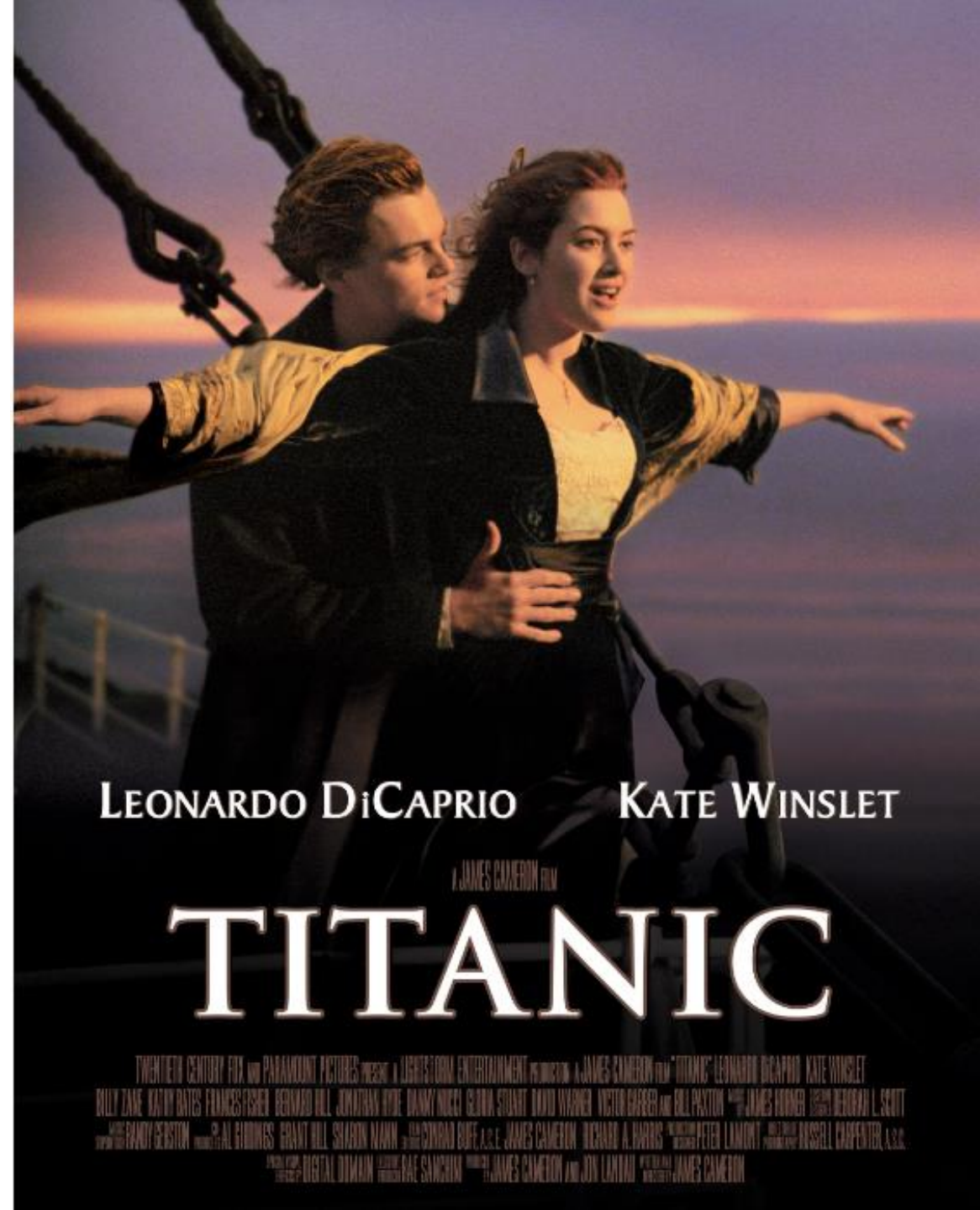


Deloitte.

