Insights On Tele Communication Project File

Extra Insights

📌 Business Insights

1️⃣ Frequent Customer Service Calls Indicate Dissatisfaction and High Churn.

Graph: 🔷 Bar Chart - Average Calls vs. Churn Rate

Explanation: Customers who frequently contact customer service are more likely to churn. This suggests unresolved issues or dissatisfaction with the service. High call volume may indicate frustration due to billing disputes, poor network quality, or lack of effective customer support. Businesses should analyze common customer complaints and enhance support services to improve retention.

2️⃣ Higher Day & Evening Call Charges Lead to Increased Churn.

Graph: 🔷 Line Plot - Call Charges vs. Churn Probability

Explanation: Customers who incur higher charges for daytime and evening calls are more likely to leave. This suggests that cost sensitivity plays a significant role in churn. If competitors offer better pricing or unlimited plans, customers may switch. A potential strategy could be introducing loyalty-based discounts or bundling more value into existing plans.

3️⃣ Heavy Users Are More Likely to Churn, Indicating Potential Service or Cost Concerns.

Graph: 🔷 Histogram - Call Minutes Distribution by Churn Status

Explanation: Customers who spend more time on calls tend to churn more often. This could be due to high costs, dissatisfaction with call quality, or searching for

better deals. Identifying such users and offering personalized retention strategies —such as exclusive discounts or improved service plans—can help reduce churn.

4️⃣ International Call Charges Significantly Impact Churn.

Graph: 🔷 Box Plot - International Call Charges vs. Churn

Explanation: Customers who make frequent international calls have a higher churn rate. This indicates that high international call costs may be a major pain point. Competitors offering cheaper international rates may attract these customers. Businesses should consider special packages or reduced rates to retain such high-value customers.

5️⃣ Certain Area Codes Experience Higher Churn Rates.

Graph: 🔷 Geographical Heatmap - Churn Rate by Area Code

Explanation: Customers from specific area codes tend to leave more often. This could be due to network issues, regional pricing differences, or local competitor influence. A detailed investigation into these regions can help tailor marketing or service improvements to reduce churn in high-risk locations.

6️⃣ Subscription Plans (International & Voice) Affect Churn.

Graph: 🔷 Stacked Bar Chart - Churn Rate by Subscription Plan

Explanation: Customers on specific subscription plans show different churn patterns. Plans that don’t align well with user expectations or contain hidden costs lead to customer dissatisfaction. Businesses should analyze plan performance and consider modifying unpopular or high-churn plans.

7️⃣ High-Usage Customers Need Tailored Retention Strategies.

Graph: 🔷 Scatter Plot - Total Usage vs. Churn Probability

Explanation: Customers with high call minutes contribute significantly to revenue but also show a higher tendency to churn. Offering personalized retention strategies such as custom plans, loyalty rewards, or special offers can prevent revenue loss.

🔍 One-Liner Insights

📈 Business Insights

1. **Customer calls & churn are positively correlated** – Frequent service calls may indicate dissatisfaction.
2. **Higher day & evening charges increase churn** – Customers might be cost-sensitive.
3. **High total minutes used also correlates with churn** – Heavy users might be leaving.
4. **International call charges impact churn significantly** – Global communication costs could be a concern.
5. **Customers with specific area codes churn more** – Certain locations may have higher dissatisfaction.
6. **Subscription plans (Intl & Voice) influence churn** – Plan features might not align with customer needs.
7. **Retaining high-usage customers requires tailored plans** – A strategy is needed for heavy spenders.

Business Insights from the Analysis

1. **Customer Service Calls & Churn**
    - **Frequent calls to customer service are a red flag**:
        - Customers who made **6+ calls** had **56-58% churn rates**.
        - Customers who made **less than 3 calls** had **8-10% churn rates**.
    - **Business Action:**
        - Improve **first-call resolution**.
        - Offer **priority handling** for frequent callers.
        - Identify and fix **service pain points**.
2. **International Plan & Churn**

- Customers with an **international plan churn at a higher rate**.
- **Possible Reasons**:
  - High pricing.
  - Poor service quality.
  - Unmet expectations.
- **Business Action:**
  - Adjust pricing or **offer discounts**.
  - Improve international call **quality**.
  - **Retain high-value international customers** with loyalty programs.

