ARAMBH: An Adaptive, Data-Driven, ML-Based Signal Control System

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This project focusses on optimising signal timing plans at signalised intersections which are the major hotspots of congestion in any transportation network. Traditionally, signal controllers are designed as fixed-time; they are incapable of adapting to the needs of dynamic real-time traffic conditions. With the emergence of powerful machine learning techniques, developing an efficient data-driven signal control algorithm needs to be considered for such a system. Thus, this project aims to develop an ML-based traffic signal control algorithms by utilising both synthetic and real-world datasets. Such algorithms will be tested and benchmarked against traditional fixed-time and adaptive signal control algorithms using a traffic simulation platform and hardware-in-the-loop system. The system uses a camera and SOC to capture the traffic feed; a mix of Computer Vision and Edge detection are used to calculate the traffic density. To make this scalable across any junction in any part of the world, the ideal time multiplier for time conversion and edge case handling need to be dynamically calculated. The data is fed into a CNN which modifies the parameters for density calculation, furthermore, a loss function is derived from the past data to modify the calculated green time. This acts as a sustainable solution for handling scenarios like varying weather, roads sizes, VIP movements etc. The intent of this project is to treat this 4-way junction as one of the nodes in the larger tra?c city graph which once implemented in a city will act as a giant decentralised load balancer helping various stakeholders such as police, city planning authorities and autonomous vehicle manufactures. The next goal is to integrate 5G in the system to make the setup hardware independent.

Awards Won: