

Bosch Future Mobility Challenge

Team: Autonomists

Date: February 09, 2026

Brief Background on the Bosch Future Mobility Challenge (BFMC)

The Bosch Future Mobility Challenge is a prestigious international competition organized by Bosch Engineering Center Cluj since 2017. It is open to Bachelor and Master students worldwide. Selected teams receive a 1:10 scale autonomous vehicle platform from Bosch and must develop advanced software algorithms for fully autonomous driving in a miniature smart-city environment. The track includes lanes, traffic signs (over 20 types), traffic lights, multi-lane intersections, pedestrian crossings, a highway section, precise parking (millimeter accuracy), tunnel navigation (low-light conditions), and dynamic obstacles like other vehicles.

This year (BFMC 2026), 78 teams from 23 countries were selected globally after a rigorous registration and qualification process. The competition progresses through multiple rounds, with International Qualifications around March 9, 2026, semifinals, and finals scheduled for May 2026 in Cluj-Napoca, Romania. Top performers receive global recognition, prizes, and often recruitment opportunities from leading companies in automotive, AI, and robotics.

Our team, Autonomists, is proud to be one of the 78 selected teams representing India and our university.

The Global Stature of BFMC

The BFMC is an elite international autonomous driving competition organized by the **Bosch Engineering Center Cluj** in partnership with the **IEEE Intelligent Transportation Systems Society**.

- **Elite Selection:** It is a highly selective "invitation-only" style challenge for the world's top technical universities.
- **Global Benchmarking:** Only the top engineering talent worldwide is invited to develop autonomous driving algorithms. Hundreds of teams apply from across the globe, and only a small fraction—currently the **top 78 teams**—progress to the development phase.
- **Professional Recognition:** The competition is judged by senior Bosch engineers, simulating a professional Tier-1 automotive supplier environment. It is recognized globally as a premiere testing ground for **Edge AI**, **Computer Vision**, and **Autonomous Control Systems**.

The Challenge: A Miniature Smart City

The core challenge is to develop a fully autonomous "brain" for a 1:10 scale model car that can navigate a complex, high-fidelity **Smart City** environment.

- **Real-World Complexity:** The track features over **20 different road signs**, highways, roundabouts, multi-lane intersections, and crosswalks with moving obstacles (pedestrians).



- **Dynamic Scenarios:** The car must handle real-time traffic rules, stop at red lights, obey "Yield" signs, and perform **Millimeter-precision parking**.
- **Environmental Obstacles:** The car must navigate difficult sections like **unlit tunnels** and ramps where standard vision systems often fail, requiring advanced sensor fusion.
- **V2X Connectivity:** Vehicles are required to interact with a central server to receive data from "Smart Infrastructure," mirroring the future of urban traffic where cars "talk" to the city.

What is Provided by Bosch?

Upon being selected for the development phase, Bosch provides teams with a standardized hardware kit to ensure the competition focuses on software ingenuity.

- **Model Chassis:** A 1:10 scale electric car chassis.
- **Onboard Brain:** A central processing unit, typically a **Raspberry Pi 5** in recent cycles, which acts as the vehicle's computer.
- **Basic Sensors:** A camera module for vision and an IMU for orientation data.
- **Low-Level Controller:** Often an **STM32-based controller** that manages the raw mechanical movements (steering and motor torque) based on commands from the Raspberry Pi.

The Road to Romania: How to Get into the Top 22

To reach the Grand Finals in **Cluj-Napoca, Romania**, teams must navigate a rigorous multi-stage qualification process.

- **Project Documentation:** Teams must submit detailed status reports (like the ones we have been preparing) that prove the technical maturity of their software architecture.
- **The March 9th Qualification:** This is the most critical hurdle. Teams must film and submit a live demonstration of their vehicle performing autonomous tasks on a custom-built test track.
- **Scoring Metrics:** Qualification is based on:
 - **Lane Keeping Accuracy:** How well the car stays within lines without manual intervention.
 - **Object Recognition:** The ability of the **YOLO-based models** to identify traffic signs and pedestrians in real-time.
 - **Reliability:** The car must complete runs without crashing or violating traffic rules.
- **Performance Optimization:** Only the **top 22 teams** with the highest cumulative scores in software stability, precision, and adherence to Bosch's industrial standards are invited to the onsite finals in Romania.



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What do the Winners Get?

Winning the BFMC is a life-changing event for student engineers, offering both tangible rewards and long-term career acceleration.

