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Comparison of Different k-NN Models for Speed Prediction in an Urban Traffic Network

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Abstract : A database that records average traffic speeds measured at five-minute intervals for all the links in the traffic network of a metropolitan city. While learning from this data the models that can predict future traffic speed would be beneficial for the applications such as the car navigation system, building predictive models for every link becomes a nontrivial job if the number of links in a given network is huge. An advantage of adopting k-nearest neighbor (k-NN) as predictive models is that it does not require any explicit model building. Instead, k-NN takes a long time to make a prediction because it needs to search for the k-nearest neighbors in the database at prediction time. In this paper, we investigate how much we can speed up k-NN in making traffic speed predictions by reducing the amount of data to be searched for without a significant sacrifice of prediction accuracy. The rationale behind this is that we had a better look at only the recent data because the traffic patterns not only repeat daily or weekly but also change over time. In our experiments, we build several different k-NN models employing different sets of features which are the current and past traffic speeds of the target link and the neighbor links in its up/down-stream. The performances of these models are compared by measuring the average prediction accuracy and the average time taken to make a prediction using various amounts of data.

Keywords : big data, k-NN, machine learning, traffic speed prediction
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