# AUTOBOT Challenge 2022 at TRYST IIT Delhi

## Problem Statement:

Make the artificially intelligent JetBot to move in an urban environment as shown in fig. 1 autonomously. Implement machine learning / deep learning-based control of JetBot in python to handle obstacles while following a road track in autonomous mode. Winner will be decided based on the points gained through the successful completion of the tasks in minimum time.

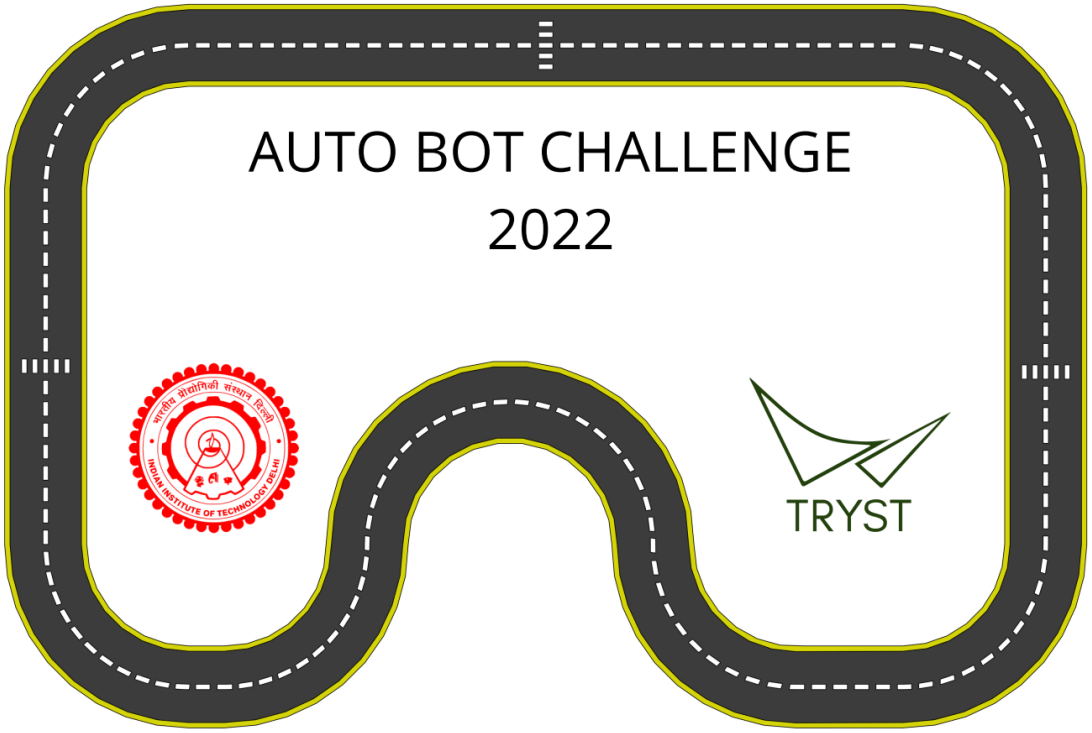


Fig.1: Road Track for JetBot

## Obstacles:

1. **END** = **Stop sign** (Stop here, race is over) **[10 Points]:** The stop sign marks the end of the race. When the stop sign is encountered, the JetBot should come to rest within a safe distance of 10 cm.

2 . **Z** = **Zebra crossing** (Wait for 2 seconds) **[15 Points]:** The zebra crossing (marked by thick white lines printed on track) will be encountered thrice by the JetBot during its entire journey along the track. The JetBot needs to be trained with relevant images to be able to detect the zebra crossing. At the zebra crossing, the JetBot is expected to stop and wait for 2 seconds after which it must resume its movement. The accurate halting of the motion of the JetBot before the zebra crossing and the accuracy of the waiting time would determine the successful completion of this task.

