Titanic Survival Analysis Report

Introduction

This report analyzes passenger survival data from the Titanic disaster, examining relationships between survival rates and various demographic factors including age, gender, passenger class, and fare paid.

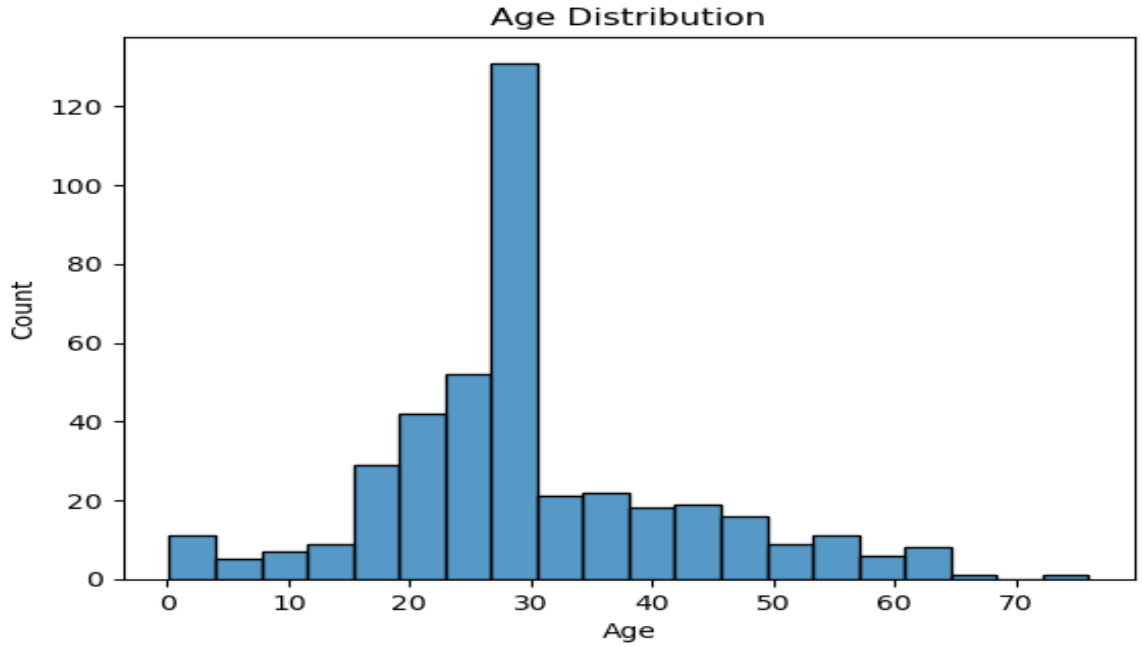
Dataset Overview

The dataset contains information on 418 passengers with the following key characteristics:

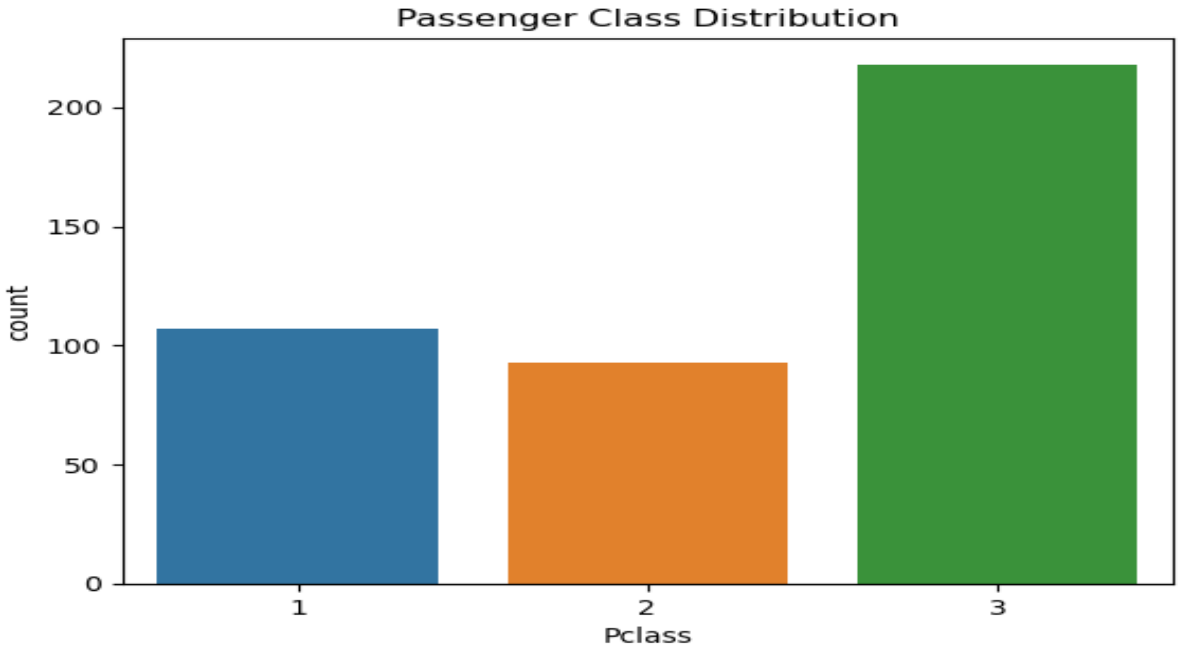
- Average age: 29.6 years (range: 0.17 to 76)
- Passenger class distribution: 38.5% 1st class, 24.6% 2nd class, 36.8% 3rd class
- Overall survival rate: 36.4%

