Traffic Prediction for Intelligent Transportation System using Machine Learning

Abstract

In our life, road structure is an essential component. As monitoring the road surface, we could notice where is a problem on the road and prevent the accident. A human-based road damage monitoring system could be the first answer but not a perfect solution because it is affected by a different condition such as weather, speed of the vehicle, the complexity of the road, and the difference of criteria from the individual inspection. Deep learning-based technology is a good key to unlock the object detection tasks in our real world. By using deep neural networks, we could break a problem that is dangerous and very time-consuming but has to be done every day like detecting the road state. We describes the solution using YOLO to detect the various types of road damage in the IEEE Big Data Cup Challenge 2020. This also aims to develop a tool for predicting accurate and timely traffic flow Information and an accident detection mechanism. Traffic Environment involves everything that can affect the traffic flowing on the road, whether it's traffic signals, accidents, rallies, even repairing of roads that can cause a jam. If we have prior information which is very near approximate about all the above and many more daily life situations which can affect traffic then, a driver or rider can make an informed decision. Also, it helps in the future of autonomous vehicles. In the current decades, traffic data have been generating exponentially.. In this work, we planned to use machine learning and deep learning algorithms to analyze the transportation system with much-reduced complexity. The evolution of the computer technologies is playing important role in the development and planning of the smart transportation system for the public domain. The smart transportation management monitors and manages the traffic in real time. We propose an approach for smart traffic monitoring and control system. The proposed system aims to provide least congestion routes for the emergency services. Decision tree algorithm is used for checking the congestion. A decision tree is a tree-like model that acts as a decision support tool, visually displaying decisions and their potential outcomes, consequences, and costs. From there, the "branches" can easily be evaluated and compared in order to select the best courses of action. To identify classification and regression we have used a Decision Tree Algorithm. The accelerometers in mobile phones detect presence of accident based on the ratio we set. User can view accident notification through the application.

Object Detection Using Deep Learning

Nowadays, deep learning has an important role in image classification. It extracts the feature maps from an input image using a neural network with hidden layers, and several deep learning networks based on

Convolutional Neural Networks (CNNs), such as AlexNet , VGGNet , ResNet , etc, achieved a successful performance in the ImageNet Large Scale Visual Recognition Challenge (ILSVRC). A main point is that object detection could be a combination of classification and localization, thus many approaches have developed to solve object detection tasks using deep learning-based technology. The detection model is trained with the image dataset which contains the bounding-boxes and the labels to detect an object. From the perspective of region proposal-based methods, they propose a region that may include the object, classify the object, refine and get rid of overlapped bounding boxes, and score them based on other objects in the input image. And there are representative region-based models such as R-CNN , Fast R-CNN , and Faster R-CNN , and they also called by two-stage object detectors.

YOLO

YOLO has a single neural network architecture, predicts a set of bounding boxes and class probabilities at a sitting for every test image. First of all, it divides the full image by several a grid with a specific size, and anchor boxes are generated in every grid of input image by predefined scale and size. Each anchor box predicts the objectness score, box center offset x, box center offset y, box width, box height, and class scores at one time in contrast to a two-stage detector. Thus, YOLO is an extremely fast end-to-end algorithm to detect the objects, and it is called a one-stage object detector. Also, the performance of YOLO has improved over the development of deep learning technology, so there are updated versions for improving the light-weight, inference speed, and accuracy.

DECISION TREE ALGORITHM

Here decision tree algorithm used for traffic prediction. A decision tree is a tree-like model that acts as a decision support tool, visually displaying decisions and their potential outcomes, consequences, and costs. From there, the “branches” can easily be evaluated and compared in order to select the best courses of action. For identifying the congested situation Collect the traffic data in every 5 min with features Location (Measured with GPS), Direction, Speed and Start-End Junction. Then Group every 5 min interval with their corresponding data. And Calculate the distance between each vehicle with all another vehicles within specified junction. if the distance is less than the specific threshold between two vehicles then those vehicles are considered to be the neighbourhood vehicles else Not considered as neighbour vehicles.

ACCIDENT DETECTION

The accident is detected based on the intensity of shake occurred while travelling. And the classification of intensity of shake is done based on the dataset taken from kaggle .The dataset is divided into train and test dataset. Each of these contains set of values which is less than the limited intensity and greater than the limited intensity. The features including in dataset are accelerometer and gyloscope. The inputs taken are compared with the dataset values and if it is greater than the limited intensity then send a message that an accident occurred to the emergency contacts with the location.