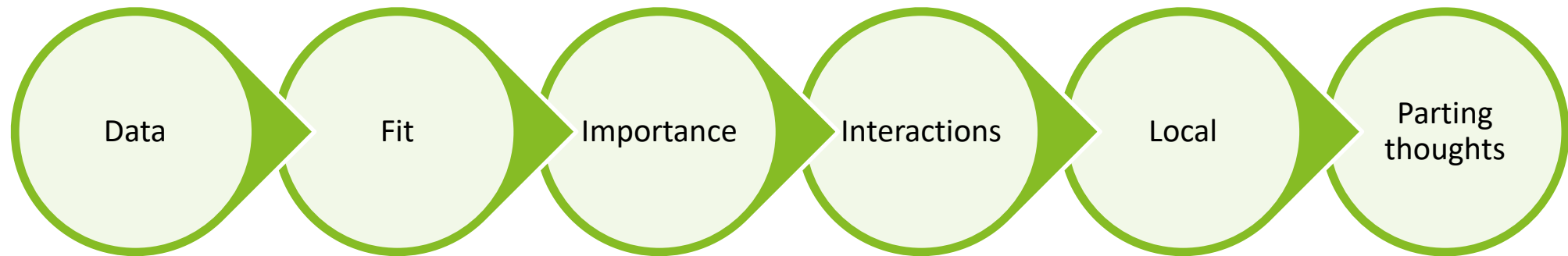
Explainable ML models: the visible and the invisible

