

Investigation of the Safety Impact of Land-use Characteristics Based on a Case Study in Coimbatore, India

Master's Thesis of Mahendra Kumar Ramesh

Mentoring:

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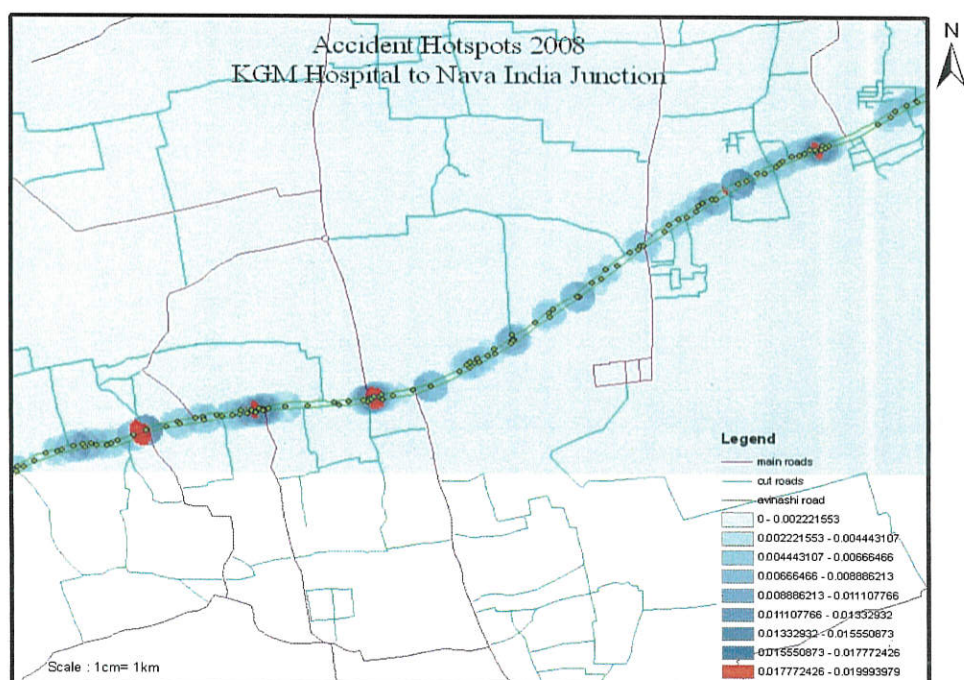


Figure 1. Hot-spot locations (as of 2008)

Tamil Nadu is located at the southernmost part of Indian peninsular. It is eleventh largest state by area and sixth most populous city in India. According to the reports obtained from police department, in the year 2013, there were a total of 15,563 fatalities. This is due to the sudden rise of number of vehicles about twice the amount within a span of five years (2007 - 2012). It is known as "Manchester of Southern India" for the activities of ginning and highest cotton producers in the country. As the number of educational institution increased, the result was the increase in student population or turned into student zone. However, Avinashi road (study corridor) serves as major entry and exit from the urban limits and connects to several educational institutions via this route. Accident study was conducted for 6.5 years (Jan 2007 - Jun 2013). During the study period, first 3.5 years had four lane roads and the remaining three years had six lane roads. As shown in Figure 1, most of crashes occurred in the area of Chinniyampalayam, Hope College, Pudhur junction and PSG Tech, in 2008. The next level of danger zones are clearly shown near R.G. Pudhur and PLS Nagar junction. Esso bunk also suffers high number of accidents in that section.

This research aims to study the causes of accidents and suggest corrective measures at potential location; to carry out before and after studies and to demonstrate the improvement in the problem area; and to investigate the impact of land-use changes on traffic accidents.

