Case Study: Telecommunication Monthly Recurring Charges (MRC) Optimization Using Data Analytics and Machine Learning

1. Executive Summary

Objective: To minimize telecommunication monthly recurring charges (MRC) by analyzing mobile data usage and optimizing rate plans. The approach combined rule-based data analysis with machine learning models to identify cost-saving opportunities.

Key Outcomes:

Significant reduction in total MRC through data-driven optimization.

Implementation of machine learning models to predict optimal plans, improving accuracy over manual methods.

Achieved potential savings of up to $118,436.65 using machine learning techniques.

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2. Project Background

The organization faced high recurring costs associated with their telecommunication MRC. The objective was to align rate plans with actual usage patterns to reduce unnecessary expenditures.

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3. Methodology

Phase 1: Rule-Based Data Analysis

Approach:

Data Collection: Collected three months of telecommunication MRC data (55,355 units).

Data Fields: Unit ID, Rate Plan Name, Plan Size, MB Conversion, Subscriber Status, Plan Price, Cycle to Date Usage (MB).

Plan Cost Mapping: Established cost mapping for different rate plans (e.g., 0KB: $0.20, 10MB: $1.19, 1GB: $9.00).

Analysis & Results:

Compared actual data usage against current rate plans.

Suggested downgrades for under-utilized plans.

Key Findings:

Units on the 500KB plan showed potential savings from $6,020.70 to $1,377.95.

Units on the 25MB plan could reduce MRC from $16,148.65 to $4,459.60.

Total Savings: Reduced total MRC from $165,440.05 to $47,312.37.

Phase 2: Machine Learning Optimization

Objective: To enhance MRC optimization using machine learning models that predict the most cost-effective plans based on historical usage patterns.

Steps Involved:

Data Preparation:

Combined three datasets for comprehensive analysis.

Cleaned and formatted data for machine learning models.

Feature Engineering:

Created features like average monthly usage, usage variance, and peak periods.

Model Selection:

Random Forest Classifier (RFC): Classified optimal plans.

Random Forest Regressor (RFR) and Gradient Boosting Regressor (GBR): Predicted plan costs.

Model Training & Evaluation:

Trained models using historical data.

Evaluated models based on accuracy and Mean Squared Error (MSE).

Results:

Random Forest Classifier (RFC):

Accuracy: 60.45%

Total Savings: Reduced MRC from $165,434.05 to $46,997.35.

Random Forest Regressor (RFR):

MSE: 1.182

Total Savings: Minimal savings, MRC remained at $165,440.05.

Gradient Boosting Regressor (GBR):

MSE: 1.221

Total Savings: Reduced MRC to $55,334.41.

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4. Key Insights

Rule-Based Analysis: Provided immediate MRC reductions by aligning plans with current usage.

Machine Learning: Offered deeper insights, identifying patterns missed by rule-based methods. The RFC model achieved the highest savings.

Cost Reduction: Potential to reduce total MRC by up to 72%.

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5. Conclusion & Recommendations

Conclusion:

The combined approach of rule-based analysis and machine learning led to substantial MRC savings.

Machine learning models, particularly the Random Forest Classifier, proved effective in predicting optimal plans.

Recommendations:

Adopt Machine Learning for Ongoing Optimization: Integrate machine learning models into the billing system for continuous MRC monitoring.

Regular Data Audits: Conduct quarterly reviews of usage patterns to adjust plans proactively.

Expand Optimization Scope: Apply similar techniques to other cost centers (e.g., voice plans, international roaming).