TopQuants
1 November 2023

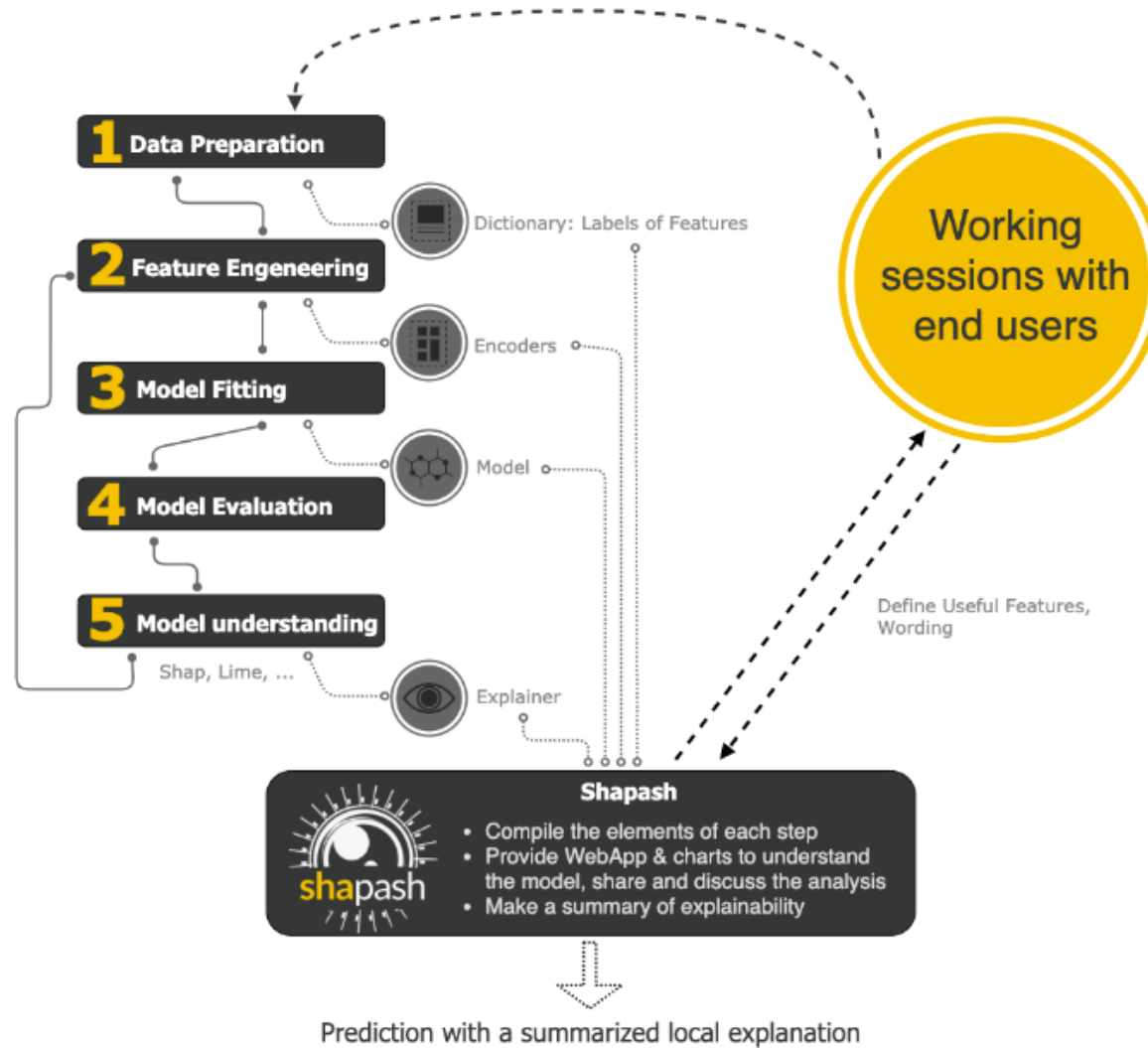
Marco Folpmers



The Titanic Problem

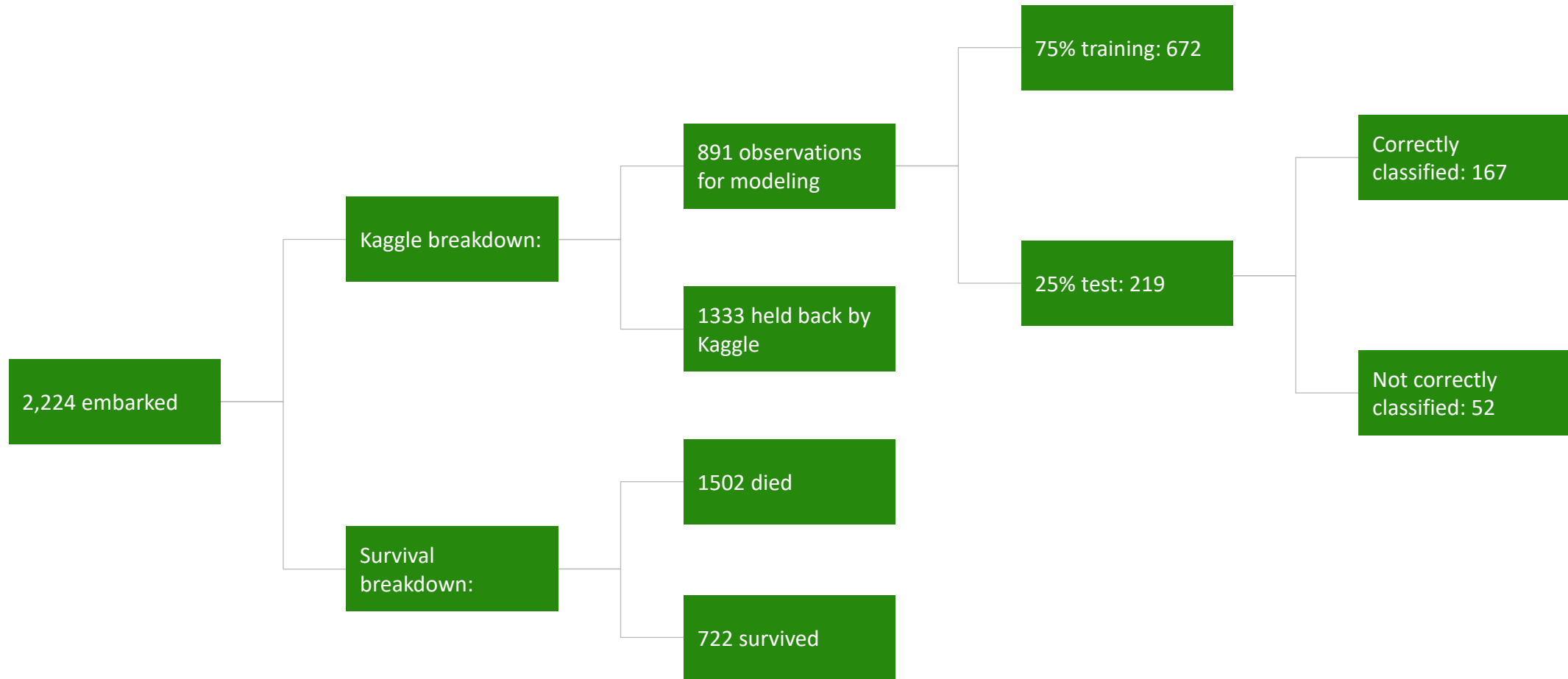
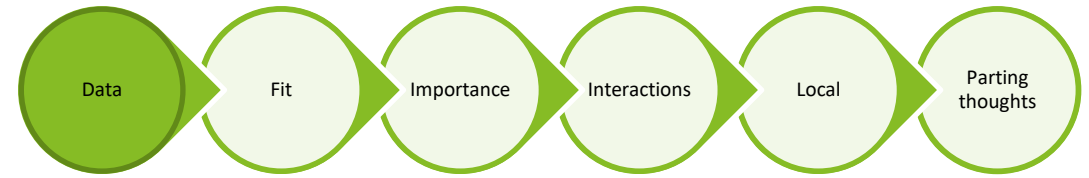