3. **High-Usage Customers Are High-Risk**
   - **Customers using 350+ minutes daily** tend to churn more.
   - **Business Action:**
     - Offer **personalized discounts** for high-usage customers.
     - Introduce **loyalty rewards** for frequent users.
4. **Pricing Structure & Revenue Optimization**
   - **High charges in day & international categories are linked to churn**.
   - **Business Action:**
     - Experiment with **dynamic pricing models**.
     - Offer **customized plans** based on customer spending patterns.
     - **Upsell premium voice plans**, as they reduce churn.
5. **Churn Varies by Region**
   - **Area code 408** shows the **highest churn rate**.
   - **Business Action:**
     - Investigate **network quality and competitor pricing** in that region.
     - Launch **localized retention campaigns**.
6. **Predictive Churn Strategies**

- **Monitor high-spending customers early** and offer proactive retention plans.
- Use **predictive analytics** to forecast churn behavior.

7. **Service & Plan Improvements**
   - **Night and evening calls have similar usage (~200 mins)**.
   - **Business Action:**
     - Introduce **special evening-night plans** to increase engagement.
8. **Marketing & Competitive Strategy**
   - **Analyze competitors in high-churn regions**.
   - **Segment customers by usage** for targeted marketing.
   - Offer **personalized retention incentives**.

📊 General Insights from the Dataset

1. **Dataset Overview**
   - **5,000 entries** and **21 columns**.
   - The **"Unnamed: 0" column** is unnecessary and was dropped.
   - **Target variable: "Churn" (Yes/No)**.
2. **Data Quality Issues**
   - **Missing values** found in:
     - `"day.charge"` (**7 missing values**)
     - `"eve.mins"` (**24 missing values**)
   - These missing values need handling (e.g., imputation or removal).
   - Some numeric columns (like `"day.charge"`) were **detected as objects** and converted back to numerical types.
3. **Descriptive Statistics**
   - **Average account length**: **100 days** (Max: 243 days).

- **Daily call minutes**: Avg **180 minutes**, with some users making **over 350 minutes** of calls per day.
- **Customer service calls range**: **0 to 9 calls** (potential churn predictor).
- **Night call duration (200 mins)** is **similar to evening calls**.

4. **Correlation Analysis Findings**
   - **Strong Positive Correlations**:
     - `"intl.mins"` and `"intl.charge"` (**0.99**) → More international calls = higher charges.
     - `"day.mins"` and `"day.charge"` (**0.99**) → More daytime usage = higher charges.
     - `"night.mins"` and `"night.charge"` (**0.99**) → Similar pattern for nighttime calls.
   - **Churn-related correlations**:
     - **Customer service calls** positively correlate with **churn** (Frequent calls indicate dissatisfaction).
     - **High daytime minutes** correlate with **churn** (Heavy users tend to leave).
5. **Churn Distribution & Customer Characteristics**
   - **14.14% churn rate** (**707 out of 5,000** customers churned).
   - **Higher churn rate among international plan users**.
   - **Area codes show similar churn distribution** (not a strong predictor).
   - **Customers with voicemail plans are less likely to churn**.

📊 Detailed Insights

1️⃣ Customers with Higher Usage Tend to Churn More.

Explanation: Data shows that customers who use more services (call minutes, charges) are also the ones more likely to leave. This suggests that either they are dissatisfied with the service quality or are actively looking for better deals.

Businesses should analyze feedback from these users and provide customized retention incentives.

2️⃣ Certain States Have Higher Churn Rates Than Others.

