

DAI2020 SMARTS Competition of Autonomous Driving



Introduction

Autonomous driving is one of the most significant applications of AI. From eliminating road accidents due to human errors to massively reducing urban space devoted to parking, autonomous promises to fundamentally change our daily lives in many ways. Deep learning, reinforcement learning, and multi-agent learning have achieved phenomenal success in recent years, and are now being actively researched for use in autonomous driving. However, large-scale research competitions and standard benchmarks in autonomous driving have mainly focused on perception and prediction rather than planning and interaction. To help advance the frontier of autonomous driving research and to stimulate research that takes multi-agent interaction in driving seriously, we organize the Autonomous Driving Competition at DAI 2020.

The competition's homepage: <https://www.drive-ml.com>

Simulation Environment

SMARTS (Scalable Multi-Agent Reinforcement Learning Training School) is the first of its kind simulation platform in that it is centrally focused on realistic dynamical driving interaction. It allows construction and control of interaction scenarios that emulate real-world behaviors at different levels of granularity. In doing so, it serves to bring research on multi-agent learning closer to the reality of autonomous driving than ever before.

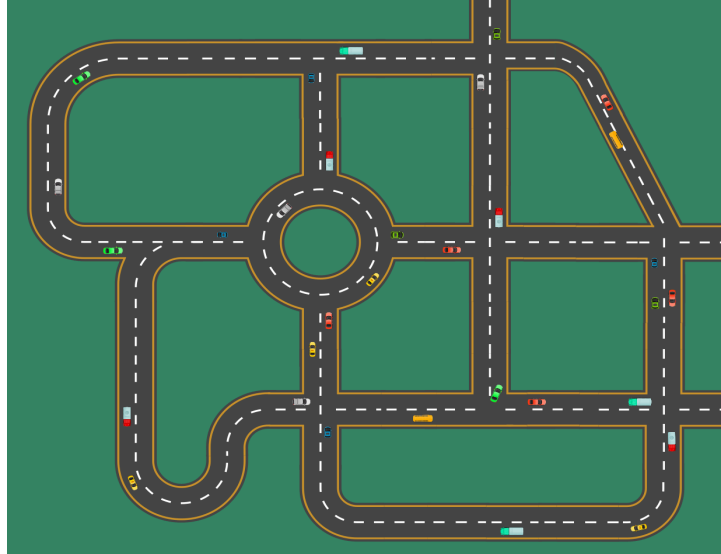
Competition Tracks

Participants are expected to develop their autonomous driving planning and control solutions to tackle complex interactive traffic scenarios provided by the SMARTS simulation platform. The solutions will be evaluated according to their competence for driving, interaction, and generalization.

There are two separate tracks in the competition. Track 1 is focused on single-agent multi-lane cruising, where the AI agent controls a vehicle to drive along lengthy routes that go through intersections and roundabouts while interacting with social vehicles. Track 2 is focused on multi-agent safe driving, where the AI agent is expected to control one or more vehicles to cooperatively accomplish scenario-specific missions such as left turn at T-junction, on-ramp merge, etc.

Track 1: Single Agent, Multi-Lane Cruising, <https://competitions.codalab.org/competitions/26007>

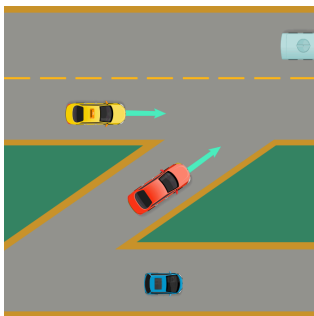
The solution agent is expected to follow a specific route through a road network that includes intersections, merges, and roundabouts. The task of the agent is to follow the prescribed route, drive as quickly and safely as possible from the start line to the finish line, amid background traffic that consists only of other vehicles.