The Titanic Problem

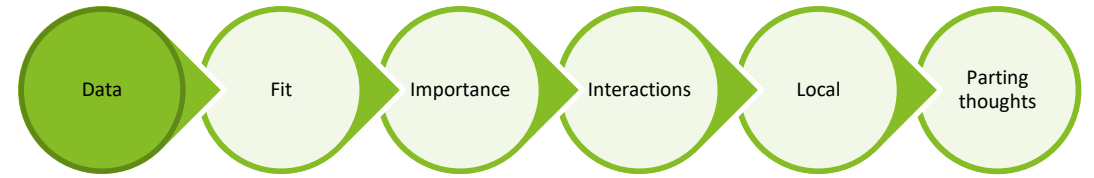


Source: <https://github.com/MAIF/shapash>

The Titanic problem

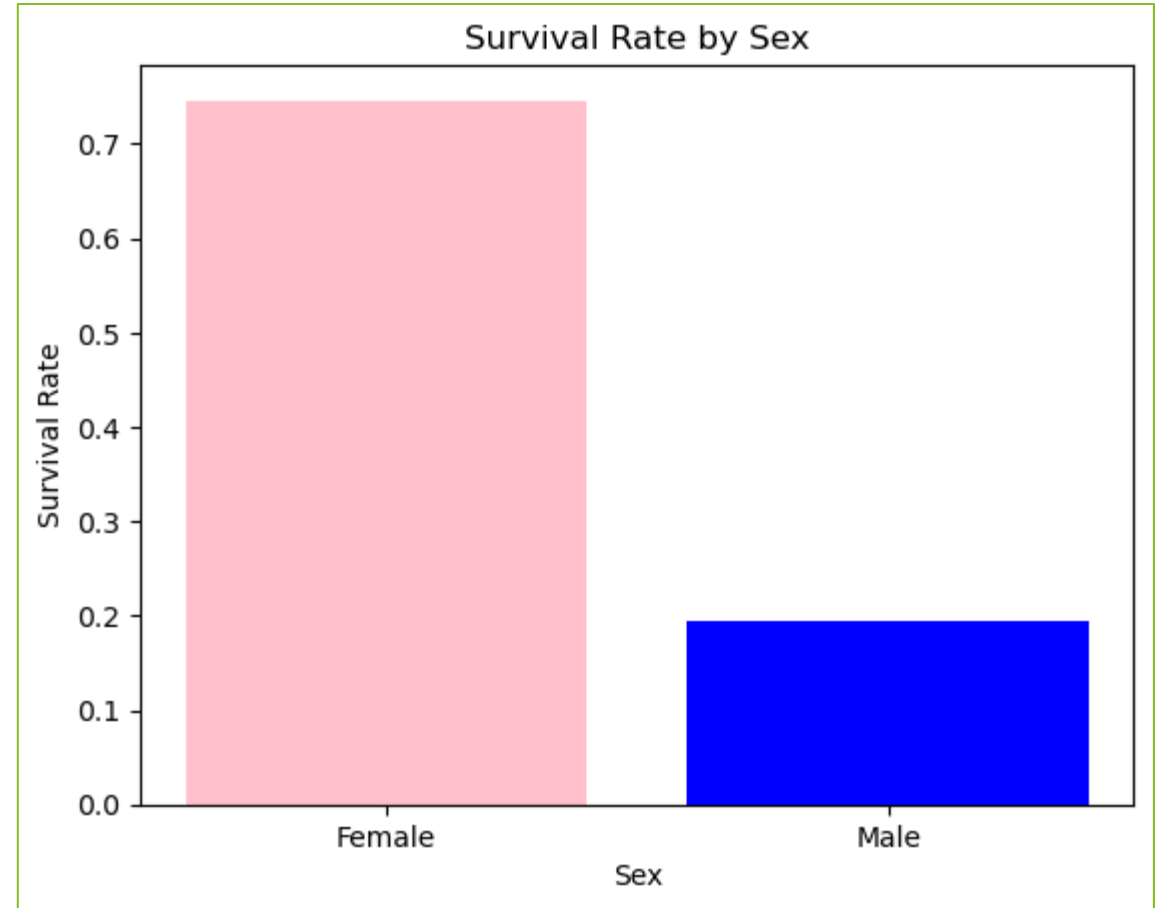
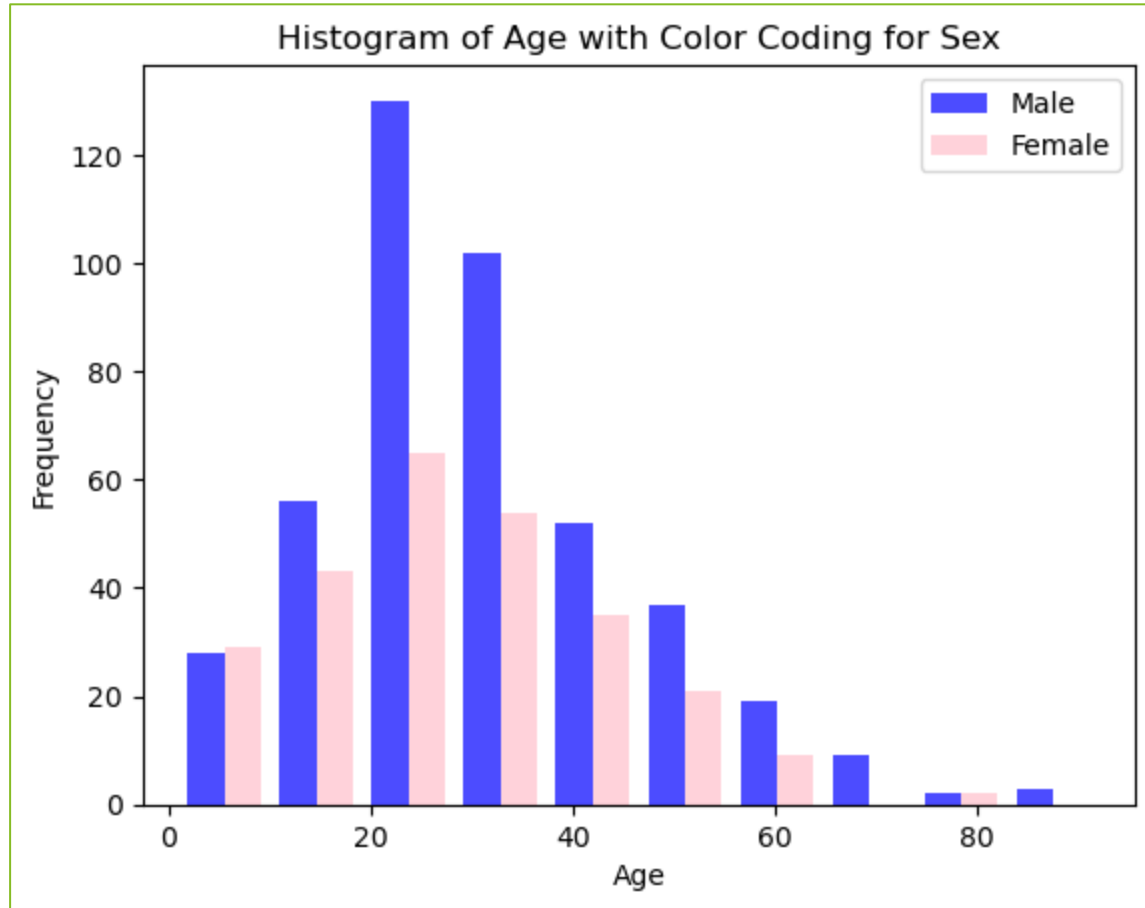
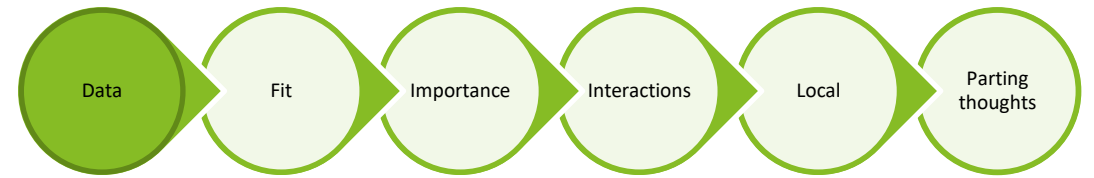


