

# AFZAL AHMAD

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## EDUCATIONAL BACKGROUND

<b>Czech Technical University in Prague, Czech Republic</b> Master of Science (M.Sc) in Artificial Intelligence Department of Computer Science	2020 - 2022 GPA: 1.7/4
<b>Indian Institute of Technology (IIT) Guwahati, India</b> Bachelor of Technology (B.Tech) in Electrical Engineering Department of Electronics and Electrical Engineering	2015 - 2019 GPA: 7.38/10

## PUBLICATIONS

Tatana Prihodova, Giuseppe Silano, **Afzal Ahmad**, Vit Kratky, Tomas Baca, Pavel Petracek, Vera Saskova, Jan Bednar and Martin Saska. *"2022 IEEE Robotics and Automation Society Summer School on Multi-Robot Systems in Prague [Education]"*, IEEE Robotics & Automation Magazine (RAM), March 2023.

**Afzal Ahmad**, Daniel Bonilla Licea, Giuseppe Silano, Tomas Baca and Martin Saska. *"PACNav: A Collective Navigation Approach for UAV Swarms Deprived of Communication and External Localization"*, Bioinspiration & Biomimetics journal (BnB), Nov. 2022.

**Afzal Ahmad**, Viktor Walter, Pavel Petracek, Matej Petrlik, Tomas Baca, David Zaitlik and Martin Saska. *"Autonomous Aerial Swarming in GNSS-denied Environments with High Obstacle Density"*, IEEE International Conference on Robotics and Automation (ICRA) 2021.

Andriy Dmytruk, Tiago Nascimento, **Afzal Ahmad**, Tomas Baca, and Martin Saska. *"Safe Tightly-Constrained UAV Swarming in GNSS-denied Environments"*, International Conference on Unmanned Aircraft Systems (ICUAS) 2021.

**Afzal Ahmad**, Vojtech Vonasek and Martin Saska. *"Cooperative path planning for multiple MAVs operating in unknown environments"*, International Conference on Unmanned Aircraft Systems (ICUAS) 2020.

## RESEARCH EXPERIENCE

<b>Multi-Robot Systems Lab, Prague, Czech Republic</b> <i>Research Engineer</i>	Dec 2022 - Ongoing
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- Designing a simulator for learning high-speed, safe flight for a swarm of UAVs.
- Improving and maintaining existing open-source libraries and code-base for other projects.

<b>Multi-Robot Systems Lab, Prague, Czech Republic</b> <i>Research Assistant, Advisor: Dr. Martin Saska</i>	Aug 2019 - Dec 2022 <i>paper, video</i>
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- Designed decentralized control algorithms for collective navigation of a swarm of UAVs.
- Focused on self-organized flocking and path planning in an obstacle-rich environment (forests).

<b>Collaborative transport using multiple UAVs, IIT Guwahati, India</b> <i>Bachelor's Thesis, Advisor: Dr. Indrani Kar</i>	Aug 2018 - Apr 2019 <i>paper</i>
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- Designed a path planning method based on rapidly exploring random tree (RRT) algorithm for UAV navigation in an obstacle-rich urban environment.
- Designed an algorithm for cooperative navigation of UAVs using the path planning approach.

## MIST Lab, Polytechnique Montreal, Canada

May 2018 - July 2018

*Research Intern, Advisor: Dr. Giovanni Beltrame*

- Worked on a ROS-based architecture for path planning and control of multi-UAV systems.
- Developed a framework for long-term autonomy of a multi-robot system using adaptive locomotion.

## Indian Institute of Technology (IIT) Guwahati, India

June 2017 - Dec 2017

*Research Intern, Advisor: Dr. Prithwijit Guha*

- Developed a model-based learning technique for locomotion of a nonholonomic snake robot (ASROA).
- Used the learned model to implement obstacle avoidance in a simulated environment.

## HONORS AND AWARDS

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- Selected among the **top 6** Masters thesis dissertations for the **Cena Wernera von Siemens awards** under the **Industry 4.0** category (for potential impact on the new age of industrial revolution).
- Awarded a scholarship to cover tuition fees for the master's program at **Czech Technical University in Prague**.
- Awarded the **Shastri Research Student Fellowship** to pursue a research internship at **Polytechnique Montreal, Canada** (only awarded to 18 students all across India).
- Awarded **Best Secretary** among 11 technical societies (clubs) of IIT Guwahati. Also awarded the **Best Club** award for my tenure.
- Secured a rank of 4591 among 118,000 students in **IIT JEE**, Joint Entrance Exam - Advanced.

## INDEPENDENT PROJECTS

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### ARLE: Autonomous Robot for Library Enhancement

Aug 2017 - April 2019

*4i Lab, IIT Guwahati*

- Implemented autonomous navigation and collision avoidance and guided the team to integrate the control system with navigation to achieve smooth trajectories during locomotion.

### HIVE: Distributed swarm system

Dec 2016 - Feb 2017

*Robotics Club, IIT Guwahati*

- Implemented a modified version of Particle Swarm Optimisation (PSO) algorithm for self-organized flocking and collaborative search.

### KBT: Autonomous football playing robot

Sep 2016 - Oct 2016

*Personal project, IIT Guwahati*

- Designed an autonomous robot to play football using object tracking and path planning to accomplish maximum goals in the shortest possible time.

## TECHNICAL SKILLS

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### Programming Languages

C++, Python, C

### Softwares & Tools

OpenCV, Gazebo, Docker, Singularity, Git, V-rep, L<sup>A</sup>T<sub>E</sub>X, Solidworks, MATLAB

### Operating Systems

Ubuntu, Robot Operating System (ROS1 and ROS2)

### Hardware

Intel NUC, Raspberry Pi, Pixhawk Autopilot, Arduino

## RELEVANT COURSES

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<b>Undergraduate</b>	Advanced Control Systems, Pattern Recognition and Machine Learning, Probability and Random Processes, Parallel Computing, Embedded Systems
<b>Masters</b>	Computational Game Theory, Statistical Machine Learning, Deep Learning, Combinatorial Optimization, AI in Robotics, Evolutionary Algorithms

## VOLUNTEERING

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**Team leader, ARLE Project** Aug 2017 - April 2019  
*4i Lab, IIT Guwahati, India*

- Lead a team of 9 students to automate book retrieval and library management tasks at the Central Library of IIT Guwahati.
- Guided with software and overall design of the robot. The team implemented the first version capable of autonomous navigation in the library.

**Secretary (Head of the student organisation)** Aug 2017 - March 2018  
*Robotics Club, IIT Guwahati, India*

- Lead a group of 40 students to organize workshops and hackathons in IIT Guwahati.
- Managed independent student projects and participated in regional and national competitions.

**Coordinator and instructor** May 2016 - July 2016  
*Avanti Learning Centers, New Delhi, India*

- Conducted a workshop on introduction to robotics for underprivileged high school students.
- All the students were able to build their own Bluetooth-controlled robot after the workshop.