भारतीय प्रौद्योगिकी संस्थान मुंबई
INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

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IIT Bombay Racing Team Excels At Formula Student AI 2025 Competition

Mumbai, September 3, 2025: At the prestigious Formula Student AI 2025 competition held at Silverstone Circuit, UK, the IIT Bombay Racing team secured an overall 4th place among 25 international teams, becoming the first-ever Indian team to complete a dynamic event in FS-AI history.

Key Highlights:

1. **Track Drive (Dynamic Event):** 3rd Place – Successfully completed 10 fully autonomous laps without hitting a single cone

2. **Static Events:** 3rd Place Overall

   - **Business Plan Presentation:** 3rd Place

   - **Real World AI:** 4th Place

IIT Bombay Racing EV – with its newest electric race car, *E14* – proudly represented India at the Formula Student Netherlands 2025 competition, held at the historic TT Circuit Assen, Netherlands.

Introduction:

IIT Bombay Racing Driverless is the autonomous division of IIT Bombay Racing, India's premier Formula Student team. Focused on building a fully driverless race car for global competitions like Formula Student AI at Silverstone, the team integrates cutting-edge hardware—including LiDARs, stereo cameras, and high-performance embedded systems—with custom-built AI algorithms for perception, localization, planning, and control. The project reflects IIT Bombay's commitment to pushing boundaries in autonomous mobility and systems integration.

History:

2007: IIT Bombay Racing was established

2012: IIT Bombay Racing made India's first Formula Student EV race car

2021: Driverless division was established

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2023: We became the first Indian team to compete in the autonomous version of Formula Student UK, achieved 3rd position in RWAI

2024: Secured top-5 rankings in Engineering Design and Business Plan Presentation

2025: Became the first Indian Team to complete a dynamic event and win overall 4th position, and 3rd position in statics

Performance Summary:

The IIT Bombay Racing Team secured a 4th overall rank out of 26 teams from all over the world at the Formula Student AI (FS-AI) 2025 competition held at the Silverstone Circuit, United Kingdom.

Individual event results:

- **Track Drive:** 3rd Place - completed 10 fully autonomous laps without hitting even a single cone

- **Business plan presentation:** 3rd Place

- **Real World AI:** 4th Place

Competition Description:

Static Events:

Static events consist of multiple competitions aimed at assessing the concepts of students on the systems they have developed. Some of these are specifically aimed at the understanding of students at an industrial level of tools and systems used:

- **Business plan presentation:** Teams pitch their autonomous systems start-up idea to judges who act as investors

- **Real World AI:** Teams present a case study focusing on expanding autonomous vehicles use in a specific country

- **Simulation Development:** Teams showcase their simulation work, a critical step in testing algorithms for edge cases and ensuring hardware safety in real-world environments.

- **Autonomous Design:** An overview of all the RnD and implementation work done

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Dynamic Events:

Dynamic events are the events where teams actually run the car: Track drive is a dynamic event where the car is supposed to manoeuvre through a complex cone demarcated track for ten laps and come to a complete stop after.

Brief Overview of our system:

Sensor Suite:

- **NVIDIA Jetson Orin AGX**: High-performance onboard compute platform

- **2× ZED2i Stereo Cameras** – For visual perception and depth estimation

- **Velodyne VLP-16 LiDAR** – For robust 3D mapping and obstacle detection

- **SBG Systems' Ellipse-N (GNSS/INS IMU)** – For precise localisation and state estimation

Software Architecture:

- **Perception (Eyes of the car):** This subsystem enables the car to detect and locate the cones on the track. We have 3 pipelines running using multiple stereo cameras and a LiDAR.

- **Simultaneous Localisation and Mapping (SLAM):** Our car builds a real-time map of its surroundings while simultaneously estimating its own position within it, using an advanced implementation of GraphSLAM. The system is powered by robust and reliable data association techniques, showing consistent performance in dynamic environments.

- **Path Planning and Controls (PPC):** Once the environment is perceived, the smoothest and fastest path is then found for the car using advanced methods like Delaunay Triangulation. Control algorithms like Stanley controller and Model Predictive Control (MPC) enable the car to navigate following this created path at the maximum possible speed.

- **Hardware Integration (AISD):** Our Autonomous Integration and Simulation Development (AISD) sub-division focuses on integrating software modules and testing them under different real-world scenarios using Software-in-the-Loop (SIL) and Hardware-in-the-Loop (HIL) setups. Furthermore, we've also developed a 1:6 scale autonomous prototype, which allows us to validate and fine-tune our algorithms in a controlled environment before deploying on the full-scale car.

Integration with a full size vehicle: We have successfully integrated our complete autonomous software stack into our in-house, Formula Student-style electric race car. Doing so we have become

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the first Indian team to develop a fully autonomous race car. This includes implementation of CAN-based communication, control of electromechanical actuators, and precise coordination of the perception, planning, and control modules for safe and repeatable autonomous operation on the track.

About IIT Bombay: The Indian Institute of Technology Bombay, set up in 1958 as the second IIT, is recognised worldwide as a leader in the field of science and engineering education and research. The Institute was granted the status of 'Institution of Eminence' by the Ministry of Education (the then Ministry of Human Resources Development) on July 9, 2018. IIT Bombay is reputed for the quality of its faculty, cutting edge research, industry relations and the outstanding calibre of students graduating from its undergraduate and postgraduate programmes. The Institute has 17 academic departments, 35 other academic entities (Centres/ Programmes/ Academic facilities/ Hubs/ Externally funded centres and Labs) and three schools. Over the last six decades, more than 75,000 engineers and scientists have graduated from the Institute. The Institute has 751 faculty members and about 150 visiting and part-time faculty, recognised nationally and globally for their excellence in education and research. On June 19, 2025, IIT Bombay was ranked 2nd in India and 129th in the world in the Quacquarelli Symonds (QS) World University Rankings for 2026. On March 12, 2025, IIT Bombay was ranked 28th in Engineering and Technology in the Quacquarelli Symonds (QS) World University Rankings by Subject for 2025.

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