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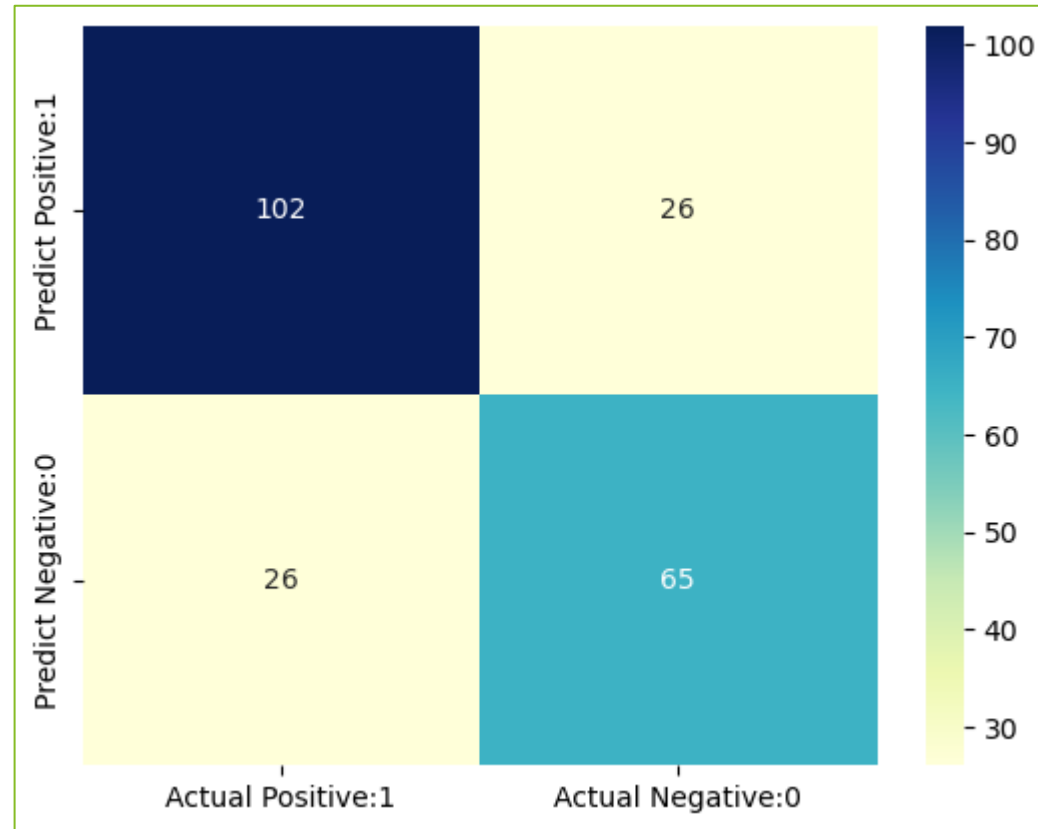
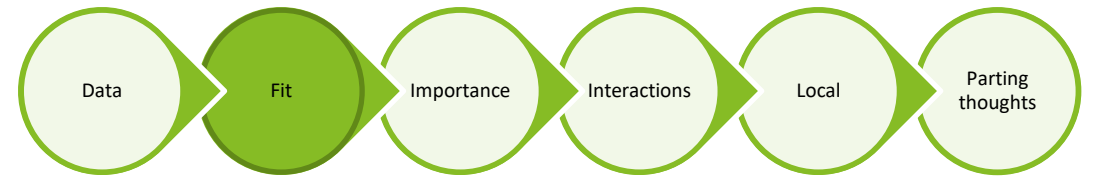


	PassengerId	Survived	Pclass	Age
count	891.000000	891.000000	891.000000	714.000000
mean	446.000000	0.383838	2.308642	38.420168
std	257.353842	0.486592	0.836071	56.525211
min	1.000000	0.000000	1.000000	1.000000
25%	223.500000	0.000000	2.000000	21.000000
50%	446.000000	0.000000	3.000000	29.000000
75%	668.500000	1.000000	3.000000	40.000000
max	891.000000	1.000000	3.000000	705.000000

