Rugved Katole

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Education

Birla Institute of Technology and Science, Pilani **Aug 2018 – May 2022**
B.E. , Mechanical Engineering; **CGPA: 8.52**

Bachelor Thesis: Prioritized patrolling of a structured environment using multiple autonomous vehicles

Publications

Autonomous Intersection Management for Non-Communicative Autonomous Vehicles Preprint 2023
Rugved Katole, Arpita Sinha, **Frontiers Robotics and AI 2023** (Under Review)

Balanced Priority Patrolling with Rabbit Walks Preprint 2023
Rugved Katole, Deepak Mallya, Arpita Sinha, Leena Vachhani

Multi-Agent Reinforcement Learning for Heterogeneous UAV Swarm Enabling Detailed Crop Health Assessment Paper 2023
Rugved Katole, Kevyn Angueira, Arpita Sinha, Christopher Stewart, **IROS Workshop 2023**

Swarm Synergy: Communication-free Community Formation Preprint 2023
Sweksha Jain, *Rugved Katole*, Leena Vachhani, **IEEE RAL** (Under Review)

MEMS based pressure sensor for detection of negative pressure wave in subsea pipelines Paper 2021
Sumit Kumar[+], *Dhyan Patel*[+], *Rugved Katole*[+], *Ujwal Gandhi*[+], **65th DAE Solid State Physics Symposium (2021)**

Experience

Research Assistant | TIH Foundation, Indian Institute of Technology Bombay **Dec 2022 – Present**
Supervisors: Prof. Arpita Sinha, Prof. Christopher Stewart

- Developed a Reinforcement Learning algorithm reducing the operational costs related to exhaustive scouting
- Through CNNs achieved 90% crop health prediction accuracy by sampling just 40% of the field.
- Increase efficacy by cutting labor costs by 4.8x and boosting profits by 36%.

Research Assistant | ARMS Lab, Indian Institute of Technology Bombay **May 2022 – Dec 2022**
Supervisor: Prof. Arpita Sinha

- Developed an Autonomous Intersection Management algorithm for self-driving cars
- Achieved 12 times better performance than Adaptive traffic lights without any infrastructure.
- Developed a complete motion-planning stack using MPC and finite state machines

Research Intern | ARMS Lab, Indian Institute of Technology Bombay **Dec 2021 – May 2022**
Supervisor: Prof. Arpita Sinha

- Developed a real-time implementable priority patrolling algorithm with time bounds
- Achieved $\approx$ 10% better performance than state-of-the-art for maximum priority node idleness
- Validated algorithm's real-time nature through turtlebot3 experiments

Research Intern **May 2020 – Jul 2020**
Reyn Labs, Sirius Motorsports

- Generated large data sets through variation of Engine parameters
- Anlaysed generated data and reduced emissions by 15% and increased torque by Engine Calibration.

Technical Skills

- Python
- MATLAB
- ::ROS ::ROS2
- Computer Vision
- C++ Language
- Deep Learning
- Solidworks
- Git versioning

[+] Equal Contributions, * MOOC

Relevant Coursework

- Mechanisms and Robotics
- Control Systems
- Modern Control Systems
- Digital Image Processing
- Mobile Robotics*
- MEMS
- Motion Planning and Control (IIT Bombay)
- Aerial Robotics*

Research Projects

Distributed Consensus in Multi-Vehicle Cooperative Control | *Robotics* **Aug 2021 – Dec 2022**
Supervisor: Prof. Rakesh R. Warier BITS Pilani

- Developed and implemented multi-agent consensus algorithms incorporating single integrator, double integrator, and unicycle dynamics in MATLAB.
- Designed and utilized bipartite graphs to establish two distinct groups for consensus, enabling the creation of pursuit-evasion game strategies.

Denoising DIC Displacement Images | *Computer Vision* **Aug 2021 – Dec 2022**
Supervisor: Prof. Iniyan Thiruselvam BITS Pilani

- Developed and efficiently trained a deep learning pipeline with 40,000+ images.
- Achieved an MSE of 2.12×10^{-5} and reduced noise by 98.89% for test data.

Noise reduction of Centrifugal Pump |*Computational Fluid Dynamics* **Aug 2020 – May 2021**
Supervisor: Prof. Pritanshu Ranjan BITS Pilani

- Designed and simulated trapezoidal impeller blade geometries for noise reduction.
- Performed Acoustic analysis on pumps with modified blade design.

Honors and Awards

Merit-Cum-Need Scholarship **Aug 2020 – May 2022**
Among Top 11% awardees in batch BITS Pilani

Merit-Cum-Need Scholarship **Aug 2019 – May 2020**
Among Top 20% awardees in batch BITS Pilani

Senior Secondary College Rank 5 **Aug 2017 – May 2018**
Overall college rank 5 in board exams Nutan Marathi Vidyalaya

Leadership

SAE BITS Goa **Aug 2020 – Aug 2021**
Chairperson BITS Pilani

- Led a club of 150+ student members involved in engineering design challenges.
- Provided mentor-ship to new student members and organized educational webinars to enhance their technical expertise.

BITS Goa Racing **Aug 2020 – Aug 2021**
Team Manager BITS Pilani

- Managed a team of 50 members designing a formula student car.
- Designed workflows and raised sponsorship worth 150K INR through various modes.

Social Work

Instructor | Cause: Education **Aug 2020 - Nov 2020**
Center for Technical Education

- Facilitated the learning of engineering design and analysis fundamentals to Freshman students through the effective utilization of multiphysics simulation software.

Volunteer | Cause: Educational Awarness **Feb 2019**
BITS Goa Racing Program Glimpses

- Spreading awareness about STEM careers among school students in goa.

Volunteer | Cause: Education **Nov 2018**
Nirman Goa chapter

- Providing free tuition to underprivileged students of zuari slum and helping them achieve a better future.