# Preface

Lane detection is a crucial component of autonomous driving systems, enabling vehicles to navigate roads safely and efficiently. In this research paper, we present a comparative analysis of three popular models: U-Net, AlexNet, and LaneNet, for the task of lane detection. We evaluate these models on a test dataset and assess their performance based on accuracy, weighted average precision, weighted average recall, weighted average F1-score, processing time per frame, and frames per second (FPS).

To conduct our analysis, we first build the three models and train them using a labeled dataset of road images. We then evaluate the trained models on a separate test dataset to measure their performance in accurately detecting lane markings. In addition to evaluating the models' accuracy, we also consider their precision, recall, and F1-score, which provide insights into their ability to handle class imbalances and ensure reliable detection across different scenarios.

Furthermore, we explore the combination of traditional computer vision techniques, such as canny edge detection and Hough line transform, with the output of the deep learning models. By fusing the lane predictions from the models with the results of these classical algorithms, we aim to improve the overall lane detection performance.

Our experimental results reveal that AlexNet outperforms both U-Net and LaneNet in terms of accuracy, weighted average precision, weighted average recall, and weighted average F1-score. However, U-Net demonstrates the lowest processing time per frame and the highest FPS, indicating its efficiency for real-time lane detection applications.

These findings highlight the trade-offs between accuracy and processing speed, emphasizing the importance of selecting an appropriate model based on the specific requirements of the autonomous driving system. Our research contributes to the existing body of knowledge in the field of lane detection and provides valuable insights for future research and development in autonomous driving technology.

(Liu, End-to-End Deep Learning of Lane Detection and Path Prediction for Real-Time Autonomous Driving., 2022)Overall, this research paper sheds light on the performance of U-Net, AlexNet, and LaneNet for lane detection, offering guidance to researchers and practitioners in selecting suitable models for their own applications. The fusion of deep learning models with traditional computer vision techniques presents a promising approach to enhance

the accuracy and efficiency of lane detection systems, further advancing the development of autonomous vehicles.