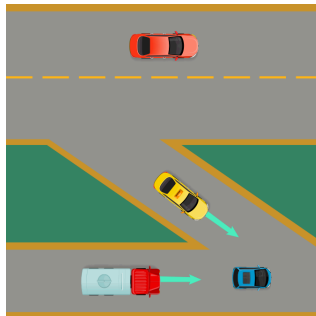
complex loop scenario

Track 2: Multi-Agent Collaboration, <https://competitions.codalab.org/competitions/26013>

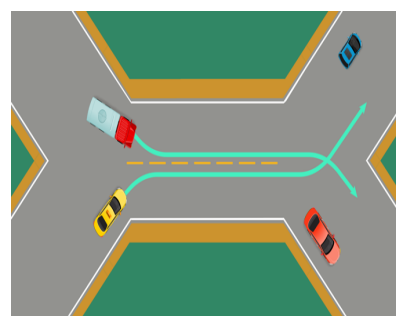
For this track, participants are supposed to develop a parameter-sharing multi-agent model to control a group of agents to accomplish short missions in specific scenarios, including Ramp, Double Merge, T-junction, Crossroads and Roundabout. Each submission will be evaluated on all of these scenarios simultaneously. Moreover, in each scenario, there are more than one mission and more than one agent instances (all sharing the same set of policy parameters), and each of these agent instances will be randomly assigned a mission. In addition to the agent-controlled vehicles, there will also be background traffic vehicles driving in the scenario.



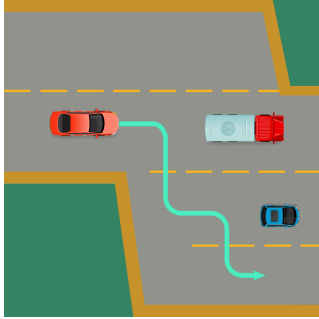
on-ramp



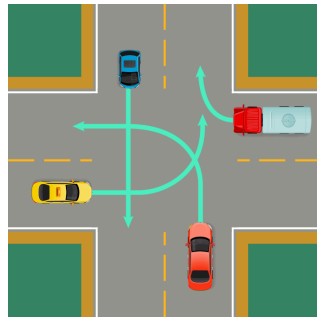
off-ramp



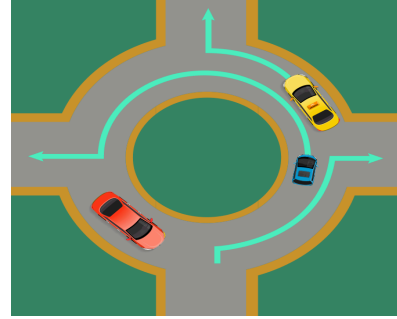
double merge



T-junction



intersection



roundabout

For either track, participants will submit their autonomous driving agents (as model file) to the competition platform for automated evaluation. To reduce the variance of evaluation, there will be repeated runs with different random seeds for each route (Track 1) or mission (Track 2). The evaluation metrics include:

Safety: percentage of routes or missions completed without critical infractions (e.g. crashes with other vehicles)

Time: time took to finish the task

Control quality: deviation from the centerline of the lane

Valid distance travelled: for track 1, the longer the better

Closeness to goal: for track 2, the closer the better

Training Support: Huawei Cloud

We will provide some computing resources for training, participants can send a request via registered email.

Competition Timeline

Aug. 14, 2020: competition opens.

Oct. 14, 2020: competition closes at 11:59pm Pacific Time.

Oct. 19, 2020: winning teams announced.

Oct. 25: top-5 teams of each track will be invited to give an online technical presentation at the DAI 2020 conference.

The final rank of the winning teams will be determined by the Academic Committee based on the leaderboard scores from automated evaluation, the technical merits of the solutions, and the quality of the technical presentation at the DAI conference.

Prizes

Cash prizes and winner certificates for our winners!

| Track | Gold Prize | Silver Prize | Bronze Prize | Fourth Place | Fifth Place |
|---------|--------------------------------|--------------------------------|--------------------------------|------------------------|------------------------|
| Track 1 | \$6000+ winner certificates | \$3000+ winner certificates | \$1000+ winner certificates | winner certificates | winner certificates |
| Track 2 | \$6000+ winner certificates | \$3000+ winner certificates | \$1000+ winner certificates | winner certificates | winner certificates |