# TRYST-IITD
# AUTOBOT Challenge 2022

## 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.

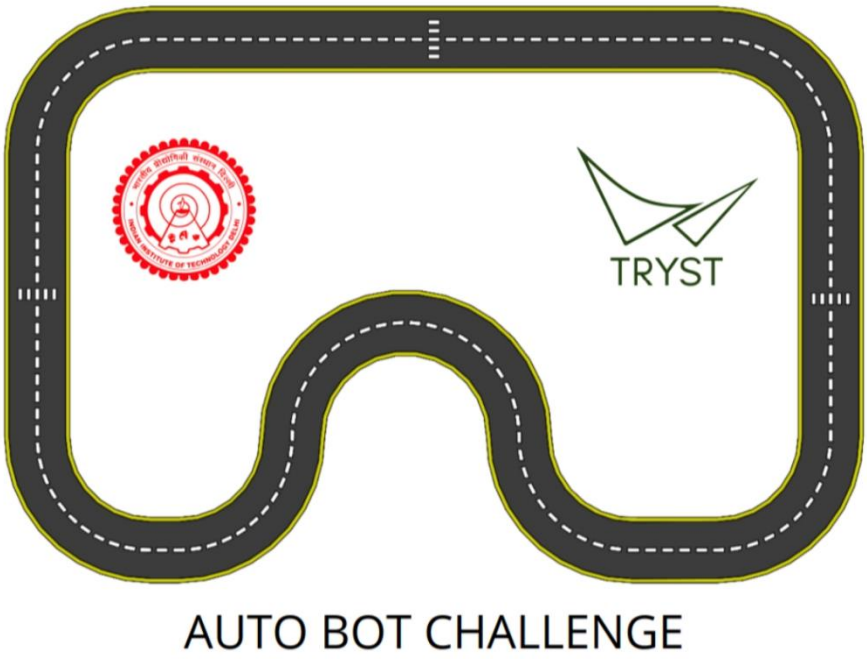



Fig.1: Road Track for JetBot

## 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.

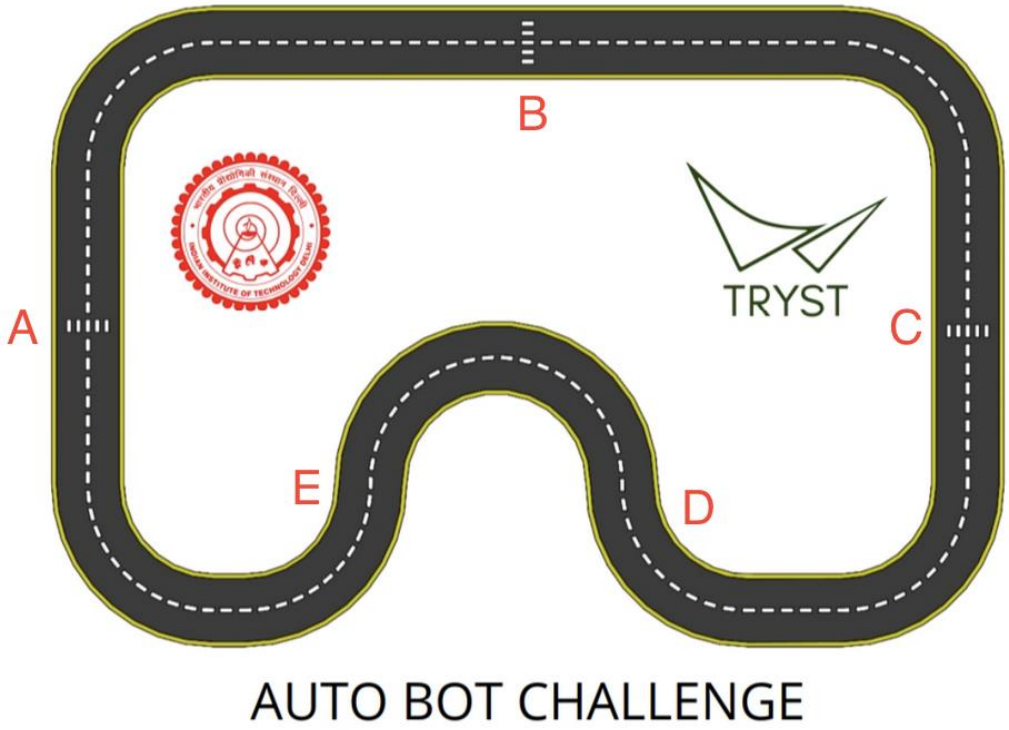
2. **Z = Zebra crossing** (Wait for 2 seconds) **[15 Points]:** The zebra crossing (marked by thick white lines printed on track) will be encountered thrice by the JetBot during its entire journey along the track. The JetBot needs to be trained with relevant images to be able to detect the zebra crossing. 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 an "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 lanes on the road. The lanes on edges of road are termed as edge lanes and the lane on centre of road with 1.5 cm thickness is termed as centre lane. Centre lane is stripped while edge lanes are continuous lines. JetBot shall follow road and manage to move itself inside the edge lanes 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 lane 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.

| Start Point: | A |
|---|---|
| Track A-B: | 10 points |
| Track B-C: | 10 points |
| Track C-D: | 10 points |
| Track D-E: | 5 points |
| Track E-A: | 10 points |
| | |

Table 1. Rubric for Path traversal

| Task | Points |
|---|---|
| END = Stop Sign | 10 points |
| Z = Zebra Crossing | 15 points |
| P = Person | 10 points |
| A = Animal | 10 points |
| Road/Lane following | 45 points |
| Traffic Lights | 10 points |

Table 2. Rubric for all tasks

## Preliminary Stage [online]:

1. You will be asked to share trained models to detect plastic human figures, plastic animal figures, zebra crossing, traffic signage [colour] and stop signs.
2. You will also be asked to share a lane detection algorithm which will be tested on an actual arena path viewed in the Jetbot's perspective.
3. Judging will be done based on accuracy on a different dataset with the same source at the testing dataset which we will provide. The points will be scaled in the same proportion as the offline event rubric.
4. A sample dataset will be provided at a later stage which can be used for testing your models at your own end.
5. For plastic human and animal figures, we will be using Lego characters. Exact images will be provided soon.

## Final Stage [offline]:

1. Top five teams will be selected from the preliminary stage and will be invited to the main event at IIT-Delhi.
2. They will be given a JetBot and asked to implement their models on the same along with autonomous control scripts.
3. The JetBots will be tested on the actual arena and will be awarded points based on the rubric mentioned.

## Datasets and related files:

The files will be uploaded and kept up to date on the following repository. Please follow for timely notifications: https://github.com/hp2309/autobot-tryst/