

COS7048-B MSc Group Project

Coursework & Demo 1, Report

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Abstract

*Pending*

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# Introduction

Road traffic wellbeing is a significant angle in each country as it keeps residents safe and forestalls wounds also, fatalities. While it is difficult to forestall all mishaps through street wellbeing measures, street traffic mishap information can be breaking down to give a "map" of where enhancements to streets should be made. The Imperial Society for the Anticipation of Mishaps (RoSPA) in the Assembled Realm have expressed on their site that "the most recent couple of many years have exhibited that viable and far-reaching street security procedures can diminish the quantity of individuals killed or harmed out, regardless of expanding traffic levels.

England presently has outstanding amongst other street wellbeing records on the planet - yet with around five individuals actually dying on England's streets consistently there is substantially more to be finished." The Division for Transport UK (United Kingdom) (DfT) are an administration office that deal with the vehicle organization in the Unified Realm. DfT distribute a dataset two times per year on auto collisions in the UK. They have distributed six vital targets in 2019 which mean to convey a superior support of general society. While nearby committees work on street security; it is likewise a critical factor to consider for DfT as they need to guarantee the street traffic network is inacceptable stream and this will not be conceivable without protected and dependable streets for the general population.

## Problem Statement

In this task we will be working with the Division for Transport (DfT) and the open dataset they distribute on accidents in the UK. The information depends on episodes answered to the police. To do this, an iterative approach will be used in providing a critical analysis to satisfy the business requirements.

As well as reviewing each data with various functions, further questions arise in the problem statement such as:

* Probability of having an accident in specific area / city? Green, Yellow and Red
* Help to interface individuals and insurance companies third parties, adjusting speculation.
* Ensure transport is protected, secure and economical.
* Creating a predictive analysis on the data we are using to create the project structure giving a probability of any data given for the future to view the trend.
* Model prediction using a future selection with features as such using exact location and time of the day to predict more accurate accident data.

Utilizing this data, we will be having a manual selection as well as having a selected feature on the data as well as implementing validation which will portrait a high accuracy rate and precision.

In this issue, the collisions from 1979 to 2019 have been joined into one bigger dataset which will give better investigation just as more precise assessment of the Huge information frameworks since the volume of information will be huge. The information comprises of millions of records as text and whole numbers (data.gov.uk, 2020). Considering DfT's goals and the lawful, moral, social, and expert difficulties distinguished, the point is to audit different huge information frameworks that accomplish proficient information preparing and maintain properties, for example, to do this, an iterative methodology will be utilized in giving a basic investigation to fulfil the business necessities.

# Aims and objectives.

**Aims**

To increase and improve the measures of effectiveness of road safety Education, Training and Publicity projects. These projects may be delivered by several bodies including (but not limited to): local authorities, emergency services, road safety partnerships, schools and companies delivering Managing Occupational Road Risk projects or those delivering driver training.

* To increase knowledge and skills of individual users in the design and execution of evaluation plans.
* Always put on helmets, seat belts and other safety equipment before driving.
* All personnel receive a proper road safety and familiarization briefing, including driving techniques for the prevailing road and weather conditions around operation.
* It is important to be aware that road traffic injuries remain an important public health problem. When road safety products are utilized correctly or efficiently. They can help save lives. Prevent accidents and injuries.

Each road situation we face is different. To help protect all road users, we need to understand what we can put in place to protect them – through skills development for safer road users, safer roads and infrastructure or technological innovation for safer vehicles. Changes in behaviour are most effective when they are progressive; we need to be receptive to new ideas, reflect, plan, act and maintain the behaviour to make real change. This "lifelong learning" approach at all stages of our lives is a foundation for this Road Safety Statement and provides the building blocks for future change in making our roads safer.

**Objectives**

Road Safety is set of terms and condition for all roads users. It is directly related to a safe life. Road Accident occur due to the irresponsible behaviour of people on the road. This issue is more critical in developing nation. Serious injuries are caused due to severe speeding up. The speed of the vehicle should be limited. Road safety rules for vehicles states that.

* Always stop your vehicles on red light.
* Avoid the usage of mobile/devices use while driving.
* Do not cross before the signal turn green.
* Never drive in the influence of alcohol and drugs.

**Issues and Risks**

There are, however, many more “human activities that have ethical issues in need of investigation and systematic discussion” (Hanson, 2017, p. 4). Traffic is just one of these. Use of personal vehicles has always been a cause of harm in modern world according to Husak (2004, p. 351). According to the World Health Organization (WHO, 2015), 1.2 million people are killed annually in road crashes.

However, fatalities are not the only issue when discussing moral issues of traffic and safety. Examples of general aspects of consideration are “infrastructure” and “transport systems.”

Ethics deals with issues of rights, obligations, duties, and responsibilities. It also elaborates on whether the intent of these theories and discussions the definition of is if these activities are right or wrong.

Traffic ethics have turned the knowledge of the essence, strength, positive and negative sides of traffic into a moral value system and code that will provide humans proper, careful, useful, and legal participation in traffic and its uses.

