

Advanced Machine Learning and Predictive Modeling Techniques for Pharmaceutical Product Classification

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Abstract: *In this project, we aimed to build a machine learning model to classify pharmaceutical products accurately, enhancing organization and identification within healthcare systems. We used the Random Forest Classifier, an ensemble method known for its high accuracy and versatility, to handle large datasets and complex data interactions. This model is crucial for ensuring the accuracy and interpretability of predictions, which directly impact patient safety, regulatory compliance, and inventory management. For model transparency, we employed LIME (Local Interpretable Model-agnostic Explanations) to show how features like dosage form, strength, and manufacturer details influence predictions. We also explored an Artificial Neural Network (ANN) with two dense layers and Relu activation to compare performance. The ANN demonstrated competitive accuracy and highlighted its ability to capture non-linear relationships in pharmaceutical data. LIME further improved the interpretability of the model, reinforcing the importance of transparent AI in healthcare applications.*

Keywords: machine learning; neural network; data classification; random forest generation; pharmaceutical industry; predictive modeling; healthcare analytics; model interpretability.