Customer Churn Analysis

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Project Overview

This project demonstrates comprehensive customer churn analysis using Python, focusing on identifying at-risk customers and providing actionable business insights. The analysis combines exploratory data analysis, machine learning predictions, and strategic business recommendations.

Business Problem

- Identify key factors driving customer churn
- Predict which customers are likely to leave
- Provide data-driven recommendations to reduce churn
- Quantify the financial impact of customer retention strategies

Technologies Used

- Python 3.8+ - Core programming language
- Pandas - Data manipulation and analysis
- NumPy - Numerical computing
- Matplotlib & Seaborn - Data visualization
- Scikit-learn - Machine learning algorithms
- Random Forest - Prediction model

Key Features

1. Comprehensive Data Analysis: EDA, missing value handling, correlation
2. Advanced Visualizations: Dashboards, heatmaps, revenue charts
3. Machine Learning Model: Random Forest, evaluation metrics
4. Business Intelligence: High-risk customer ID, ROI strategy

How to Run

- Ensure Python 3.8+ is installed

  ```
  python --version
  ```

- Install required packages

  ```
  pip install -r requirements.txt
  ```

- Run the complete analysis

  ```
  python customer_churn_analysis.py
  ```

- Expected Output:
- - Console Output: Detailed analysis results
- - customer_churn_analysis.png: Visualization dashboard
- - feature_importance.png: ML model insights

Key Findings & Insights

🔍 Customer Segmentation

- High-Risk: Month-to-month customers with <12 months tenure
- Churn Rate Variation: 15-45% across segments
- Revenue Impact: Potential annual loss of $208,266

□ Predictive Model Performance

- Accuracy: 85%+
- Top Predictors: Contract, tenure, charges, tech support

Strategic Recommendations

5. Retention Campaigns: Target month-to-month customers
6. Service Enhancement: Improve tech support quality
7. Pricing Strategy: Review high-charge customer segments
8. Proactive Intervention: Implement early warning systems

Project Architecture

- Total Customers: 1,000
- Churned Customers: 267 (26.7%)
- Retained Customers: 733 (73.3%)
- Model Accuracy: 87.50%, Precision: 0.85, Recall: 0.82
- Monthly Revenue Loss: $17,355.50

- Annual Revenue Loss: $208,266.00

Business Impact

- Identify 20% of customers responsible for 80% of churn risk
- Quantify potential revenue savings
- Reduce customer acquisition cost, improve LTV

Future Enhancements

9. Real-time Prediction API
10. Advanced Segmentation with clustering
11. Time Series Analysis for seasonal patterns
12. A/B Testing Framework for campaigns

Technical Skills Demonstrated

- Data Science: End-to-end analysis pipeline
- Machine Learning: Classification, feature engineering
- Visualization: Dashboards and storytelling
- Business Acumen: Strategic thinking and ROI analysis

Why This Project Stands Out

13. Complete Business Solution
14. Production-Ready Code
15. Visual Storytelling
16. Financial Quantification
17. Scalable Architecture

Contact

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