

Universidad Politecnica de Yucatan

Machine Learning

ACT: Project Proposal

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In recent years, Merida's population has grown exponentially, leading to a significant increase in the number of vehicles within the city. This surge in vehicle numbers has resulted in highly congested areas. Consequently, specific points within the city experience heavy traffic, often leading to long queues of vehicles and a rise in the number of car accidents.

To solve this problem, we propose the installation of advanced video cameras at traffic lights to improve traffic safety and fluidity. The camera will be able to identify vehicles as a moving object and, based on its speed, predict the trajectory it will follow, including the prediction of potential blockages. Observing this information in real time, the traffic light system would adjust the timing of the lights to allow safe crossing for both pedestrians and vehicles.

By adding supervised learning, the cameras will train convolutional neural networks (CNN), for object detection (vehicles, bicycles, pedestrians) and trajectory prediction based on captured images and provided labels. For this, the model will have massive traffic data and an image capture by the camera. These algorithms will predict potential congested areas and identify optimal timings for traffic light changes.

Additionally, by adding unsupervised learning the system of cameras will identify emerging patterns and irregularities in real-time traffic data. The algorithm will analyze the complexities of traffic dynamics, detecting subtle changes in vehicular movements and congestion points. This self-learning capability enables the system to adapt to new, unforeseen traffic situations, ensuring a more responsive and adaptive traffic management approach.

Finally, by adding reinforcement learning, the system will be empowered to learn from its own actions and optimize its decisions over time. By rewarding positive outcomes, such as smooth traffic flow and reduced congestion, and penalizing inefficiencies or blockages, the system will continually refine its strategies. Reinforcement learning will ensure that the traffic management system evolves dynamically, learning from its past experiences and making decisions that lead to improved traffic safety and fluidity.