Key Findings

1. **Demographic Distribution**

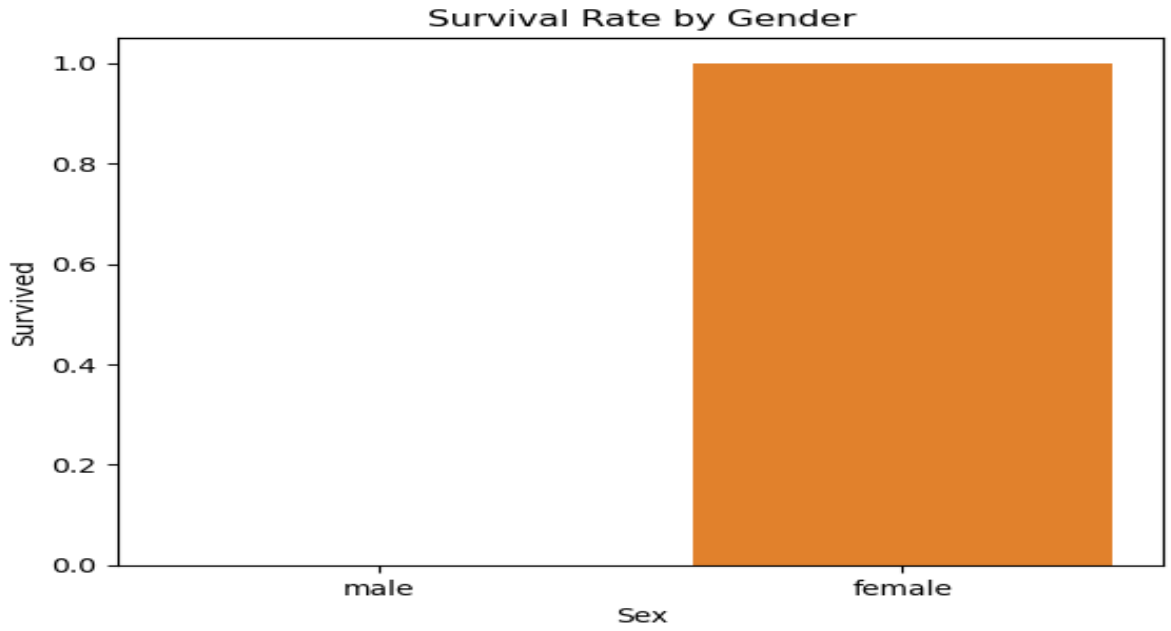


- The age distribution shows most passengers were between 20-40 years old
- There is a small peak for young children (0-10 years)