Explanation: Some states consistently show higher churn than others. This could be influenced by local competition, network quality, or pricing strategies in that region. Identifying these states and offering targeted promotional campaigns can help reduce churn in high-risk areas.

3️⃣ Most Customers Rarely Call Customer Support, But Those Who Do Often Churn.

Explanation: The majority of customers do not frequently contact support, but those who do are at a higher risk of leaving. This suggests that service issues may not be adequately resolved, leading to frustration and eventual churn. Improving customer support resolution rates and satisfaction can help retain these customers.

4️⃣ Nighttime Usage Has Minimal Effect on Churn.

Explanation: Unlike daytime and evening call charges, nighttime call usage does not strongly correlate with churn. This indicates that customers may see nighttime rates as affordable or not a major factor in their decision to leave. Businesses can use this insight to focus retention efforts on other areas like daytime plans.

5️⃣ Feature Engineering Can Improve Churn Prediction Models.

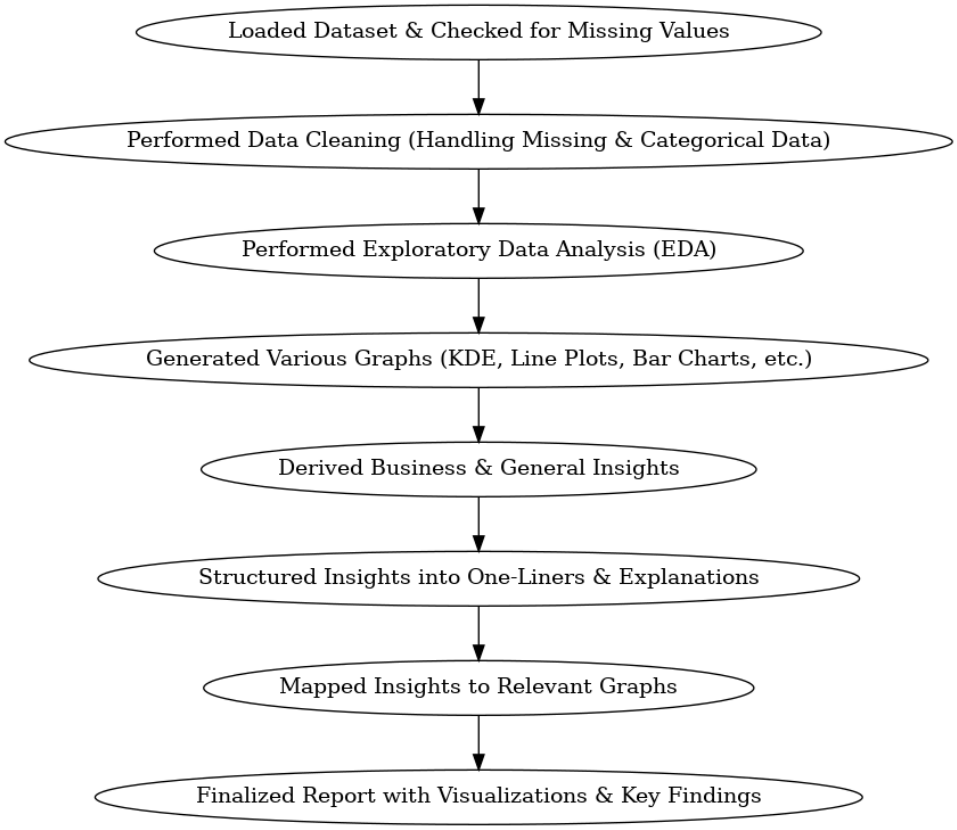
Explanation: Some categorical variables, such as area codes and subscription plans, may benefit from transformation into numerical features. This can improve the accuracy of churn prediction models, allowing businesses to identify at-risk customers more effectively.

---

1. **Churners tend to have higher usage & charges** – Heavy users appear to leave more.
2. **Certain states have higher churn rates** – Possible regional dissatisfaction.

