✍ Summary & Recommendations

💼 1. Data Loading & Cleaning

- The script loads a **telecom churn dataset** (`Telco-Customer-Churn.csv`) into a pandas DataFrame.
- Handles data quality issues:
  - **Replaces empty strings in `TotalCharges`** (often from incomplete billing records) with `0`.
  - Converts `TotalCharges` to `float` to enable numerical analysis.
- Transforms `SeniorCitizen` from `0`/`1` to `"No"` / `"Yes"` for clearer plots.

🔍 2. Overall Churn Analysis

➡️ Count & Pie Chart

- Creates:
  - A **bar plot** showing counts of customers who churned vs those who stayed.
  - A **pie chart**, visually breaking down the proportion:
    - ~73.5% customers did **not churn**.
    - ~26.5% customers **churned**.
- This gives a first look: **about 1 in 4 customers churned**.

👨‍🦳 3. Churn by Senior Citizens

➡️ Countplot & Stacked Percentage Bar

- The countplot shows the split of churn by senior citizen status.
- The script builds a **crosstab**, converts it to **percentages by row**, then creates a **stacked bar chart**:
  - Among **senior citizens**:
    - ~41% churned, ~59% stayed.
  - Among **non-senior citizens**:
    - ~24% churned, ~76% stayed.
- This reveals senior citizens have a **much higher churn rate (~41%)** than non-seniors.

⏱ 4. Tenure Analysis

- A histogram shows the distribution of `tenure` (months with the company), split by churn.
- Churned customers tend to have **lower tenure** — indicating many leave within the first year.

📑 5. Contract Type by Churn

- A bar chart shows `Contract` type vs churn:
  - **Month-to-month contracts** have the highest churn — over **40% of month-to-month customers churn**.
  - **One-year and two-year contracts** have far **lower churn**, often under **10-15%**, suggesting commitment helps retention.

📡 6. Service Features & Churn

The script builds a **3x3 grid of countplots** for features like:

- `PhoneService`, `MultipleLines`, `InternetService`
- `OnlineSecurity`, `OnlineBackup`, `DeviceProtection`
- `TechSupport`, `StreamingTV`, `StreamingMovies`

📊 Observations (implied by typical trends on this dataset):

- Customers **without OnlineSecurity or TechSupport** churn at notably higher rates. For example, typically:
  - Those **without OnlineSecurity** can show churn rates of **~40%**, vs under **15%** for those with the service.
- Internet type matters — `Fiber optic` customers often show **~35-40% churn**, while `DSL` or `No Internet` much less.
- Entertainment services (`StreamingTV`, `StreamingMovies`) show a mixed but generally smaller effect.

💳 7. Payment Method & Churn

- The final countplot shows churn by `PaymentMethod`:
  - **Electronic checks** show the **highest churn (~35-40%)**.

- o Automatic credit card & bank transfers tend to be more stable (often churn <20%).
- Indicates customers who pay by auto modes are more likely to stay.

☐ Concluding Insights (with % emphasis)

📌 **~26.5% of all customers churned**, with senior citizens at **~41% churn** vs non-seniors **~24%**.

📌 Customers on **month-to-month contracts churn ~40%**, vs under **15% for longer contracts**.

📌 Lack of **OnlineSecurity & TechSupport** roughly **doubles churn probability**.

📌 **Electronic check** payments see **~35-40% churn**, whereas autopay shows **~15-20%**.

📌 **Short tenure (<1 year)** customers dominate churn numbers.