

The Curse and Blessing of Dimensionality: Increasing Safety in Autonomous Driving Using 3D Object Detection

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In autonomous driving, camera based object detection is one important task to be solved within the environment perception pipeline. Object detection in academia often limits itself to standard object detection, i.e. drawing a 2D bounding box around objects. In practical applications like autonomous driving this representation is not sufficient for dynamic objects. Too many information about important geometric properties of the objects of interest is lost, like their orientation or their dimensions. However, this information is required for safe autonomous driving. Using 3D bounding boxes as a more complex representation of objects solves this problem, but at the same time induces higher model complexity and thus an increased runtime.

In this talk, I will outline the required steps to evolve the well-studied 2D object detection frameworks into 3D detection frameworks while retaining both the accuracy as well as the speed of 2D models despite their higher model complexity. I will focus on the required adjustments in the training data, the evaluation measures and adjustments within the object detection frameworks to guarantee the best possible trade-off between detection accuracy and speed in 3D object detection.