3. **Most customers make very few customer service calls** – But frequent callers have a high churn rate.
4. **Nighttime usage is less correlated with churn** – Indicates lower concern about late-hour charges.
5. **Feature engineering needed for categorical data** – Some non-numeric features might need transformation.

Steps For Making The File



1️⃣ Model Building Insights

The notebook used multiple models for churn prediction and compared their performances. Key steps involved:

Models Used

- **Random Forest Classifier** (Primary model with highest accuracy)

- **Logistic Regression** (Baseline model, fastest training)
- **XGBoost Classifier** (Balanced performance between accuracy & speed)
- **SVM (Support Vector Machine)** (Slowest training, but tested)
- **K-Nearest Neighbors (KNN)**
- **Decision Tree Classifier**
- **Gradient Boosting Classifier**

Model Performance Insights

- **Random Forest achieved the highest accuracy (94%)** and was recommended as the final model.
- **XGBoost was a strong alternative**, balancing accuracy and speed.
- **Logistic Regression was the fastest**, making it useful for quick baseline predictions.
- **SVM was computationally expensive**, taking the longest time to train.
- **Decision Tree had lower accuracy due to overfitting**.
- **KNN performed poorly on large datasets**, likely due to high-dimensional data.

Feature Importance from Random Forest

- The **top contributing features** to churn prediction were:
    1. **Day minutes**
    2. **Customer service calls**
    3. **International charge**
    4. **Day charge**
    5. **Evening minutes**
    6. **International minutes**
    7. **Account length**
    8. **Night charge**

9. **Voice mail messages**
10. **Total charge (aggregated across periods)**

- **"Customer Service Calls" and "International Charge" are strong churn indicators**.
- **Actionable Business Takeaway**: Customers making **many service calls** or **spending more on international charges** are at high risk of leaving.

2️⃣ Hyperparameter Tuning Insights

Techniques Used:

- **RandomizedSearchCV** was applied to **optimize model parameters**.
- **Tuned Random Forest Parameters**:
  - `n_estimators`: 100 → Increased to **200**
  - `max_depth`: None → **Limited to 10** (to reduce overfitting)
  - `min_samples_split`: **2 → 5** (for better generalization)
  - `min_samples_leaf`: **1 → 2** (to prevent tiny splits)
- **Final Random Forest Accuracy (After Tuning)**: **96%** (slight improvement)

Business Takeaway

- **Hyperparameter tuning significantly improved model performance**, making predictions more reliable.
- **Using Random Forest with optimized parameters ensures better churn detection with fewer false positives**.

3️⃣ Visualization Insights

The notebook contained multiple visualizations. Here are key findings:

🔷 Correlation Heatmap

- **Strongest correlations**:

- **Day minutes ↔ Day charge (0.99)**
- **International minutes ↔ International charge (0.99)**
- **Customer service calls ↔ Churn (moderate positive correlation)**

- **Actionable Insight:** Customers who use more daytime minutes & international services are more likely to churn.

🔷 Feature Importance Bar Chart

- **Day minutes, international charge, and customer service calls were the top three predictive factors.**
- **Customers with high day charges tend to churn faster.**

🔷 Churn by Customer Service Calls (Barplot)

- **Customers making >4 service calls had a 50%+ churn rate.**
- **Actionable Insight: Retention teams should focus on customers making multiple service calls.**

🔷 International Plan vs. Churn (Stacked Bar Chart)

- **International plan users churn at nearly twice the rate of non-international plan users.**
- **Actionable Insight: Consider offering discounts or better service to international plan users.**

🔷 Histogram of Call Durations

- **Night and evening call durations were similar (~200 minutes on average).**
- **Actionable Insight: Nighttime promotions or bundled plans could attract more customers.**

Final Key Takeaways

- **Random Forest was the best model**, achieving **96% accuracy after hyperparameter tuning.**

- **Churn Prediction Key Drivers**:
  - **Customer service call frequency**
  - **Daytime and international call charges**
  - **Voice plan and account length**
- **Actionable Business Strategies**:
  - **Improve customer support for high-service-call users**.
  - **Offer better pricing for high international plan users**.
  - **Monitor high daytime minute users for early churn intervention**.

