital Campus Hackathon conducted by VJTI, Mumbai
- Built a **Online Scholarship portal** to digitalize scholarship application process and provide a centralized platform for students to get information and interact with the Scholarship Department of VJTI

**HACKNICHE by DJ Sanghvi, Mumbai** [↗](#)

- Shortlisted as **Top 5 teams** in the Hackniche Hackathon 2023, conducted by DJ Sanghvi College of Engineering, Mumbai
- Built **HackTrack** - a Web application for shortlisting teams based on their resume score and communication between Hackathon organizers and participants

## MHT-CET EXAMINATION

- Secured **99.93 percentile** in the MHT-CET examination, a state entrance examination for engineering majors in PCM.

## COMMUNITY & LEADERSHIP

---

**Society of Robotics and Automation, VJTI** [↗](#)

**June 2021 – present**

*Core Member and Lecturer*

- Managed, mentored and co-conducted **Wall-E** [↗](#) (Self-balancing Robot), **Mario** [↗](#) (3 DOF Robotic Arm) Workshops and **Pixels** [↗](#) (Image Processing and Computer Vision) Seminar for over more than 150 students
- Delivered lectures on **I2C Communication Protocol** and **Separable Convolutions** in these workshops
- Mentored juniors for projects on **Constructing an Image Pipeline** and **GPGPU with Gles** in Eklavya mentorship program

**Community of Coders, VJTI** [↗](#)

**Jan 2023 – present**

*Student Mentor*

- Mentored Juniors for project on **Web Application for Number plate detection** using OpenCV in Inheritance mentorship program 2022-23