**SMART INDIA HACKATHON – 2020**

**Problem Statement**: Automatic Assessment of Pavement condition based on road photographs

**Problem statement description**:

Works constructed under the PMGSY scheme are to be maintained by the contractor as per the PMGSY guidelines. Pavement Condition Index is required to be performed to identify the road condition and further to take the maintenance or upgradation of the work. Through EMARG and PMGSY-III, NRIDA has collected a vast collection of pictures of roads. These pictures are collected while doing inspection of roads or collection of PCI through visual inspections. An AI assisted module would be able to automatically assess the picture and identify common issues such as shoulder clearance, potholes, road furniture etc. Requirement is of a solution where there should be a provision to capture the chainage wise pavement condition index. Use of open source software and existing neural network is encouraged. Train a machine learning model, computer vision etc. which is able to identify common issues with pavement based on photograph(s) per road alone.

**PS Number**: MK199

**Datasets:** Annotated images by NRIDA

**Abstract:** Variesresearch on damage detection of road surfaces using image processing techniques has been actively conducted, achieving considerably high detection accuracies .So far, most studies focus only on detection and labeling the type of damage present in the image. However, in real-world scenarios, road inspection performed by government for maintenance require parameters like **Pavement Condition Index** (PCI) which is identified by surface condition, riding comfort, and Normal Driving Speed.

In this project, we must accomplish the following two tasks to address this issue. First, is to use a pretrained model to detect and localize different types of surface road damage with high accuracy. Second is to find the PCI for the road with the help of detected damages.

**Introduction**:

* **Pavement Condition Index** (PCI)

The pavement condition index (PCI) is a simple, convenient and inexpensive way to monitor the condition of the surface of roads, identify **maintenance** and **rehabil­itation** (M-and-R) needs as well as ensure that road main­tenance budgets are spent wisely. The PCI provides a numerical rating which ranges from 0-100 for the condition of road segments within the road network, where 0 is the worst possible condition and 100 is the best.

* **How PCI is calculated?**

A PCI is developed based on visual inspection and observation. An inspector notes down the frequency and severity of specific surface defects on the checklist. Each type of surface distress is given a weight to reflect its importance in a rehabilitation strategy and the weighted average is used for numerical rating. The inspector also rates the Comfort Rating at posted speed, assigning it a numerical rating between 0 and 10.

* **Approach**

1. First step is to explore the dataset and experiment various pre-processing techniques
2. As many research papers concludes, among the state-of-the art object detection methods, the SSD using **Inception V2** and SSD using **MobileNet** are those with relatively ***small CPU loads*** and ***low memory consumption***, even while maintaining high accuracy. We also train our custom object detector using other DL architectures like the **YOLO v3**, **VGG – 16** to identify which framework results in high accuracy on the test set.
3. To develop an algorithm to **calculate PCI** for a sample of road images taken over a fixed distance as mentioned by the PSMGY scheme.
4. Final step is to deploy the model using a mobile application that allows the road inspection officials to feed in the captured video of roads and obtain the results without any hassle.