

# **Enhancing Employee Turnover Prediction with Optimized ANNs and Data Augmentation: A Cluster-Based Approach in HR Analytics**

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## **Abstract**

This study presents an innovative methodology that incorporates Artificial Neural Networks (ANN) with clustering techniques to predict employee turnover, focusing on hyperparameter tuning of various input parameters to obtain optimal ANN models. By segmenting data, the study identifies key predictors of turnover, allowing targeted interventions to be implemented to improve the efficiency and effectiveness of retention policies. Data augmentation using Conditional Generative Adversarial Networks (CTGAN) was performed on clusters with imbalanced data. Following this, the optimized ANN models were applied to these augmented clusters, leading to a notable improvement in their performance. We evaluate our optimized ANN models against four other ANN variants and four traditional machine learning models to demonstrate their superior accuracy and recall. By utilizing our study's innovative approach, operational advantages can be achieved through a shift away from generalized strategies to more focused, cluster-based policies, which can be used to optimize resource utilization and reduce costs. Because of its practicality and enhanced ability to predict and manage employee turnover, this method, supported by empirical evidence, is a significant advancement in human resource (HR) analytics.

**Keywords:** *Employee Turnover Prediction, Artificial Neural Networks, HR Analytics, Machine Learning in HRM, Cluster Analysis*