Uncertainty Estimation in Perception Tasks for Self-driving Vehicles

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Abstract. Perception is the visual cognition process for self-driving vehicles. In recent years, deep learning has become the leading technique in perception tasks such as 3D object detection, depth estimation and scene segmentation. While results are undoubtedly impressive, they often do not take into account measures of confidence. Standard deep learning frameworks, indeed, do not allow for uncertainty estimation in regression tasks and only provide normalized scores for classification ones. This aspect is particularly crucial for transportation applications, where human safety is at stake.

We propose to address these shortcomings through a novel, light-weight framework which integrates uncertainty estimations while providing real-time performances. We define a loss function based on a Laplace distribution, which can be more robust to noisy data.