**EDA:**

Exploratory Data Analysis Summary:

Based on the visualizations, here are some key findings related to customer churn:

* **Gender:** Churn rate is similar for both male and female customers.
* **Senior Citizens:** Senior citizens have a higher churn rate compared to non-senior citizens, particularly in the initial months of their service.
* **Partners and Dependents:** Customers without partners and dependents have higher churn rates.
* **Tenure:** Churn rate is highest in the first year of service and decreases as tenure increases.
* **Monthly Charges:** Customers with longer tenure tend to have higher monthly charges. There are instances where customers with short tenure have high monthly charges, potentially due to subscribing to premium service bundles early on.
* **Total Charges:** Total charges generally increase with tenure for both churned and non-churned customers, but at a faster rate for non-churned customers.
* **Monthly/Total Charges Ratio:** Churned customers tend to have a higher Monthly/Total Charges Ratio, especially at lower tenures.
* **Additional Services:** Customers with Online Security and Tech Support tend to have lower churn rates. Interestingly, churned customers who do not have additional services can have similar monthly charges to non-churned customers who *do* have additional services, suggesting that perceived value for money is important.
* **Internet Service:** Customers with Fiber Optic internet service have the highest churn rate. Customers without internet service have a very low churn rate.
* **Phone Service:** Customers with phone service have a slightly higher churn rate than those without phone service.
* **Payment Method:** Customers using Electronic check as their payment method have a higher churn rate compared to other payment methods. For churned customers, those using Electronic check tend to have lower total charges at any given tenure, suggesting they might be churning earlier.
* **Contract Type:** Customers with month-to-month contracts have a significantly higher churn rate compared to customers with one-year or two-year contracts.

These findings suggest that customer churn is influenced by factors such as demographics (seniority, partnership, dependents), length of service, the type of services subscribed to, contract type, and payment method. Further analysis and modeling can be done to identify the most significant predictors of churn and develop targeted retention strategies.

**Feature building:**

* **No missing values were initially present in the dataset.**
* **The TotalCharges column was initially of object data type and required conversion to numeric. This conversion resulted in 11 missing values, which were subsequently removed.**
* **Categorical features were successfully one-hot encoded, and the original categorical columns were dropped.**
* **Four new features were successfully engineered: MonthlyToTotalChargesRatio, IsSeniorCitizen, HasInternetService, and HasPhoneService.**
* **Numerical features (tenure, MonthlyCharges, TotalCharges, and MonthlyToTotalChargesRatio) were successfully scaled using StandardScaler.**