OPTIMIZING FINANCIAL STABILITY THROUGH PREDICTIVE MODELING

Strategies for Predicting and Managing Credit Risk

Predictive Model Plan

1. Model Logic

Overview

To predict customer delinquency, we'll employ **Logistic Regression** due to its interpretability and efficacy in financial risk classification. Additionally, a **Gradient Boosting Model (e.g., XGBoost)** is considered for enhanced accuracy and its ability to handle nonlinear relationships.

Workflow

1. **Data Preprocessing**:
   - Address missing values.
   - Scale numerical features.
   - Encode categorical variables to numerical ones.
2. **Feature Selection**:
   - Select key predictors based on correlation analysis and feature importance scores from preliminary models.
3. **Model Training**:
   - Train models using Logistic Regression or Gradient Boosting to classify accounts as delinquent or not.
4. **Evaluation**:
   - Assess model performance using metrics such as AUC-ROC, Precision, Recall, and F1-score.
5. **Deployment**:
   - Integrate the chosen model into Geldium's existing credit risk assessment pipeline.

Top Five Features

- **Missed_Payments**: Historical payment behavior as an indicator of future risk.
- **Credit_Utilization**: Reflects how much of the available credit is being used.
- **Credit_Score**: A comprehensive measure of financial reliability.
- **Debt_to_Income_Ratio**: Shows financial burden in relation to income.

- **Loan_Balance**: Indicates the level of financial strain.

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2. Justification for Model Choice

Logistic Regression

- **High Interpretability**: Essential for making informed financial decisions.
- **Transparency**: Facilitates regulatory compliance and trust.
- **Ease of Deployment**: Simplicity and computational efficiency make it suitable for rapid implementation.
- **Proven Financial Use**: A well-established tool in credit risk analysis.

Gradient Boosting (XGBoost)

- **Improved Accuracy**: Offers better predictive performance, especially in complex scenarios.
- **Explainability**: Maintains a degree of interpretability acceptable in financial contexts.

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3. Evaluation Strategy

Key Metrics

- **AUC-ROC**: Evaluates the model's ability to distinguish between classes.
- **Precision & Recall**: Helps balance the trade-off between false positives and false negatives.
- **F1-Score**: Provides a single metric that balances precision and recall.

Bias Detection & Mitigation

- **Fairness Audits**: Conduct audits to ensure model predictions are unbiased across different income levels and demographics.
- **Adversarial Debiasing**: Implement techniques to mitigate any identified disparities.

Ethical Considerations

- **Transparency**: Maintain clarity in how model predictions are made.
- **Regulatory Compliance**: Ensure the model adheres to financial regulations and ethical guidelines.

By following this plan, Geldium will be equipped with a robust, ethical, and high-performing predictive model to assess customer delinquency effectively.