**Clustering-based multi-objective evolutionary ensemble learning for customer churn prediction**

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**Abstract**

Nowadays, customer churn is one of the key challenges organizations face. By accurately predicting customer churn, companies can reduce their costs and improve their growth. In order to predict churn, ensemble learning models are widely used. The diversity of the ensemble classifier, as well as the prediction performance, are two critical principles. Therefore, a significant challenge in this area is developing ensemble learning models consisting of different base classifiers. For churn prediction in this study, two models of multi-objective evolutionary ensemble learning based on clustering (MOEEC)s; are proposed, which are include a novel diversity measure. Also, to solve the data imbalance problem, the second model uses another objective function to evaluate ensemble performance. A dataset collected from a mobile operator database is used to test the models proposed in this paper. Using four performance metrics of Accuracy, AUC, F-score, and G-means, the proposed models outperform previous models.

**Keywords:** Customer churn; Ensemble learning methods; Layered clustering; Imbalanced data; Diversity; Multi-objective optimization algorithm.

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