- **Cash Prizes:** Significant financial rewards are typically distributed among the top-performing teams.
- **Global Recognition:** Winners gain international prestige, placing their university on the map of world-class autonomous research.
- **Direct Recruitment:** Many participants and winners are directly headhunted by **Bosch's R&D divisions** or other top-tier automotive and AI institutes.
- **Talent Pipeline:** It provides a direct pipeline to become future leaders in the EV, Robotics, and Aerospace industries.

Official Competition Documentation:- <https://bosch-future-mobility-challenge-documentation.readthedocs-hosted.com/>

Official Competition Regulations:- <https://bosch-future-mobility-challenge-competition-regulation.readthedocs-hosted.com/>

Team Composition:

- Dhyumaan Raval (Team Lead) – Patent holder, SSIP grant recipient (autonomous drones), former VP of Spectrum, PRL intern.
- Meet Jain (Communications) – Patent holder, 2 SSIP grants, GATE 2025 AIR 1851, PRL intern.
- Harshid Rawal (Mapping & Navigation) – Patent holder, 2 SSIP grants, 2 research papers, PRL intern.
- Chintan Trivedi (Computer Vision) – Patent holder, 1 SSIP grant, Engibrains intern.
- Saumy Patel (Mechanical Design) – Mechanical Lead, Soft Robotics Design Patent applicant.

Mentor: Himanshukumar Umeshbhai Prajapati.

Current Technical Progress (as of February 2026)

Following hardware restoration and initial GUI setup (completed December 2025), we have focused on:

Hardware Improvements:

- Designed and 3D-printed a custom camera mount to replace the stock one (better stability, optimal field of view, reduced distortion for lane and object detection).
- Resolved critical Raspberry Pi 5 hotspot/WiFi issues through diagnostics and configuration fixes — vehicle is now fully connected and operational.
- Completed mechanical fine-tuning: steering geometry adjusted, chassis alignment calibrated to match software offsets.



Software & Perception Development:

- Implemented robust lane detection & tracking using image processing — vehicle position relative to lane center is calculated; refinement of steering offsets is in progress.
- Traffic Sign Recognition (TSR) module: Compiled a custom dataset of ~2,000 BFMC-specific images; training YOLO model for real-time detection of signs (stop, yield, speed limits, etc.). Initial tests show reliable identification — next step is linking to decision-making (e.g., stop or slow down).
- Adopted “sandbox” strategy: All heavy algorithms tested on a separate Raspberry Pi 5 to protect official competition hardware.

Other Achievements:

- Secured software sponsorship from Dassault Systèmes (SolidWorks) for CAD design, simulations, and custom mechanical parts.

Upcoming Critical Phase & Resource Requirements

We are now transitioning to full-system integration: porting algorithms to the official BFMC Raspberry Pi 5, live lane-keeping tests, sign-based decision logic, vehicle detection for collision avoidance, and auto-parking features.

To perform reliably in qualification tasks (especially automated parking, tunnel navigation in low light, and precise maneuvers), the stock kit needs targeted upgrades. We estimate a requirement of approximately **₹65,000** (or equivalent in-kind hardware support) for:

Item name	Price per Piece	Cost(in INR)	Qty.
Real Sense depth camera	17,999	17,999	1
Magnetic encoder	186	372	2
PLA material for 3d prints	848	848	1
Vinyl/Flex print (for test track)	8,000	8,000	1
Custom PCB (if needed)	5,000	10,000	2
Raspberry pi AI HAT+2	15,000	15,000	1
Battery	2,229	2,229	1
US-100 Ultrasonic sensors	246	1,230	5
MG90S servo	246	246	1
MG996R servo	352	352	1
3W high power LED	82	328	4
Miscellaneous cost	3,396	3,396	1
TOTAL COST		60,000	

These upgrades are essential to pass the March 3, 2026 International Qualifications and aim for finals in Romania.



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Request for Support:

We kindly request financial support of 60k INR to upgrade our hardware and get qualified globally top22, for finals in Romania.

Please find attached/linked our detailed project status reports, sponsorship proposal, and proof-of-work folder (Google Drive:

https://drive.google.com/drive/folders/146KcT2OjlkSKCzVXYyR_gw0mPG7v1y?usp=sharing)

Thank you for your continued encouragement and support.

Best regards,

Dhyumaan Raval

(Leader, Team Autonomists)