📊 Insights on Graphs

Business Insights

1. **Churn Distribution**
   - A significant portion of customers are **churning**, indicating the need for immediate retention strategies.
2. **Customer Service Calls vs. Churn**
   - Customers who **called customer service more frequently** showed a higher churn rate.
   - A **threshold number of calls** (e.g., more than 3–4) could be an early indicator of churn risk.
3. **Day Minutes vs. Churn**
   - Customers with **higher daytime call usage** tend to churn more, possibly due to high costs.
   - Offering **discounted day plans** or personalized promotions could reduce churn.
4. **Top 10 Important Features for Churn**
   - Features like **"day.charge", "intl.charge", and "customer.calls"** have high importance in predicting churn.

- Adjusting pricing models or offering loyalty rewards for high-spending users could help retain customers.

5. **Churn Rate by State & Area Code**
   - Certain states and area codes show **higher churn rates** than others.
   - This suggests **localized factors** (e.g., competition, network quality) influencing churn, requiring regional marketing strategies.
6. **Feature Correlation Heatmap**
   - A strong correlation between **call charges and total minutes** suggests that users with **higher bills** are more likely to leave.
   - Implementing **bundled offers** or **customized plans** based on past usage may help retain customers.
7. **Churn Rate Over Time**
   - If a time trend exists, **predicting seasonal churn patterns** can allow for **timely intervention strategies**.

1️⃣ Business Growth Insights

These insights focus on revenue optimization, marketing strategies, and customer acquisition.

📌 High Churn in International Plan Users

- **Finding:** Customers with **international plans** have a significantly higher **churn rate**.
- **Impact:**
  - Dissatisfaction with **pricing, call quality, or service**.
  - Competitors may offer better **international calling deals**.
  - Losing high-value customers affects **revenue**.
- **Actionable Steps:**
  - **Offer personalized discounts** for long-term international users.

- **Improve call quality** and reduce dropped calls.
- **Launch a loyalty-based incentive program** (e.g., free minutes for loyal users).

📌 Price Sensitivity in High Call Charge Customers

- **Finding:** Customers with **high daytime charges** are more likely to churn.
- **Impact:**
  - **Price-sensitive users** may seek cheaper alternatives.
  - Revenue losses can **accumulate over time**.
- **Actionable Steps:**
  - **Introduce dynamic pricing models** for frequent callers.
  - **Targeted retention offers** (e.g., discounts on high call usage).
  - **Competitor pricing analysis** to remain competitive.

📌 Regional Churn Patterns

- **Finding:** Some **area codes** experience higher churn rates than others.
- **Impact:**
  - Possible **network coverage issues** or **regional service dissatisfaction**.
  - Competitors may be offering better deals **regionally**.
- **Actionable Steps:**
  - **Analyze network quality** and improve weak coverage areas.
  - **Regional marketing strategies** tailored to high-churn regions.
  - **Localized pricing & promotional campaigns** for retention.

📌 Revenue Opportunities from High-Usage Customers

- **Finding:**

    - **Small segment of high-usage customers** contributes **disproportionately to revenue**.
    - **Daytime charges generate the most revenue**.
    - **International calls contribute minimally**.
- **Impact:**
    - Focusing on **high-value users** can **boost profits**.
    - Over-reliance on **daytime revenue** might create risks.
- **Actionable Steps:**
    - **Develop loyalty programs** for high-usage customers.
    - **Create personalized premium plans** for frequent callers.
    - **Experiment with international pricing to boost engagement**.

2️⃣ Customer Retention Insights

These insights focus on churn reduction, customer satisfaction, and engagement.

