

Master's Thesis

Estimating Localization Uncertainty in Object Detectors for Autonomous Driving

In the rapidly evolving field of autonomous driving, the ability to accurately detect and track objects in dynamic environments is critical to ensuring safety and reliability. While advancements in deep learning have significantly improved object detection performance, these systems are not without their limitations. Factors such as sensor noise, environmental variability, and model imperfections introduce inherent uncertainties in detection outputs, which, if unaccounted for, can lead to catastrophic failures in real-world scenarios.

This thesis focuses on the development and application of uncertainty estimation techniques for object detection in autonomous driving. Specifically, the localization of detected objects (bounding boxes) should be extended with a measure for the prediction's uncertainty, e.g. it could be formulated as a distribution in space.

You will analyze different concepts for the estimation of uncertainties in object detectors, implement them into an existing object detector and evaluate the performance of the network regarding detection performance and uncertainty.

Your work will consist of following work packages:

- Literature review of uncertainty estimation in deep neural networks
- Developing a concept for the evaluation of the uncertainty estimation
- Implementing promising uncertainty estimation techniques into an object detector
- Evaluating the object detector and its uncertainty estimates

Good knowledge of Python, ideally experience with pytorch, a strong interest in autonomous driving and an involved working attitude will make you the ideal candidate.

Please include a CV and your current transcript of records into your application.

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