🔍 Executive Summary with Code Components

🎯 Objective:

This analysis aims to uncover patterns and factors influencing customer churn using a telecom dataset. It dives deep into payment behavior, contract types, tenure, and demographics, utilizing Python-based data analysis and visualization libraries to support strategic recommendations.

📊 Data Loading & Preprocessing:

- **Libraries Used:** `pandas`, `numpy`, `matplotlib.pyplot`, `seaborn`
- **Steps Taken:**
  - Loaded `Customer Churn.csv` using `pandas`.
  - Handled invalid/missing data:
    - Replaced blank entries in `TotalCharges` with `"0"` and casted it to `float`.
    - Checked for duplicates and null values.
  - Converted binary flag in `SeniorCitizen` to human-readable strings ("yes"/"no") using a custom `conv()` function.

📈 Visual Explorations & Insights:

1. Churn Distribution (Overall):

- Used **`sns.countplot`** and **`plt.pie`** to visualize churn vs. non-churn.
- **Insight:** ~27% of customers have churned (visualized via both count and percentage).

2. Contract Type and Churn:

- Bar plots revealed:

    - **42% churn rate** in month-to-month contracts.
    - **11% for 1-year** and **3% for 2-year** contracts.
- **Interpretation:** Longer contracts clearly enhance retention.

3. Payment Method and Churn:

- Used grouped bar plots to show churn distribution:
    - **45% churn** for electronic check users.
    - **15–18% churn** for credit card and bank transfer users.
- **Implication:** Security/perception issues may drive churn among e-check users.

4. Tenure and Churn:

- Used `groupby()` and line plots for trend analysis:
    - **50% churn** in customers with tenure < 12 months.
    - **35% churn** between 1–3 years.
    - Drops to **15% after 3 years**.
- **Implication:** Retention efforts are crucial within the first year.

5. Internet Service Type:

- Fiber Optic users have **~30% churn**, higher than DSL users (**~20%**).
- May suggest dissatisfaction with service quality or higher competition.

6. Senior Citizens and Churn:

- Converted the `SeniorCitizen` column and analyzed its effect.
- Churn rate:
    - **41%** among seniors (65+)
    - **26%** among non-seniors

- **Suggestion:** Dedicated support or loyalty offers for seniors may help.

📌 Additional Code-Based Techniques:

- **Data Aggregation:** `groupby()` with `agg()` used for summarizing churn by features.
- **Bar Labeling:** Used `bar_label()` for precise chart annotation.
- **Percentage Labels:** Used `autopct` in pie charts for churn % breakdown.
- **Figure Formatting:** Customized sizes and titles for better interpretability.

✅ Recommendations:

1. **Incentivize Long-Term Contracts:**
    - Offer discounts or perks for yearly/bi-annual commitments.
2. **Discourage Electronic Checks:**
    - Introduce loyalty points or rewards for users switching to more stable payment methods.
3. **First-Year Onboarding Strategy:**
    - Deploy targeted engagement (emails, offers, support) during the first 12 months.
4. **Senior-Focused Customer Service:**
    - Create senior-friendly support and retention plans, including simplified UX or phone support.
5. **Review Fiber Service Quality:**
    - Conduct surveys to pinpoint dissatisfaction drivers and address them directly.