**Predictive Model Plan – Student Template**

Use this template to structure your submission. You can copy and paste content from GenAI tools and build around it with your own analysis.

# 1. Model Logic (Generated with GenAI)

Use a GenAI tool (e.g., ChatGPT, Gemini) to generate the logic or structure of your predictive model.  
- You may include pseudo-code, a step-by-step process, or a simplified code snippet.  
- Briefly explain what the model is designed to do.

Paste your GenAI-generated output below or describe the logic in your own words:

We used a **Decision Tree Classifier** to predict whether a customer is likely to become delinquent. The model takes the top 5 most relevant features identified during EDA:

* **Credit Utilization**
* **Missed Payments**
* **Credit Score**
* **Debt-to-Income Ratio**
* **Income**

**Step-by-step logic:**

1. **Data Preprocessing**: Handle missing values using median imputation; apply SMOTE to balance the dataset due to class imbalance.
2. **Feature Selection**: Select top 5 predictors based on correlation with delinquency.
3. **Model Training**: Train a decision tree classifier on the cleaned and resampled dataset.
4. **Prediction**: Generate a probability score for each customer based on the decision paths.
5. **Classification**: If the predicted probability exceeds 0.5, classify as “delinquent”; otherwise, “non-delinquent”.
6. **Evaluation**: Assess model accuracy, precision, recall, F1 score, and AUC.

A screen shot of a computer program

Description automatically generatedCode generated by GENAI- CHATGPT-4

**Model Evaluation Results:**

* **Accuracy:** 0.86
* **Precision:** 0.00
* **Recall:** 0.00
* **F1 Score:** 0.00
* **AUC Score:** 0.56
* **Confusion Matrix:**

[[86, 0]

[14, 0]]

# 2. Justification for Model Choice

Explain why you selected this specific model type (e.g., logistic regression, decision tree, neural network). Consider:  
- Accuracy  
- Transparency  
- Ease of use or implementation  
- Relevance for financial prediction  
- Suitability for Geldium’s business needs

I chose a **Decision Tree** because it provides a balance of performance and interpretability—essential in the financial services industry. While models like neural networks can offer higher accuracy, their "black-box" nature makes them harder to explain to stakeholders and regulators. Decision trees visually show how decisions are made, making them transparent and easy to justify. For Geldium, this transparency supports regulatory compliance and helps the collections team understand and trust the model's predictions. It’s also easy to deploy and doesn’t require complex preprocessing, making it a practical fit for Geldium’s risk assessment process.

# 3. Evaluation Strategy

Outline how you would evaluate your model’s performance. Include:  
- Which metrics you would use (e.g., accuracy, precision, recall, F1 score, AUC)  
- How you would interpret those metrics  
- Any plans to detect or reduce bias in your model  
- Ethical considerations in making predictions about customer financial behavior  
To evaluate the model’s performance, I would use the following metrics:

* **Accuracy**: Measures the overall correctness of the model.
* **Precision**: Tells us how many customers predicted to be delinquent actually were.
* **Recall**: Helps us understand how many actual delinquents were successfully identified.
* **F1 Score**: Balances precision and recall, especially helpful for imbalanced datasets.
* **AUC (Area Under the ROC Curve)**: Evaluates the model’s ability to distinguish between delinquent and non-delinquent customers.
* **Confusion Matrix**: Gives a clear picture of false positives and false negatives.

Additionally, I would perform **fairness checks** to ensure the model isn’t biased against any particular demographic group (like employment status or location). Ethical considerations include being cautious with over-predicting delinquency, which could unfairly penalize customers. If needed, techniques like rebalancing the dataset, tweaking thresholds, or adding fairness constraints would be applied.