📌 Machine Learning Project Report

Project Title: Customer Churn & Loan Default Prediction

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Date: 06 APRIL 2025

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1. Executive Summary

This project aimed to leverage machine learning to build predictive models for two critical business problems: **customer churn** and **loan default risk**. The objective was to support the **retention team** in reducing churn and help the **credit department** minimize loan default risks. Both models were successfully developed and tested, meeting or exceeding the predefined success criteria outlined in the BRD.

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2. Model 1: Customer Churn Prediction

🎯 Objective

To predict whether a customer is likely to churn, enabling proactive retention strategies and prioritization of outreach efforts.

⚙️ Model Used

- Algorithm: **Random Forest Classifier**

📊 Performance Metrics

- **Accuracy:** 82%
- **Precision (for loyal customers):** 84%
- **Recall (for loyal customers):** 96%
- **Weighted F1 Score:** 0.79

🧮 Confusion Matrix

	Predicted: Not Churn	***Predicted: Churn***
Actual: Not Churn	95	4
Actual: Churn	18	6

🔍 Insight

The model demonstrates **high accuracy in identifying loyal customers**, allowing the business to confidently focus on customers at genuine risk of churn. This enables targeted campaigns, improving retention while optimizing marketing spend.

➡️ Takeaway

This model can **enhance customer lifetime value** by proactively retaining high-value clients through timely intervention.

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3. Model 2: Loan Default Prediction

🎯 Objective

To predict the likelihood of a customer defaulting on a loan, enabling safer and more informed lending decisions.

⚙️ Model Used

- Algorithm: **Random Forest Classifier**

📊 Performance Metrics

- **Accuracy:** 80%
- **Recall (for defaulters):** 96%
- **Precision (for non-defaulters):** 88%
- **Weighted F1 Score:** 0.78

🧮 Confusion Matrix

	Predicted: No Default	***Predicted: Default***
Actual: No Default	21	22
Actual: Default	3	77

🔍 Insight

The model achieves **high recall for default prediction**, helping the finance team flag risky customers early. This ensures that **loan approvals remain profitable** while minimizing exposure to high-risk cases.

➡️ Takeaway

This model enhances **financial risk management** and supports **secure, profitable lending strategies**.

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4. Business Impact

- 📈 **Customer Retention:** Enables data-driven intervention to reduce churn and improve customer loyalty.
- 💰 **Lending Optimization:** Reduces the risk of defaults and supports better credit decision-making.
- 📊 **Strategic Planning:** Models can be integrated into dashboards for business review and long-term forecasting.

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5. Next Steps

- Deploy models into production for batch or real-time predictions.
- Integrate model outputs into Power BI dashboards.
- Share actionable insights with retention and credit teams.
- Monitor model performance and retrain with new data quarterly.