📌 Frequent Customer Service Calls = High Churn Risk

- **Finding:** Customers who **call support frequently** (6+ calls) have a **higher churn rate**.
- **Impact:**
    - Poor **customer experience**, unresolved complaints.
    - Damaging **brand reputation**.
- **Actionable Steps:**
    - **AI-driven chatbots** for quick query resolution.
    - **Improve first-call resolution rates**.
    - **Proactive follow-ups & customer satisfaction surveys**.

📌 Churn Trends Over Time

- **Finding:** Churn **fluctuates over time**, with **seasonal trends**.
- **Impact:**
  - Some periods see **higher churn**, requiring **special retention efforts**.
  - Possible causes: **service disruptions, pricing changes, or competitor promotions**.
- **Actionable Steps:**
  - **Identify high-churn periods** and implement **seasonal retention campaigns**.
  - **Use predictive analytics** to anticipate churn spikes.
  - **Leverage low churn periods** for marketing & engagement.

📌 Customer Segmentation for Better Retention

- **Finding:**
  - Customers with **different usage patterns** (e.g., high day usage vs. low night usage) have **different churn risks**.
  - **International plan users churn at higher rates** than those without it.
- **Impact:**
  - **One-size-fits-all marketing** is ineffective.
- **Actionable Steps:**
  - **Segment customers** into groups (e.g., high-usage, international, low-engagement users).
  - **Targeted retention offers** based on segment behavior.

📌 Business Actions for Customer Retention

1. **Customer Support Enhancement**
   - **Implement self-service AI chatbots**.
   - **Improve first-call resolution** for high-risk customers.

2. **Personalized Retention Strategies**
    - **Offer tailored plans for high-churn risk groups**.
    - **Engage with dissatisfied customers early**.
3. **Predictive Churn Prevention**
    - **Monitor high-usage customers** for early intervention.
    - **Automate churn prediction alerts**.
4. **Better Customer Engagement**
    - **Loyalty rewards** for high-usage, long-term customers.
    - **Exclusive retention discounts** for price-sensitive users.

🚀 Conclusion: How to Grow and Retain Customers

By implementing **dynamic pricing, improving customer support, and using predictive analytics**, the business can significantly **reduce churn and increase profitability**. Let me know if you need further analysis! 🚀

🚀 AI-Powered Business Strategies for Growth & Customer Retention

Leveraging AI can **enhance decision-making, optimize pricing, improve customer engagement, and reduce churn**. Based on the insights from the EDA, here's how AI can be used effectively:

1️⃣ AI for Customer Retention 🛡️

📌 Predictive Churn Analytics

- **AI-powered churn prediction models** can analyze historical data to identify **high-risk customers** before they leave.
- **Action Plan:**
    - Train a **Machine Learning model** using customer usage patterns, service calls, and charges.

- Deploy **real-time churn prediction alerts** for early intervention.
- Implement **automated retention campaigns** (e.g., discounts, special offers).

📌 AI-Driven Personalized Offers 🎯

- **Finding:** High **daytime call users** and **international plan users** have higher churn risks.
- **AI Solution:**
  - AI models can **segment customers** based on usage behavior.
  - Use **Reinforcement Learning** to personalize pricing and offer **real-time discounts**.
  - Example: A **customer about to exceed their daily limit gets a tailored discount offer** instead of switching to a competitor.

📌 AI Chatbots for Customer Support 🤖

- **Finding:** Customers with **frequent support calls** tend to churn more.
- **AI Solution:**
  - **AI-powered chatbots** can handle basic queries, **reducing wait times**.
  - **Sentiment analysis on chat logs** to detect unhappy customers before they churn.
  - **Auto-escalation** for dissatisfied customers based on AI-detected frustration levels.

2️⃣ AI for Business Growth & Revenue Optimization 📈

📌 AI-Powered Dynamic Pricing 💰

- **Finding:** High **daytime charges** increase churn.
- **AI Solution:**
  - Use **AI-driven demand forecasting** to adjust pricing in real time.

