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An end-to-end auto labeling framework for autonomous driving datasets

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Data labeling is crucial in database and machine learning applications. Traditional methods rely heavily on humans to engineer labels. However, human works are highly costly for large datasets and even unaffordable in some special cases which require people to have multiple-domain knowledge's. Additionally, the quality of human labeling largely relies on individual's professional and attentiveness that may entail biases to the labels. In autonomous-driving algorithm research, the datasets are so massively huge that only relying on human labeling is neither economically nor practically feasible. In this research we design a reinforcement-learning based auto labeling framework which achieves online data-labeling while vehicles are driving (with driver or driverless). Firstly, we reframe the problem of data labeling as a semantic segmentation problem which maximizes specific goals. Then we propose a deep reinforcement-learning procedure with multi-objective rewarding functions designed, which determines the semantic segmentation strategy and the labeling process, achieving long-term goals of maximizing the labels precision for training autonomous driving algorithms. This framework is deployed on fleets of vehicles which distributedly implement the deep reinforcement-learning agent to compete the labelling tasks among which the ones optimize the objectives are selected. By exploiting this auto labelling framework in the development of autonomous driving systems, we reduce the cost by more than 50%, while achieving 5%-25% higher accuracy.