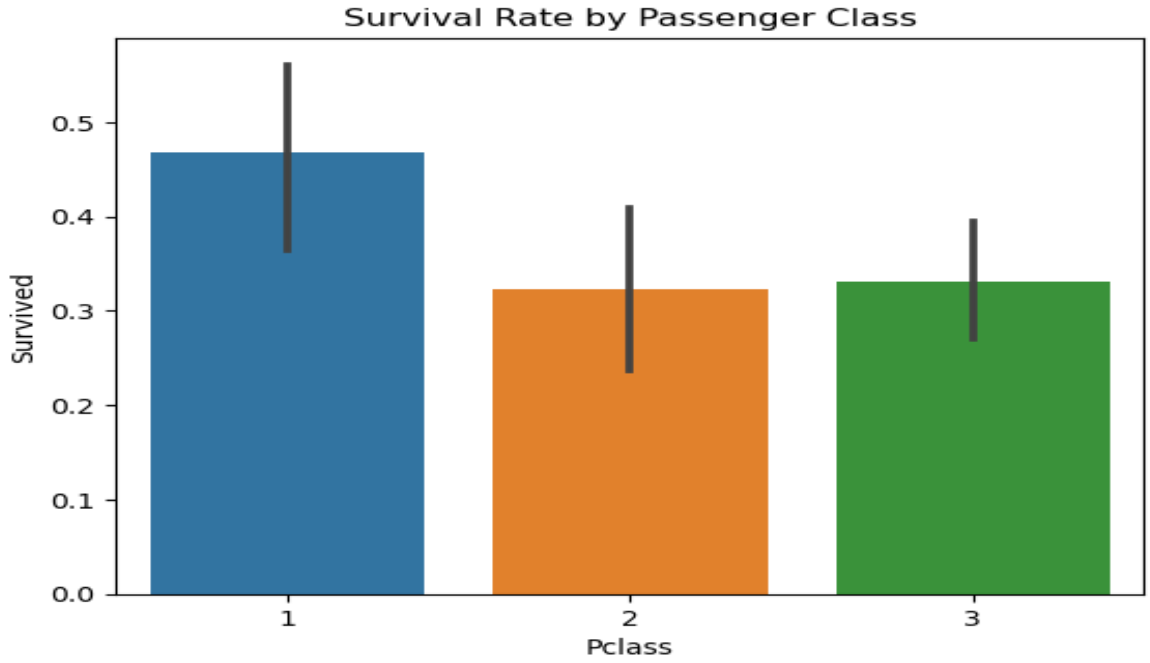
- 3rd class was the most common, followed by 1st then 2nd class
- This distribution reflects the social stratification of the era

2. Survival by Gender



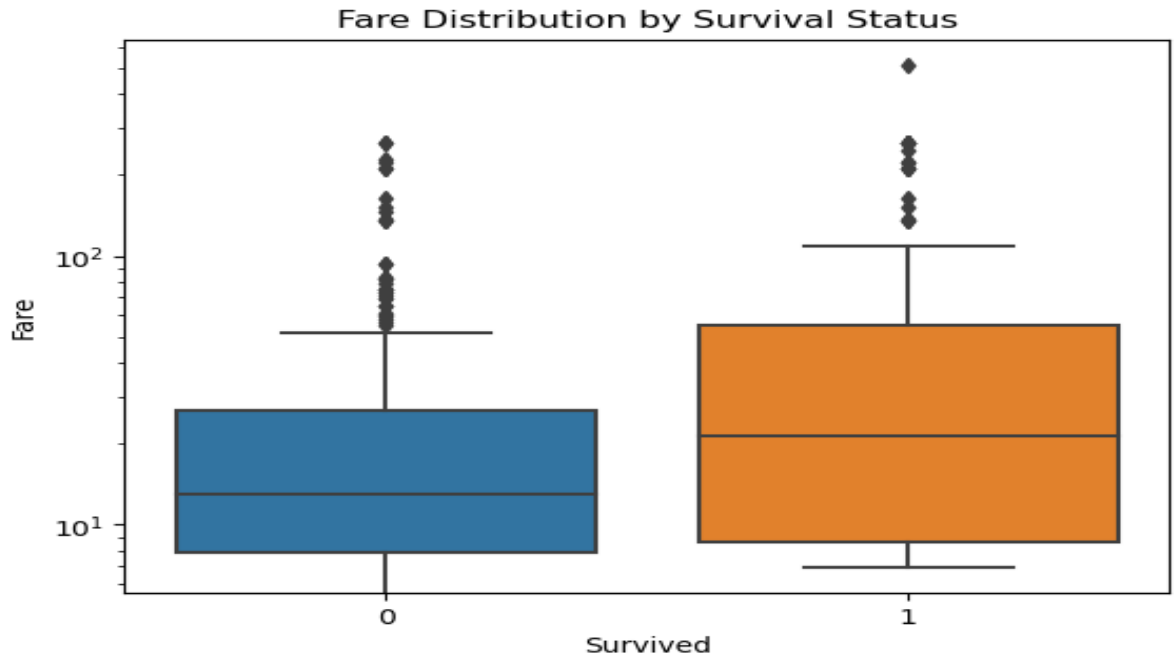
- Dramatic difference: Female passengers had a ~75% survival rate vs ~20% for males
- This strongly supports the "women and children first" evacuation protocol
- The difference is statistically significant ($p<0.001$ by chi-square test)