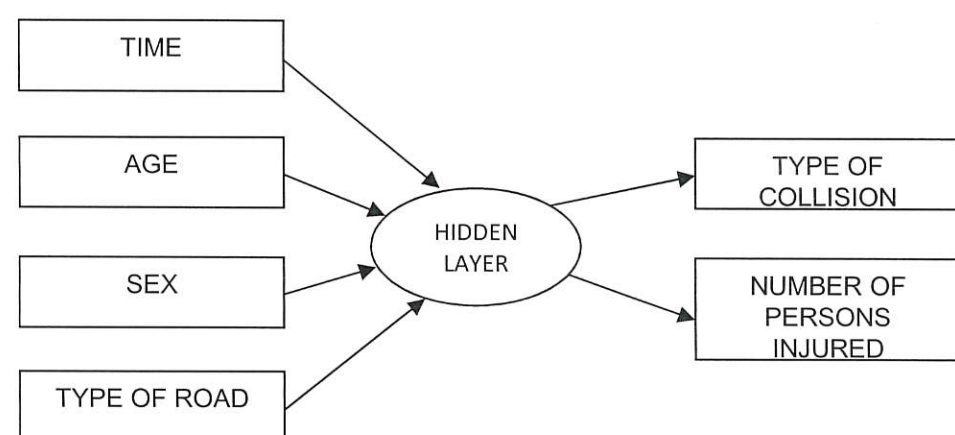


Figure 2. A conceptual flowchart of artificial neural network

As shown in Figure 2, the artificial neural network (ANN) used in this study is made of multiple layers. Thus, architecture of this class besides possessing an input and output layer also has one or more intermediary layers called hidden layers. The computational unit of the hidden layer are known as the hidden neurons or hidden units. The hidden layer aids in performing useful intermediary computations before directing the input to the output layer. The input layer neurons are linked to the hidden layer neurons and the weights on these links are referred to as input - hidden layer weights. Again, the hidden layer neurons are linked to the output layer neurons and the corresponding weights are referred to as hidden - output layer weights. A multilayer feed forward network with l input neurons, m_1 neurons in the first hidden layer, m_2 neurons in the second hidden layer and n output neurons in the output layer is written as $(l - m_1 - m_2 - n)$.

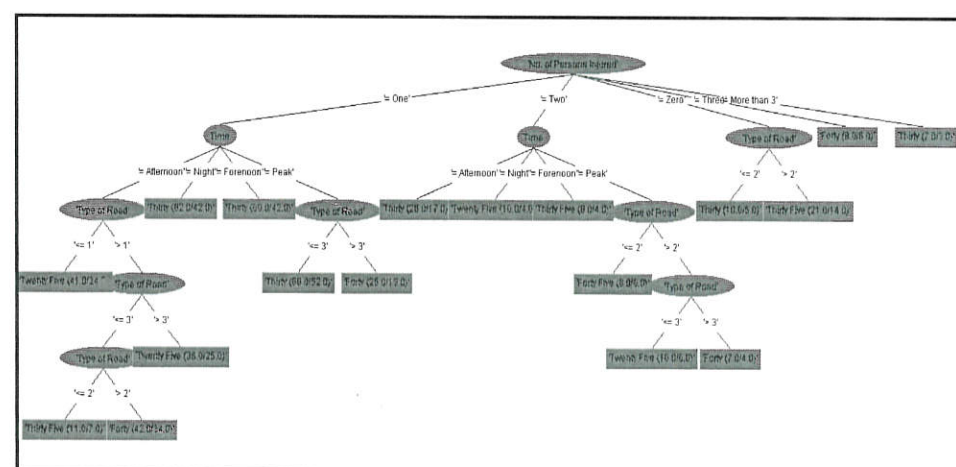


Figure 3. Decision tree method

Decision Tree method is a statistical classifier (or) it is an effective data mining tool. As this research collected 6.5 years of accident data from police station, this tool is applied to obtain meaningful inference and to know the important parameters which decides the major accidents. Meaningful statements are obtained from this decision tree with the syntax "if-then" statement. Tree models where the target variable can take a finite set of values are called classification trees. Decision trees where the target variable can take continuous values are called regression trees.

As a result, when the roads had four lanes, the people of age group about 25 to 40 were the major reasons for causing accidents. However, after six laning of roads, the age group between 14 to 25 was the major cases. This clearly shows that the increase in road capacity influences the age group which causes more accident. Lack of experience in handling critical situations make young riders result in injury. From the study, it is evident that bikes and students are the main causes of accident. Student population has lack of maturity during lane changing technique, over speeding, drink-and-drive and usage of mobile phone while driving were also visualized. Law enforcement should be very strictly adhered so that we can minimize number of traffic accidents and the implementation of safety precautions firmly. Issuance of driving license to be strictly regulated after imparting training. The lane changing process must be religiously followed. Deterrence of drunken driving and usage of mobile phones while driving.