

Application of K-Nearest Neighbours in Regression Modelling for Solving Transportation Problems

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Abstract: This study presents a regression model using the K-Nearest Neighbours KNN technique to estimate average travel time in transportation networks. The model considers factors such as route length, route width, and historic traffic patterns. The application of this model can aid in effective traffic management and planning, thereby minimizing disruptions and inconvenience to users.

Keywords: Traffic pattern, End users, Transportation Problem, Regression Modeling, K-Nearest Neighbours

1. Introduction

Transportation means transferring the goods from one area to another area. The main problem is to build predictive models capable of forecasting average travel time of vehicles as well as traffic volume on road networks. The problem posed on this competition is a difficult and significant one for traffic authorities as well as end users. Traffic patterns evolve with time, as several factors such as seasonality, weather conditions, business hours, holidays, road accidents, etc. Influence it. Stochastic variations of traffic patterns make the problem more difficult to model with traditional approaches.

2. Traffic management and Average travel time

Traffic authorities can plan their strategies, including traffic control, diversions, and route maintenance, to cause minimal disruption and inconvenience. Similarly, end users can plan their travel effectively by being aware of potential congestion and expected delays in travel routes. We apply Regression modelling to estimate the average Travel time for a particular route depends on route length, route width, link length, number of links, type of vehicles, historic traffic patterns observed on a route/link.

3. Regression Modelling

$$Y = a + bX$$

$$b = \frac{N\sum XY - (\sum X)(\sum Y)}{N\sum X^2 - (\sum X)^2} \quad a = \frac{\sum Y - b\sum X}{N}$$

Where,

N = number of observations, or years

X = a year index (decade)

Y = population size for given census years

The regression means predicting the dependent variable based on the independent variable i.e., X,Y. The linear regression equation is shown below.

We modelled the problem to estimate average travel time for a particular route. The End user can transport the goods

at minimum time. The K- Nearest Neighbours (KNN) Technique is used for estimation.

4. K-Nearest Neighbours

KNN can be used for classification-the output is a class membership (predicts a discrete value). An object is classified by a majority vote of its neighbours, with the object being assigned to the class most common among its K-Nearest Neighbours. It can also be used for regression – output is the value for the object (predicts continuous value). This value is the average(or median) of the values of its K-Nearest Neighbours.

5. Estimation of Average Time

By using this KNN Technique, select the object as average travel time is classified into route length, route width etc., We develop a Regression equation to estimate the average travel time for particular route based on its classification. Classification (X) is independent variable. Average Travel time(Y) is dependent variable.

6. Conclusion

This study developed a regression model using KNN to estimate the average travel time for a particular route based on factors such as route length and width. The application of this model can significantly aid in traffic management and planning, leading to minimized disruptions and improved user experience.

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