

# RUGVED KATOLE

+91 8329148761 ✉ katolerugved22@gmail.com 🌐 github.com/RugvedKatole

## Education

Birla Institute of Technology and Science, Pilani  
B.E. , Mechanical Engineering; **CGPA: 8.52**

Aug 2018 – May 2022

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

## Publications

### Priority Hops for Efficient bounded Patrolling with Priority locations

*Rugved Katole, Deepak Mallya, Arpita Sinha, Leena Vachhani, IEEE RAL (Under Review)*

Preprint 2023

### Decentralized Management of Road Intersections without Communication

*Rugved Katole, Arpita Sinha, Frontiers Robotics and AI 2023 (Under Review)*

Preprint 2023

### Swarm Synergy: Communication-free Community Formation

*Sweksha Jain, Rugved Katole, Leena Vachhani, IEEE RAL (Under Review)*

Preprint 2023

### Multi-Agent Reinforcement Learning for Heterogeneous UAV Swarm Enabling Detailed Crop Health Assessment

*Rugved Katole, Kevyn Angueira, Arpita Sinha, Christopher Stewart, IROS Workshop 2023*

[Paper](#)

MEMS based pressure sensor for detection of negative pressure wave in subsea pipelines

*Sumit Kumar<sup>+</sup>, Dhyan Patel<sup>+</sup>, Rugved Katole<sup>+</sup>, Ujwal Gandhi<sup>+</sup>, 65th DAE Solid State Physics Symposium (2021)*

[Paper](#)

## Experience

**Research Assistant** | TIH Foundation, Indian Institute of Technology Bombay

Feb 2023 – 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%.

**Junior Research Fellow** | ARMS Lab, Indian Institute of Technology Bombay

May 2022 – Feb 2023

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

Nov 2022 – 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
- Analysed generated data and reduced emissions by 15% and increased torque by Engine Calibration.

## Relevant Coursework

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

## Technical Skills

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

## Research Projects

<b>Distributed Consensus in Multi-Vehicle Cooperative Control</b>   <i>Robotics</i> Supervisor: Prof. Rakesh R. Warier	<b>Aug 2021 – Dec 2022</b> BITS Pilani
<ul style="list-style-type: none"><li>Developed and implemented multi-agent consensus algorithms incorporating single integrator, double integrator, and unicycle dynamics in MATLAB.</li><li>Designed and utilized bipartite graphs to establish two distinct groups for consensus, enabling the creation of pursuit-evasion game strategies.</li></ul>	
<b>Denoising DIC Displacement Images</b>   <i>Computer Vision</i> Supervisor: Prof. Iniyar Thiruselvam	<b>Aug 2021 – Dec 2022</b> BITS Pilani
<ul style="list-style-type: none"><li>Developed and efficiently trained a deep learning pipeline with 40,000+ images.</li><li>Achieved an MSE of <math>2.12 \times 10^{-5}</math> and reduced noise by 98.89% for test data.</li></ul>	
<b>Noise reduction of Centrifugal Pump</b>   <i>Computational Fluid Dynamics</i> Supervisor: Prof. Pritanshu Ranjan	<b>Aug 2020 – May 2021</b> BITS Pilani
<ul style="list-style-type: none"><li>Designed and simulated trapezoidal impeller blade geometries for noise reduction.</li><li>Performed Acoustic analysis on pumps with modified blade design.</li></ul>	

## Leadership

<b>SAE BITS Goa</b> Chairperson	<b>Aug 2020 – Aug 2021</b> BITS Pilani
<ul style="list-style-type: none"><li>Led a club of 150+ student members involved in engineering design challenges.</li><li>Provided mentor-ship to new student members and organized educational webinars to enhance their technical expertise.</li></ul>	
<b>BITS Goa Racing</b> Team Manager	<b>Aug 2020 – Aug 2021</b> BITS Pilani
<ul style="list-style-type: none"><li>Managed a team of 50 members designing a formula student car.</li><li>Designed workflows and raised sponsorship worth 150K INR through various modes.</li></ul>	

## Social Work

<b>Instructor</b>   Cause: Education Center for Technical Education	<b>Aug 2020 - Nov 2020</b>
<ul style="list-style-type: none"><li>Facilitated the learning of engineering design and analysis fundamentals to Freshman students through the effective utilization of multiphysics simulation software.</li></ul>	
<b>Volunteer</b>   Cause: Educational Awareness BITS Goa Racing Program	<b>Feb 2019</b>
<ul style="list-style-type: none"><li>Spreading awareness about STEM careers among school students in goa.</li></ul>	
<b>Volunteer</b>   Cause: Education Nirman Goa chapter	<b>Nov 2018</b>
<ul style="list-style-type: none"><li>Providing free tuition to underprivileged students of zuari slum and helping them achieve a better future.</li></ul>	