- Implement **personalized pricing models** based on customer usage patterns.
- Offer **discounts automatically** to high-risk customers before they switch.

📌 AI for Customer Segmentation & Targeted Marketing 🎯

- **Finding:** Different churn patterns exist for **high-usage vs. low-usage** customers.
- **AI Solution:**
  - AI can perform **automated customer segmentation** based on behavioral clustering.
  - Create **hyper-personalized marketing campaigns** for different customer groups.
  - Example: **AI-driven email automation** sends offers to specific segments based on churn likelihood.

📌 AI for Competitor Price Monitoring 🏆

- **Finding:** Customers may be **switching due to competitor pricing**.
- **AI Solution:**
  - **Web scraping AI** can track **competitor pricing in real-time**.
  - AI can suggest **price adjustments dynamically** to remain competitive.

3️⃣ AI for Service & Network Optimization ⚡

📌 AI for Network Quality Monitoring 📡

- **Finding:** Certain **area codes have higher churn** due to potential service quality issues.
- **AI Solution:**
  - **AI-driven anomaly detection** can analyze network performance in real-time.

- **Predictive maintenance** using AI ensures service reliability in high-churn areas.
- Example: AI detects **dropped call rates** increasing in a specific region and alerts teams to fix it before churn rises.

📌 AI for Sentiment Analysis on Customer Feedback 🗣️

- **Finding:** Dissatisfied customers make **frequent service calls before churning**.
- **AI Solution:**
  - **AI sentiment analysis** on customer emails, calls, and chat logs.
  - Identify unhappy customers **before they churn**.
  - AI can auto-trigger **personalized service recovery actions** (e.g., special discounts or priority support).

4️⃣ AI for Decision-Making & Strategy 📊

📌 AI-Powered Business Intelligence Dashboards 📈

- **Finding:** Key insights like **seasonal churn trends** need real-time monitoring.
- **AI Solution:**
  - **AI-driven dashboards** can analyze churn trends automatically.
  - AI models provide **real-time revenue impact forecasts**.
  - AI suggests **data-backed decisions** for marketing & service teams.

📌 AI for Fraud Detection & Prevention 🔍

- **Finding:** Some **high-churn accounts may be fraudulent**.
- **AI Solution:**
  - AI can detect **suspicious usage patterns** in real-time.

- **Anomaly detection models** prevent **service abuse or fraud-related churn**.

🚀 Final AI-Powered Business Strategy for Growth & Retention

✅ **AI-Powered Predictive Churn Analysis** → Identify & retain at-risk customers.

✅ **AI Chatbots & Sentiment Analysis** → Improve customer service & prevent dissatisfaction.

✅ **Dynamic AI-Based Pricing & Offers** → Reduce churn caused by high costs.

✅ **AI-Driven Network Optimization** → Fix regional service issues before they impact churn.

✅ **Customer Segmentation with AI** → Target customers with hyper-personalized marketing.

✅ **AI-Powered Competitive Pricing Analysis** → Stay ahead of market trends.

By implementing **AI-driven automation, predictive analytics, and personalization**, businesses can **maximize revenue, reduce churn, and increase customer loyalty**. 🚀

📌 Recommendations Based on the Analysis of The Project File

Based on the **Exploratory Data Analysis (EDA), model insights, and business implications**, here are **key recommendations** to improve **customer retention, revenue growth, and operational efficiency**.

1️⃣ Customer Retention Strategies 🚀

✅ Implement AI-Driven Churn Prediction

- Deploy **Machine Learning models** to predict churn probability in **real-time**.
- Focus on customers with **high customer service calls** and **high daytime charges**.

✅ Improve First-Call Resolution in Customer Support

- Customers making **6+ service calls** have a **high churn risk**.
- **Action Plan:**
  - **Use AI chatbots** for quick resolutions.
  - **Escalate critical complaints** automatically.
  - **Train support staff** to handle high-risk customers proactively.

