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Oblique Random Forests for Regression Using Weighted Support Vector Machines

The increased use of random forest (RF) methods as a supervised statistical learning technique is primarily attributed to their simplicity and ability to handle complex datasets. A RF consists of multiple decision trees, which can be categorized into two types based on how they process node splitting: parallel and oblique. Axes-parallel decision trees split the feature space using a single feature at a time, aligning the hyperplane with the coordinate axes. In contrast, oblique decision trees partition the space with hyperplanes that are oblique to the axes, often leading to higher predictive power. This work introduces a novel method to create an oblique RF for regression tasks. The base learner in this ensemble is an oblique decision tree where the splitting hyperplane is obtained through a weighted support vector machine classifier. As in standard RF, a bootstrap sample is drawn before growing each tree, and a random subset of predictors is considered at each node. The algorithm splits the data at each node by applying the classifier to the most correlated features, selected from the current subset, with the dependent variable. The cardinality of the selected subset is chosen randomly to increase diversity among the base learners. The proposed oblique RF is then evaluated on real-world benchmark datasets and compared to other state-of-the-art machine learning techniques. Results show a consistent improvement in predictive performance.

Special/ Invited session

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Mainly methodology

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