Time Series Prediction using Artificial Intelligence Methods

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Time series prediction [1] is important in a wide range of areas and has numerous applications. Take, for instance, forecasting the traffic of queueing systems, predicting product demand in business, or forecasting share prices in financial markets. Since estimates about future changes and developments are important for taking decisions and actions, there is a constant need for more precise forecasting techniques. A lot of research has been done on time series forecasting regarding queueing systems, but the vast majority of them deal with conventional statistical methods.

When compared to traditional statistical methods, intelligent learning methods have a high degree of flexibility in the types of functions. These can be adaptively approximated during the training process. They are well suited to such approximation tasks. After being trained using the examples from the training set, the theory it has learned can be used to classify (predict) new examples.

The aim of this paper is to describe three different learning methods for solving the problem of forecasting the traffic of queueing systems. The new aspects of this work are: using and developing different AI learning methods to solve such problems, dealing with external factors and applying supervised learning techniques. The applied AI methods are decision trees, support vector machines and artificial neural networks.

Prediction is a difficult problem which confronts most human endeavours. While many specialised time series prediction techniques have been developed, these techniques have certain limitations. Most are restricted to modeling whole series rather than extracting predictive features, and are generally difficult for domain experts to understand. Symbolic machine learning (decision trees [3]) promises to address these limitations.

Support Vector Machines [4] techniques can provide very accurate predictions.

The benefits of using artificial neural networks [2] is that it is possible to encode some predictor variables into the network architecture.

Using a combinations of these methods, we can obtain reasons for the decision as well as an accurate prediction. In the comparision and analysis phase we can see which methods produce better or worse results. Taking the latter into account we can then construct a new hybrid model. An other benefit of this new model is the handling of external factors (trends and special events), which could provide more precise prediction compared to traditional methods.

Keywords: time series prediction, intelligent prediction models, queueing systems, Artificial Intelligent (AI) learning methods.

References

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