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Synopsis

**Title: Feasible Real Time Helmet Detection Using
Raspberry PI**

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India is well renowned for their medical healthcare but has the worst road safety standards in the world, a fact repeatedly outlined in World Health Organisation reports and backed up by the government's own reports. NCRB data shows that as many as 43,540 people were killed in accidents involving Two-Wheelers in a single year. More Indians die each and every year in road accidents than the total casualties suffered by India's armed forces in all the wars fought since independence. Most accidents that happen on National highways include Two-Wheelers.

Reports reveal that the National Highways, which constitute approximately 2 percent of India's total road network of over 56 lakh kilometres, accounted for 30.4 percent of total road accidents and 36.0 percent of deaths in 2017, while accidents on State Highways and other roads constituted 25 percent and 44.6 percent respectively. Helmets have been found to be the most effective measure to protect individuals from certain death. Seeing the effectiveness of a helmet the government has mandated the use of a helmet for daily commute. Yet many individuals don't adhere to the law. Thus, a lot of Traffic police manpower is spent on preventing helmet violations which is a pain point in society.

Given the current scenario of oil prices there will be an obvious increase in the usage of normal bikes, electric bikes and cycles. Thus, enforcing the law of wearing Helmets for commute becomes essential. The motive is to use a microcomputer to detect bike riders not wearing helmets and store a picture of theirs in a database which can be viewed by law enforcement officers. The application works in real time with object detection processing done on board and then uses IOT to transfer information to a server which then stores the data and makes it available for viewing through the website.

Most existent methods suffer from several problems such as occlusion of objects and varying illumination conditions. Most of the Deep Learning-based approaches use CNNs but ultimately don't work well with real time detection and are computationally expensive. The proposed systems which do not use specialized hardware usually have low accuracy or work only under certain conditions. This places several constraints of the implementation of such systems. The systems which use modern machine learning techniques are power hungry and this creates a bottleneck on the feasibility of deploying such systems in large scale.

Limitations of the existing applications include problems such as occlusion of objects and varying illumination conditions, computationally expensive and doesn't work in real time, low accuracy if no specialized hardware is used, high cost for specialized hardware which causes a bottleneck on feasibility.

Functionalities of the proposed application include continuous monitoring of traffic for helmet violations during the day. Real time processing of violators done on board using object detection. It uses IOT to transfer pictures of violators to a webserver. A website to browse violators for the Law enforcement officers. Messages sent to violators mobiles if phone number available.

Scope and benefits of the application include efficient and low power usage, easy to use interface for Law enforcements officers, truly feasible system due to small budget and energy requirements. It will reduce death rates drastically due to increased use of helmets. It will effectively make law enforcement officers free for better traffic management and flow. It can be made to work on solar power thus making it eco-friendly. It's extensible and thus new features can be added eventually.

Software and Hardware selection include CPU Quad-Core 64-bit Broadcom 2711, Cortex A72 Processor (Raspberry Pi), Cortex A-53 cores and above (Mobile app), Intel i7 core, ROM 2 - 50 GB, RAM 1 - 16 GB, Processor Speed of 1.3 GHz and above. System type includes a 64-bit Operating System. Programming languages HTML, CSS, JAVASCRIPT, JAVA, XML, DART, PYTHON and Firebase/Amazon Web services.