3. **P** = **Person** (Wait for 6 seconds) **[10 Points]**: {can only use pre-trained models for detection} The JetBot must stop whenever a "Plastic Human figure" is encountered and wait for 6 seconds after which it must resume its movement. The "Plastic Human figure" will be kept on the road (i.e., inside the edge lanes) in any orientation. JetBot needs to detect the human figure and stop for the desired time before moving further. You can use classification and detection only via pre-trained models.

4. **A** = **Animal** (Wait for 10 seconds) [**10 Points]**: {can only use pre-trained models for detection or classification} The JetBot has to stop whenever a "Plastic Animal Figure" is encountered and wait for 10 seconds after which it must resume its movement. Note that the "Plastic Animal Figure" will not be kept on the road (i.e., inside the edge lanes) but on the side of the road (i.e., outside the edge lanes). You can use classification and detection only via pretrained models.

5. **Road / Lane Following [45 Points]**: For this task, JetBot must be trained to follow the road. Training data is gathered by the teams and will be used to train the JetBot to follow the lane. There are 3 lines on the road. The lines on edges of road are termed as edge lines and the line on centre of road with 1.5 cm thickness is termed as centre line.

Centre line is stripped while edge lines are continuous lines. JetBot shall follow road and manage to move itself inside the edge lines all the time and special attention must be given at following the road on curved track which will also be an integral part of the task. The strip length of the centre line is 4cm and any two strips have a gap of 2 cm. The JetBot needs to move with minimum oscillations close to the dashed middle line during the complete game.

6. **Traffic lights [10 Points]**: When the JetBot encounters a traffic light during its journey, then the bot needs to detect and classify the colour of the traffic light and take the following decisions based on the colour of the traffic light (Red: stop and wait till colour changes to Green, Green: Move Forward). The JetBot needs to be trained with relevant images to be able to detect and classify the traffic light. The Task will be completed with correct detection and classification of the traffic light, and the bot's correct response to the colour of the light.

## JetBot Details:

JetBot is an open-source robot based on NVIDIA Jetson Nano. JetBot costs less than $250 in parts, *including* Jetson Nano. The DIY kit includes a bill of materials which you must purchase and a 3D printed chassis that you can print, or order. If you're looking to get up and running as quick as possible, there are also many third-party kits available that come pre-bundled.
JetBot includes a set of Jupyter Notebooks which cover basic robotics concepts like programmatic motor control, to more advanced topics like training a custom AI for avoiding collisions. What you'll learn isn't limited to JetBot. You'll learn concepts related to neural network data collection and training that extend as far as your imagination.

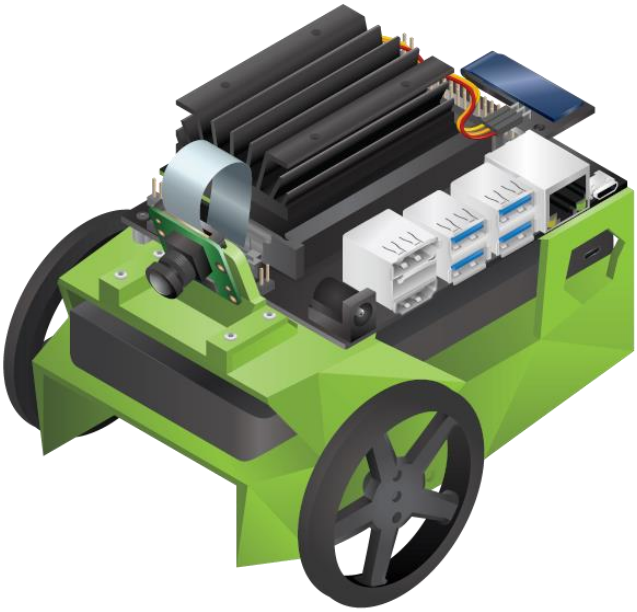

Fig.2: JetBot Vehicle

## Team Members Details:

1. Smit Savaliya (Leader)
2. Shyam Faladu
3. Kunal Lathigara
4. Pratham Patel
5. Jay Vala

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