

The Design of a Vehicle Traffic Flow Prediction Model for a Gauteng Freeway Based on an Ensemble of Multi-Layer Perceptron

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Abstract : The cities of Johannesburg and Pretoria both located in the Gauteng province are separated by a distance of 58 km. The traffic queues on the Ben Schoeman freeway which connects these two cities can stretch for almost 1.5 km. Vehicle traffic congestion impacts negatively on the business and the commuter's quality of life. The goal of this paper is to identify variables that influence the flow of traffic and to design a vehicle traffic prediction model, which will predict the traffic flow pattern in advance. The model will enable motorists to be able to make appropriate travel decisions ahead of time. The data used was collected by Mikro's Traffic Monitoring (MTM). Multi-Layer perceptron (MLP) was used individually to construct the model and the MLP was also combined with Bagging ensemble method to training the data. The cross-validation method was used for evaluating the models. The results obtained from the techniques were compared using predictive and prediction costs. The cost was computed using combination of the loss matrix and the confusion matrix. The predicted models designed shows that the status of the traffic flow on the freeway can be predicted using the following parameters travel time, average speed, traffic volume and day of month. The implications of this work is that commuters will be able to spend less time travelling on the route and spend time with their families. The logistics industry will save more than twice what they are currently spending.

Keywords : bagging ensemble methods, confusion matrix, multi-layer perceptron, vehicle traffic flow

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