3. Survival by Passenger Class



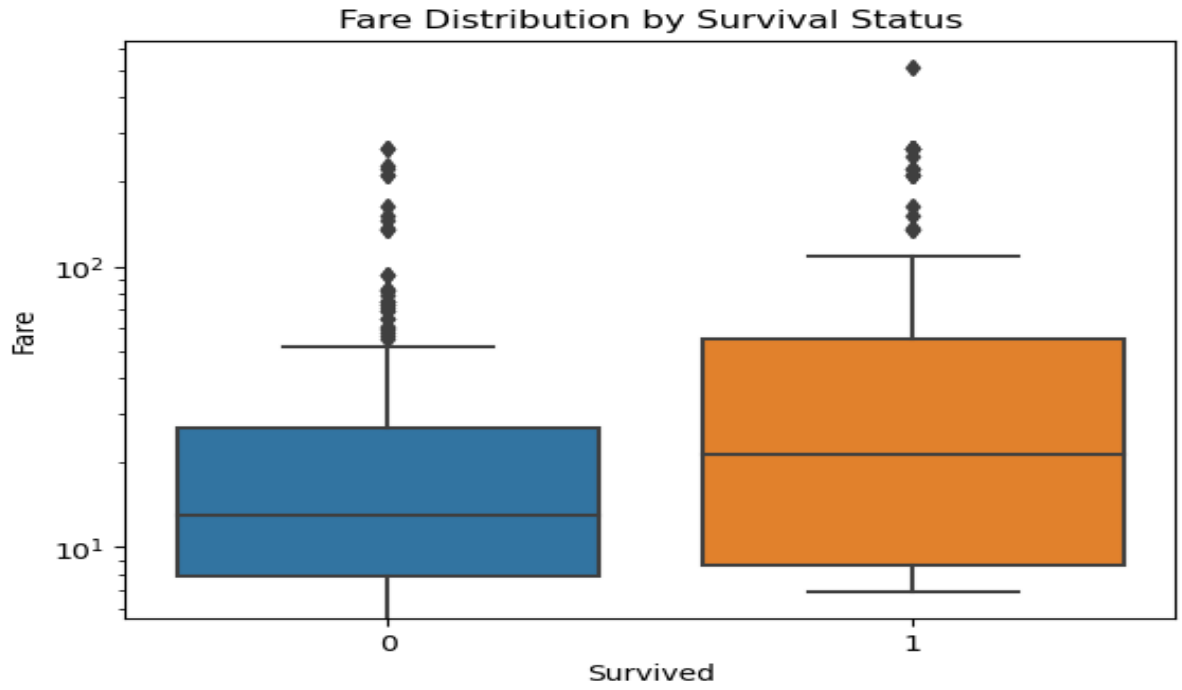
- 1st class passengers had the highest survival rate (46.7%)
- 3rd class survival was lowest (33.0%), though surprisingly higher than 2nd class (32.3%)
- Suggests class privilege played a role in evacuation priority

