

Pranav Deo

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Outlook

Passionate about research in **Deep Reinforcement learning** and **Computer Vision** with keen interest in it's real-life application in **Autonomous Systems** and **Robotics**.

Professional Experience

Honda Robotics

Tokyo, Japan

Robotics Research Engineer

Oct'21 - Present

- Benchmarked established online and offline algorithms for **dexterous in-hand manipulation** tasks in simulation
- Implemented hybrid learning algorithms on an in-house robot hand, achieving successful dexterous task mastery
- Utilized multi-modal sensor input to train and deploy enhanced learning algorithms in simulation and real robot
- Constructed real-time teleoperation pipeline and collected task demonstrations using it on real hardware
- Engineered a robust solution for 6D pose estimation of a marked object using a RGB multi-camera system

Daikin Japan

Remote

Computer Vision Intern

Jun'20

- Achieved **95%** test accuracy on edge devices, training object detection on a **custom web-scraped dataset**
- Created a **browser based interface** for serving the custom detection model using Tensorflow.js and JavaScript

Tactopus

Remote

Software Engineer Intern

Dec'18

- Developed an integrated solution using Python for live processing of audio-augmenting AR print material
- Modified the system to work on **live feeds** from **smartphone camera** with a native application for ease of use

Education

Indian Institute of Technology Bombay (IITB)

Mumbai, India

B.Tech in Civil Engineering | GPA - 9.26

Jul'17 - May'21

- Completed **dual minor degrees** in Computer Science and Engineering and AI and Data Science
- **Key courses:** Robotics, Advanced Machine Learning, Medical Image Computing, Machine Learning for Remote Sensing, Data Structure and Algorithms, Data Science, Electrical and Electronics circuits

Publication

Offline Reinforcement Learning with Mixture of Deterministic Policies

Takayuki Osa, Akinobu Hayashi, **Pranav Deo**, Naoki Morihira, Takahide Yoshiike

TMLR, Sep'23

Introduced the technique of mixture of deterministic policies which addresses the problem of multi-modality of offline RL policies and significantly improves the training stability and performance of the policy

Key Technical Projects

Mahindra RISE Driverless Car Challenge | Autonomous Vehicles

Jan'18 - May'21

Prof. Amit Sethi

One of the 11 finalists among 259 teams (prize money - **\$ 1 million**)

- Part of the team SeDriCa - developing **India's 1st self-driving car** targeting level 4 autonomy for Indian conditions
- **Stereo Vision:** Implemented object detection and distance estimation using pointcloud and corresponding images
- **Computer Vision:** Designing **multi-task network** for perception; **30%** efficiency increase expected in real-time
- **Localization:** Worked on the **SLAM** of the car using pre-recorded sensor data of 3D lidar, GPS and IMU
- **Vehicle dynamics:** Applied adaptive **PID** and **NMPC** control for **20%** and smoother velocity and steering profile
- **Simulations:** Built a car model with all mounted sensors in **CARLA** environment based on Unreal engine
- **Path Planning:** Implemented **Hybrid A*** and **RRT*** informed algorithms to work in real time in **ROS** environment

Histopathology Image Retrieval | Deep Learning

Apr'20 - May'20

Prof. Amit Sethi

- Developed an encoder-decoder based **multi-task** model for hash code generation of histopathology images
- Trained the multi-task network using **cosine cross entropy** and **Cauchy quantization** for convergence of hash codes
- Achieved **96%** accuracy with unsupervised clustering of images and hashes using K-nearest neighbour network

COVID-19 Diagnosis | Deep Learning

Mar'20 - May'20

Prof. Suyash Awate

- Trained a COVID-19 classification network (Resnet-50) in **Pytorch** using chest X-Ray images with **84% test accuracy**
- Analyzed the latent features of COVID-19 positive X-rays and studied the **intra-class variation** among patients
- Applied **GradCAM** and **LIME** for better medical interpretability of symptoms in lung area with t-SNE visualizations

Positions Of Responsibility

Overall Coordinator | Unmesh Mashruwala Innovation Cell, IIT Bombay

May'20 - May'21

Heading a team of **50 students** working on autonomous ground and aerial vehicles with international participation

- Orchestrated the **two-month long** recruitment process of **150** aspirants having interviews, training and projects
- Negotiated with IIT Bombay authorities for revamping of a 1400 sq.ft. lab with an estimated budget of **₹4 million**
- Created the UMIC **alumni network** with **50+ alumni** currently, organising regular **lectures** on innovation and AI
- Planned publicity drives on digital platforms, reaching over **7.6k+** students and entrepreneurs all over India

Undergraduate Teaching Assistant | IIT Bombay

- **Computer Programming and Utilization** | Prof. Sharat Chandran | Dept. of CSE Summer'19
Mentored back-logged students individually, facilitated discussion on online class forum, graded homeworks
- **Engineering Graphics and Drawing** | Prof. Salil S. Kulkarni | Dept. of ME Spring'21
Created detailed weekly solutions on AutoCAD and SolidWorks for assessment of solutions, graded submissions

Coordinator | Events, Techfest, IIT Bombay

May'18 - Dec'18

Asia's Largest Science and Technology Festival | Audience of 1,75,000 | Reach of 2500+ colleges in India

- Set a new **Guinness World Record** by assembling 5000+ School children in one place with self-made solar lamps
- Coordinated with international and national artist groups and arranged their infrastructure and property needs

Skills

Languages	English (<i>native</i>), Japanese (<i>intermediate</i> , JLPT N3), Hindi(<i>native</i>), Marathi(<i>native</i>)
Programming	C++, Bash, ROS, Python, OpenCV, Pytorch, Tensorflow, MATLAB, HTML, SQL, AWS
Softwares	Git, SolidWorks, MATLAB, ANSYS, MSC ADAMS, AutoCAD, Arduino IDE, \LaTeX

Achievements

- Graduated as **Department Rank 5** in the batch of 102 B.Tech students '21
- Recipient of **Institute academic prize (< 1%)** for consistent high academic performance at IIT Bombay '20
- Awarded **Institute Technical Color (< 0.5%)** for exceptional contribution to the technical sphere '20
- Secured All India Rank **1681** in JEE Advanced out of nearly **0.2 million** candidates '17

Other Projects

ASME Student Design Challenge | Robotics

Aug'18 - Dec'18

Prof. Abhishek Gupta

- Stood **first** in **Asia-Pacific** level and qualified for international level winning prize money of **\$500**
- Worked in the **mechanical subsystem** of the project; contributed to design, manufacturing and assembly of robot

International Robowars | Heavy Robotics

Dec'17

Techfest, IIT Bombay

- Designed a symmetric **120 lbs** robot equipped with a heavy rotating drum, capable of obliterating the opponent
- Assembled the bot and finalized the design after considering various constraints, **armour materials** and **weapons**