UNIVERSITY OF SALERNO

DEPARTMENT OF INFORMATION AND ELECTRICAL ENGINEERING AND APPLIED MATHEMATICS

MASTER'S DEGREE COURSE IN COMPUTER ENGINEERING

MASTER'S THESIS

ON

AUTONOMOUS VEHICLES DRIVING

Semi-Automatic labeling of dataset acquired by ego-vehicle via transfer learning

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Abstract

Description of the problem faced

In the technological revolution of the 21st century, autonomous driving represents one of the central pillars that is redefining the entire transport sector, with repercussions that go far beyond, influencing the way we design our cities, infrastructure, and our daily lifestyle. The promise of vehicles that can autonomously navigate through complex environments is captivating. However, behind this promise lies a major challenge: the significance and complexity of data. One of the main players in this revolution, often hidden but of vital importance, is the world of data. Data powers every aspect of autonomous driving, from recognizing obstacles and pedestrians, to route planning, to the real-time decisions a vehicle must make in unpredictable situations.

Framing of the paper in the contemporary technical scenario

For data to serve its purpose effectively, it needs to be precise, pertinent, and properly annotated. The task of annotating data presents multiple complexities. Given the surge in data availability, the manual annotation of each data point soon becomes unfeasible. Mistakes due to human fatigue, repetitive nature of the task, and oversights can result in errors that, especially in scenarios like autonomous driving, can lead to severe repercussions.

Personal contribution of the candidate to the solution of the problem described

Faced with this challenge, our research sought to devise a solution that could balance efficiency with accuracy. Through the adoption of transfer learning and the integration of complex algorithms, we aimed to address potential network issues and

bring artificial intelligence to the forefront of the labeling process. Our objectives were twofold: firstly, to diminish the manual workload for annotators, and secondly, to refine the quality of the associated data.

Description of the application/experimental content of the paper

The experiments conducted and described within this thesis demonstrate the feasibility and effectiveness of this approach. We saw how, in certain scenarios, our semi-automatic labeling framework could not only speed up the labeling process but also improve the overall accuracy of the labels. Beyond tangible results, this thesis also represents a broader reflection on the role of data in the age of autonomous driving. With the advent of increasingly intelligent and connected vehicles, the demand for accurate and well-labeled data will grow exponentially. The need for efficient labeling methods will therefore become increasingly pressing.

The research presented offers an in-depth look at the challenges and opportunities in data labeling for autonomous driving. It marks a significant step towards creating more effective and efficient methods, laying the groundwork for future developments in this crucial field.