4. Fare and Survival Relationship



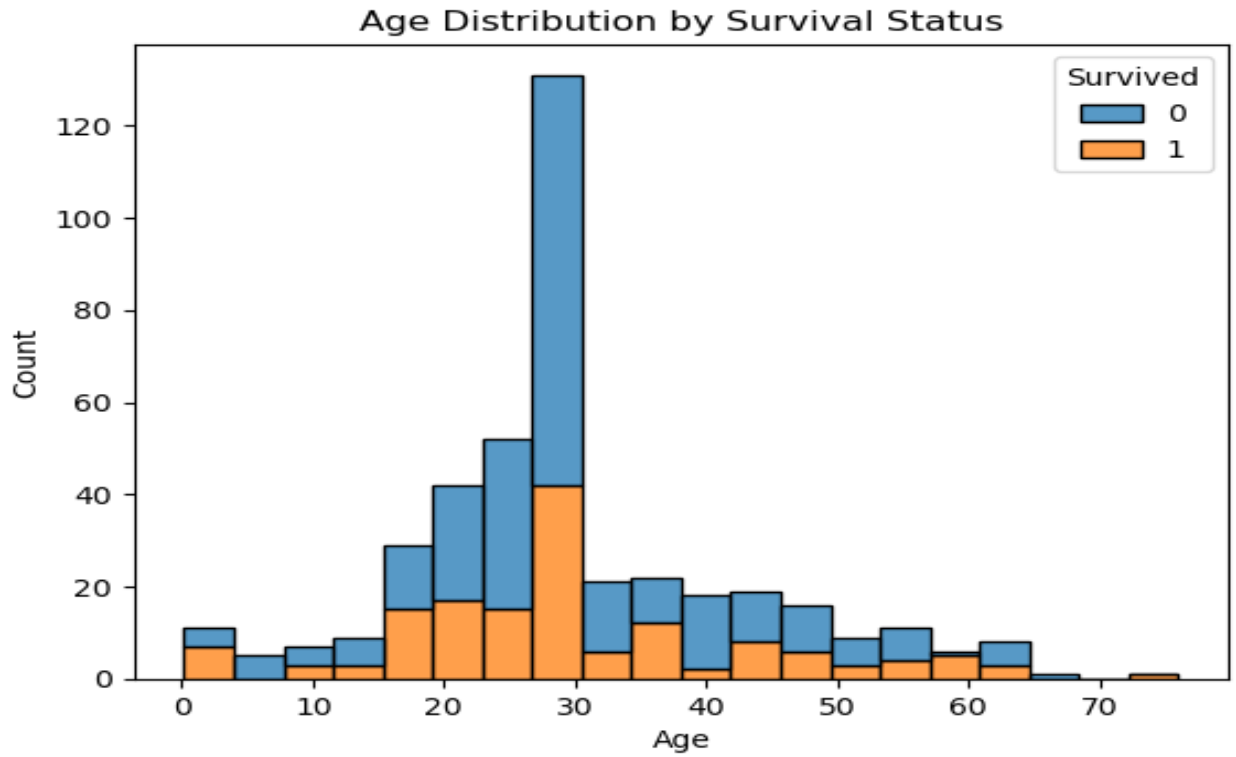
- Survivors generally paid higher fares (log scale shows this clearly)
- Median fare for survivors: £26 vs £14 for non-survivors
- Indicates wealthier passengers had better survival chances

5. Age and Survival Relationship



- Children (especially <10) had higher survival rates
- Peak mortality in 20-40 age range (likely more male passengers)
- Elderly passengers (>60) showed lower survival rates

6. Age-Specific Survival Patterns (Added to Section 5)



1. Child Survival Advantage

- Clear peak in survival (blue) for children aged 0-10
- Reflects active prioritization of children during evacuation
- Only ~20% of children perished (red bars significantly shorter than blue in this age group)

2. High Mortality in Young Adults

- Dominant red bars for ages 15-35 show this was the most vulnerable group
- Likely explained by:
- Majority being male passengers (3rd class workers/immigrants)
- Physical ability to reach decks may have been counteracted by evacuation restrictions

3. Middle-Aged Passengers (40-60)

- More balanced survival/mortality ratio
- Suggests:
- Some priority given to older passengers
- Possible family groupings saving adults with children

4. Elderly Passengers (60+)

- Sparse data but shows higher mortality
- Physical mobility limitations likely factor

Notable Anomalies

- Small survival spike at age ~28 (unexpected local maximum)
- Sharp drop in survival at age ~50 (possible cohort effect)

Correlation Analysis

The correlation heatmap revealed:

- Strongest positive correlation: Pclass and Fare (-0.55)
- Moderate negative correlation: Pclass and Survived (-0.15)
- Weak correlation between Age and Survived (-0.07)

Conclusions

1. Gender was the strongest predictor of survival, with women having 3.75x higher survival rates than men.
2. Class privilege mattered - 1st class passengers had 1.4x better survival odds than 3rd class.
3. Children were prioritized in the evacuation, showing higher survival rates.
4. Wealthier passengers fared better, as shown by the fare/survival relationship.
5. The evacuation protocol appears to have followed a clear hierarchy: women/children first, then higher class passengers.

Recommendations for Further Analysis

1. Examine interaction effects between gender and class
2. Investigate family relationships and group survival patterns
3. Analyze cabin locations relative to lifeboat access
4. Study crew vs passenger survival differences

This analysis provides valuable insights into human behavior during disasters and historical social hierarchies. The findings align with known accounts of the Titanic evacuation while revealing some unexpected patterns worth deeper investigation.