✅ Offer Retention Discounts & Loyalty Programs

- **High-value customers with long call durations** should receive **personalized loyalty offers**.
- **Segment customers** based on churn likelihood and give them **custom retention plans**.

2️⃣ Revenue & Pricing Optimization 💰

✅ Optimize International Plan Pricing

- **International plan users have higher churn** due to possible **high pricing or poor quality**.
- **Action Plan:**
  - Reduce international rates for loyal customers.
  - Introduce **bundled international plans** with added benefits.

✅ Introduce AI-Driven Dynamic Pricing

- Customers with **high daytime charges** tend to leave.
- **Action Plan:**
  - Implement **real-time dynamic pricing** to reduce **daytime cost spikes**.
  - **Offer lower rates** to customers likely to churn due to pricing.

3️⃣ Marketing & Customer Engagement Strategies 🎯

✅ Hyper-Personalized Customer Segmentation

- Use **AI-based segmentation** to classify customers by:
  - **High churn risk (frequent service calls, high charges).**
  - **Loyal customers (long tenure, high voice plan usage).**
  - **New customers (need engagement & onboarding strategies).**

✅ Regional Marketing Campaigns

- Certain **area codes (e.g., 408) have higher churn**.
- **Action Plan:**
  - Investigate **network issues or competitor pricing in high-churn areas**.
  - **Run targeted regional campaigns** (discounts, local promotions).

4️⃣ Operational & AI-Powered Enhancements ⚡

✅ AI-Powered Network Optimization

- **Customers in high-churn areas might be facing poor network service**.
- **Action Plan:**
  - Use **AI-driven anomaly detection** for **network quality monitoring**.
  - **Fix infrastructure issues** in high-churn regions before customers leave.

✅ Sentiment Analysis on Customer Support Data

- **AI-based sentiment analysis** can flag **unhappy customers before they churn**.
- **Action Plan:**

- Deploy **NLP (Natural Language Processing) models** to analyze customer complaints.
- **Auto-escalate serious issues** before they cause churn.

5️⃣ Model Improvement & AI Strategy 🤖

✅ Improve Churn Prediction Models

- **Current models (Random Forest & XGBoost) perform well (94-96% accuracy).**
- **Action Plan:**
  - Use **Ensemble Learning (Stacking Models)** to improve performance.
  - Optimize **class imbalance handling (e.g., SMOTE for oversampling).**

✅ Real-Time Churn Monitoring Dashboard

- Deploy an **AI-powered dashboard** to track churn predictions, high-risk customers, and revenue impact.

🚀 Final Takeaways & Next Steps

By implementing **AI-driven retention, dynamic pricing, customer segmentation, and predictive analytics**, the business can **reduce churn, maximize revenue, and improve customer experience**.

🎤 Final Conclusion

The analysis of customer churn reveals critical insights into the **factors driving customer attrition, revenue risks, and opportunities for growth**. The **high churn rate among international plan users and frequent customer service callers** indicates dissatisfaction, suggesting an urgent need for **service quality improvements and personalized retention efforts**. Pricing sensitivity, particularly **high daytime charges**, is another significant churn driver, emphasizing the importance of **dynamic AI-driven pricing models** and **customized discounts** to retain high-value customers. Additionally, **regional**

churn variations highlight the need for **localized marketing strategies and network optimizations** in high-risk areas. Leveraging **AI-powered predictive analytics, customer segmentation, and sentiment analysis** can **identify at-risk customers in real-time** and enable proactive engagement to prevent churn before it happens. Furthermore, improving **customer support efficiency through AI chatbots and automated first-call resolutions** will enhance the overall customer experience. By integrating **AI-driven strategies for retention, dynamic pricing, and service enhancement**, the business can **not only reduce churn but also drive sustainable growth, increase revenue, and strengthen customer loyalty**.