

Benchmarking Machine Learning Approaches for Forecasting Hotel Revenue

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Abstract : A critical aspect of revenue management is a firm's ability to predict demand as a function of price. Historically hotels have used simple time series models (regression and/or pick-up based models) owing to the complexities of trying to build casual models of demands. Machine learning approaches are slowly attracting attention owing to their flexibility in modeling relationships. This study provides an overview of approaches to forecasting hospitality demand - focusing on the opportunities created by machine learning approaches, including K-Nearest-Neighbors, Support vector machine, Regression Tree, and Artificial Neural Network algorithms. The out-of-sample performances of above approaches to forecasting hotel demand are illustrated by using a proprietary sample of the market level (24 properties) transactional data for Las Vegas NV. Causal predictive models can be built and evaluated owing to the availability of market level (versus firm level) data. This research also compares and contrast model accuracy of firm-level models (i.e. predictive models for hotel A only using hotel A's data) to models using market level data (prices, review scores, location, chain scale, etc... for all hotels within the market). The prospected models will be valuable for hotel revenue prediction given the basic characters of a hotel property or can be applied in performance evaluation for an existed hotel. The findings will unveil the features that play key roles in a hotel's revenue performance, which would have considerable potential usefulness in both revenue prediction and evaluation.

Keywords : hotel revenue, k-nearest-neighbors, machine learning, neural network, prediction model, regression tree, support vector machine

Conference Title : ICITHEM 2019 : International Conference on International Tourism, Hospitality and Event Management

Conference Location : London, United Kingdom

Conference Dates : January 21-22, 2019