Titanic Dataset - EDA Report

Objective

To explore and understand the patterns, trends, and anomalies in the Titanic dataset, with a focus on identifying the key factors that influenced passenger survival.

1. Summary Statistics & Visual Exploration

- Numeric features (`Age`, `Fare`, `SibSp`, `Parch`) were summarized.
- Visualizations included histograms, KDE plots, boxplots, heatmap, and pairplots to assess distribution, outliers, and correlations.

2. Chi-Square Tests

All tested categorical features (Pclass, SibSp, Parch) showed statistically significant associations with survival.

Pclass: p=2.11e-11 (Significant)
SibSp: p=0.0058 (Significant)
Parch: p=2.86e-06 (Significant)

3. T-Tests (Numerical Differences)

Fare: p=7.09e-12 (Survivors paid more)
Age: p=0.0146 (Survivors were slightly younger)

Both features had significant differences between survivors and non-survivors.

4. Anomaly Detection (Z-score)

Fare: 18 outliers detected (valid high-paying passengers)
Age: 0 outliers found

Confirms that the cleaned dataset has no extreme invalid values.

5. Group-Based Survival Rate Trends

Pclass:
- 1st: 56.38%
- 2nd: 46.58%
- 3rd: 24.65%

SibSp:
- 0: 30.82%
- 1: 44.73%
- 2: 38.89%

Parch:
- 0: 29.98%
- 1: 60.29%
- 2: 56.67%
- 3: 60.00%
- 4+: 20.00%

Survival rates confirm that smaller families and higher classes had better odds.

6. Feature-Level Inferences from Visuals

Fare: Survivors peaked at higher fares (positive correlation)
Age: Slight peak in young age group among survivors
SibSp/Parch: Best survival with 12 family members
Pclass: Clear drop in survival rate from 1st 3rd class
Heatmap: Fare (positive) and Pclass (negative) most correlated with survival

Final Comprehensive Insights

Survival was not random. It was highly influenced by class, fare, age, and family size.
Visuals, statistical tests, and grouped trends all confirmed the same patterns.
1st class passengers and small families had a significantly higher survival rate.

This analysis can now guide further modeling, feature engineering, or dashboard building.