One of the issues of dictating traffic laws is that it must be clear on the functions of everyone for his or her responsibility in traffic. There is a constant need to warn people of the negative moral procedures and for everyone to control themselves to prevent their behaviours to cause suffering to themselves or others.

They are many risks concluding as time goes on, they are more of a growth of cars on the road which increases the probability of accidents to increase as more car users are on the road. Passage of people and commodities on the road is essential for societal, economic, and constitutional grounds, but this needs to travel guides to a risk of road traffic damages. A variety of factors establish who uses different components of the transport system, by what means they use them and wherefore, and at what point in time. It may not be viable in put into practice to eradicate all risk, but it is conceivable to reduce some.

# Literature review and research

In urban areas, motorways, and other UK roads, a major safety has been a serious social problem by itself and affects the capacity and performance of the road network. In 2020, around 1,580 people were killed on roads and 131,220 in the UK alone. Many examinations have thus been completed to examine the impact on the recurrence of road accidents from various contributory factors. Because of its geometric design and surfacing friction, risk locations like congestion areas, M1, M25 are critical areas. It describes the road curve as a sharp bend area, which must be turned to the end of the zone by the driver. Likewise, a vehicle can be hit by an approaching vehicle because it either pulling out of side streets or navigating to some unacceptable blind spot.

The data demonstrate that adverse weather conditions can affect road safety and driving behaviour. Road accidents on slippery roads are, for example, more likely to occur than dry roads. This can mostly be defined as the resistance to skids that leads to a friction force necessary for stability and control of vehicles on the road. At wet surfaces, the friction between tyres, but depends on the shape of the tyre, the surface texture, and the water depth. Roads can also be affected by the sun as it can prevent the driver from having an unobstructed vision of the road ahead, especially after rain.

The technology for roads and cars is constantly improving. Today's motorways have several features such as variable speed limits, warning and information signals, smart motorways, SOS phone boxes, congestion monitoring, and digital speed cameras. New vehicles are being developed for easier and safer driving. Natural factors and stress play a key role in causing major road accidents. Other key factors such as vehicle age, safety measures, human blunder, time, and a spot of misfortune.

DfT has identified many factors related to road traffic accidents. Certain factors have now been well identified including, but not limited to, effects on the road surface, weather, and driver experience, knowledge of road signs, and age of the driver.

Various authors have analysed different cause and effects of road accidents on the everyday lives of individuals involved and the economy some of these effects are highlighted below:

Effects of Weather on Road Accidents

It is said weather affects mobility; however, these effects differ on the type of roads, due to this the number of causalities and injuries differ depending on the effect of mobility (Hayat et.al., 2013). Weather as a huge effect on mobility, because mobility is enhanced through friction and a slight change in one of the two surfaces crossing t a particular moment can cause a slip. Therefore, during a bad weather (e.g., heavy snow or rain) the number of accidents and causalities recorded during the accidents is at its peak (fhwa.dot.gov, 2021). During this season caution is advised by the DfT to citizens when using the roads. The papers reviewed in this research work analysed the added risk of driving during a bad weather, Harold Brodsky in 1987 used two statistical methods to analyse the risk factor and his results were a 91% possibility of having an accident during a bad weather.

Effects of Road Accidents on the National Economy

How much exactly does road accidents cost our economy the factor taken into consideration is the economy’s Gross Domestic Product (GDP), irrespective of how developed a country is it is estimated by world bank that at least 2% of its GDP is used in developing a road accident prevention and management plan (worldbank.org, 2021), and it also estimates that countries that do not invest towards road accident prevention and management may lose 22% of their GDP. The criteria to estimate the cost of road accidents should be as follows:

* The cost of estimate should not be too old,
* The estimate should include all road accidents.
* The estimate should include direct and indirect cost of accidents, including an estimated cost for life.
* It should also include the GDP of the country for the year (Rune Elvik, 2000).

Effects of Speed on Road Accidents

Rise in technology as seen the introduction of state-of-the-art cars that can move very fast, many young people however ignore the dangers of over-speeding and simply ride for the thrill it brings, according to the DfT over 20% of road accidents record is caused by over-speeding. The higher the speed the more likelihood an accident will occur (Taylor et.al., 2000), a 5% change in accidents was mostly because of a 1 mile/hour change in speed. Taylor et.al., in their research follow two main approaches which is driver-based and road-based, in the road-based they focused on discovering what type of roads accidents caused by over speeding where more prominent on and what roads they were not, and in the driver-based they focused on the state of mind of the driver, if driving under the influence of alcohol and drugs or not cause the increase in speed. The results were that in each set of traffic and road condition the frequency of accidents increases basically with the speed of the traffic and vice-versa.

Drunk Driving/ Tiredness

“Tiredness is insufficiently recognised as a cause of road accidents” (Brown, 1994), he performed an extensive literature review and is conclusion was as stated above, he also stated that the main effect is a “progressive withdrawal from road and traffic demands”. In 1980 a statistical research by Narim shows that 1% of road accidents casualties are caused by tiredness and 48% of its fatalities. In a questionnaire created by Fridulv Sarberg in 1999 during his research into drowsiness as a cause of road accident he discovered that crossing the edge line on the road while feeling drowsy was a major reason for accidents as it happened 40% of the time, he also discovered that age also had an effect as 50% of road accidents caused by drivers were caused by the older generation.

