

Occupancy Prediction for Mobile Robots

MSc. Project Proposal at the Autonomous Multi-Robots Lab, Cognitive Robotics, TU Delft

Brief description: To ensure the safe navigation of mobile robots in indoor dynamic environments, a new challenge has emerged: effectively modeling dynamic objects, such as pedestrians, alongside static ones. One promising and popular approach in the autonomous driving field is to use occupancy networks to predict the 3D semantic occupancy status. In CVPR 2023, there was a challenge regarding the occupancy network [1][2]. Fig. 1 illustrates the input and output of these occupancy networks. Our goal is to adapt similar methods for mobile robots. However, this adaptation will encounter several difficulties due to the differences in working environments between mobile robots and autonomous driving cars. These difficulties include: 1) dynamic obstacles typically consist of pedestrians rather than vehicles; 2) static obstacles can be more unstructured.



Fig.1. Occupancy Prediction in Autonomous Driving [1]. The left side shows the images captured by the cameras around the vehicle. The right side shows the predicted occupancy map with different colors suggesting different semantic labels.

In this project, you will:

- 1) Learn how the occupancy networks work. Implement an existing occupancy network.
- 2) Use our own data (we are working on it) to train a network that can be used for mobile robots.
- 3) Improve the performance of your occupancy network.

Requirements: Programming skills in Python. Knowledge in deep learning is preferred.

Start date: No later than September, 2024. We are working on a dataset for mobile robot's occupancy prediction. If you join early, you can also participate in the dataset work and get a better understanding of this field.

For further questions or to apply, please contact Clarence Chen <g.chen-5@tudelft.nl>. When applying, please provide a short motivation, up to date CV, a transcript of your current degree program and intended start date.

Group information: <http://www.autonomousrobots.nl/>

References:

- [1] CVPR 2023 3D Occupancy Prediction Challenge. <https://github.com/CVPR2023-3D-Occupancy-Prediction/CVPR2023-3D-Occupancy-Prediction>
- [2] Tian, Xiaoyu, et al. "Occ3d: A large-scale 3d occupancy prediction benchmark for autonomous driving." Advances in Neural Information Processing Systems 36 (2024).