Driving under the influence is frowned upon because in that state the sense of sight is skewed (swan, 2015), and it has contributed to a huge number of road accidents and casualties. In a survey conducted by the NHS in 2016, 17 % of reported accidents were cause by intoxicated drivers, 13% of which resulted in the deaths of the accident victims and 9% of which suffered from serious injuries. The legal limit for alcohol level of drivers is 8o milligrams of alcohol per 100 millilitres of blood, 35 micrograms per 100 millilitres of breath, or 107 milligrams per 100 millilitres of urine (drinkaware.co.uk, 2021).

## 2.1 Data sources

The improvement of technology has seen road safety become an important part of our everyday lives, as research into the various causes of road accidents and the importance on educating the public on road safety measures take precedence a lot of data has been recorded and the data used in the research is on road accidents in the UK, the data investigates the various roads and motorways present in the UK and compares the varied factors that causes road accidents on those days.

The data used in this research was taken from UK data repository that is responsible for recording datasets for various sectors of the UK government. The dataset includes the road accidents data from 1971-2019 (data.gov.uk, 2021).

# Methodology

The publication shows the research results obtained in partnership with the DfT. Research describes and analyses accidents involving road traffic accidents in the United Kingdom between 1979 to 2019. The data set is based on the given records. Numerous studies in the field of information mining have been used to investigate progress to achieve more useful information objectives. To investigate the ample collection of information from the DfT on road accidents, it is essential to cleanse up information, so that invalid information is removed.

The research uses an SQL database system to record the data. The information present in dataset, it then applies machine learning techniques to select features from dataset which predicts when an accident will likely occur.

A dashboard will be created to show the probability of an accident happening on a road, this dashboard will depict this using the red/green/yellow colors for easy understanding, various features will be considered, and a graph will also be displayed on the dashboard to show accident prone roads and motorways.

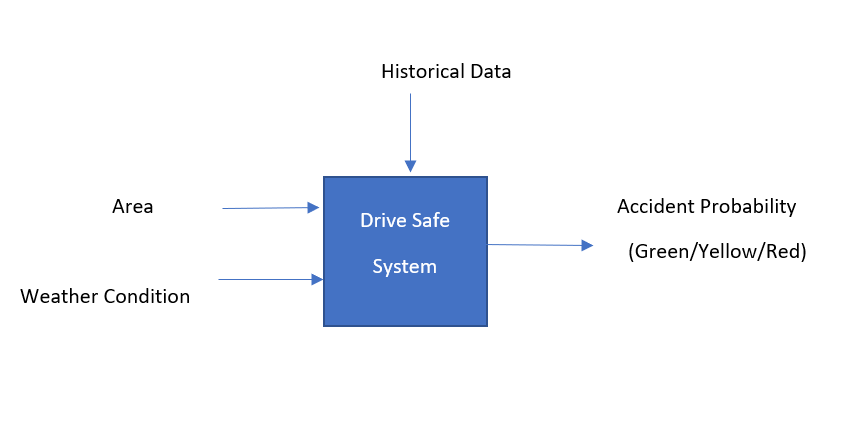
# Requirements

**Business requirements**: The UK Department for Transport (DFT) has publicly published the road safety dataset that contains information about the reported road accidents to the public, stakeholders, and researchers. While the companies can extract valuable knowledge out of this dataset and put it in use for their business, the public remains have limited access to the knowledge this dataset could provide. So, there is a need for more open-source research and systems that study and use this dataset and publish their results and tools for public use and access. Also, some of the system features should be designed to have non-public access and sell this functionality to the targeted stakeholders.

**Stakeholder requirements**: The public in Great Britain ask for an online interactive system that provides them with daily road safety hazard in an area of their select. The ABC car insurance company asked for a system that classifies the GB areas and cities according to the probability of car accidents to take measures and decisions on where and how many car maintenance agencies they need to sign a contract within that area.

**Solution requirements**: Using the historical road safety data to build a prediction system that calculates the probability of having an accident in a specific area and assigns a categorical class for every area daily according to the weather condition.

* **Functional requirements** – The system accepts the area name as input and produces and safety alarm as output to indicate the probability of accidents on the inquiry date.



* **Non-Functional requirements:**
* Accuracy of the system (90%).
* Scalable system.
* High Performance and Responsive Time.

(PMBOK 6th Edition)

* Providing the public with suitable data as well as ensuring that all existing records are compiled and securely stored without any loss of data or data mismanagement for future references.
* Formulating the data in such a way that it can be easily visualized and analysed to promote intelligent business decision making.
* Recommending the DfT senior management to adhere to all legal privacy laws and regulations regarding usage.
* Organizing training sessions with the DfT team on this data portrayal is to reduce the risk of incompetent data analytics which could negatively impact the business.

# Initial prototype / results

# Future work/reflection

and on the second stage we will be adding additional data selection features.

Data selection feature

Data validation

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