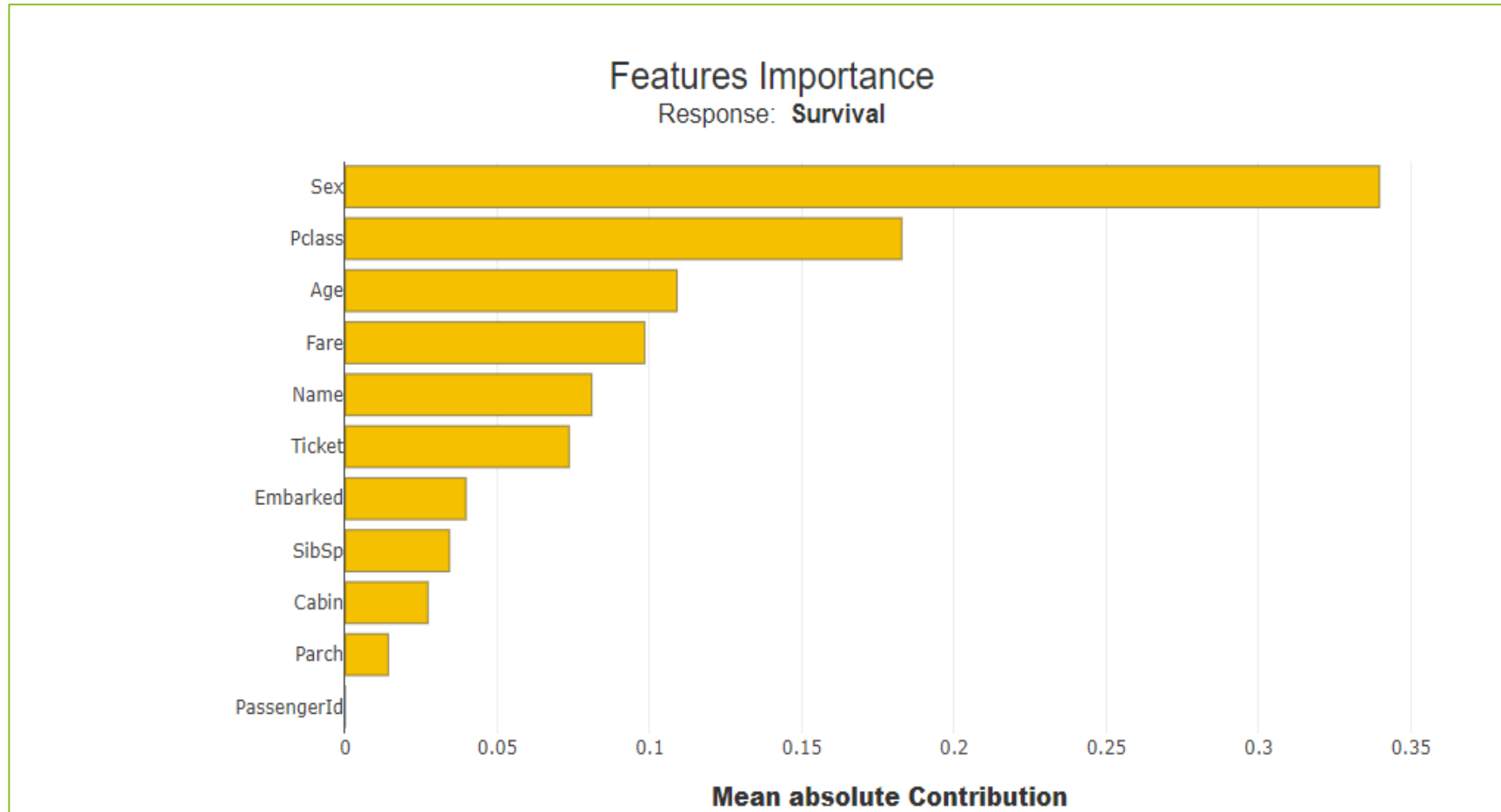
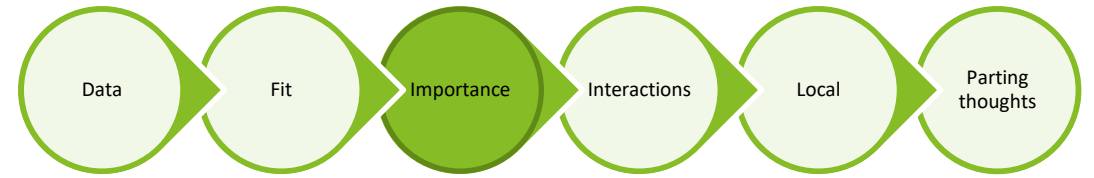
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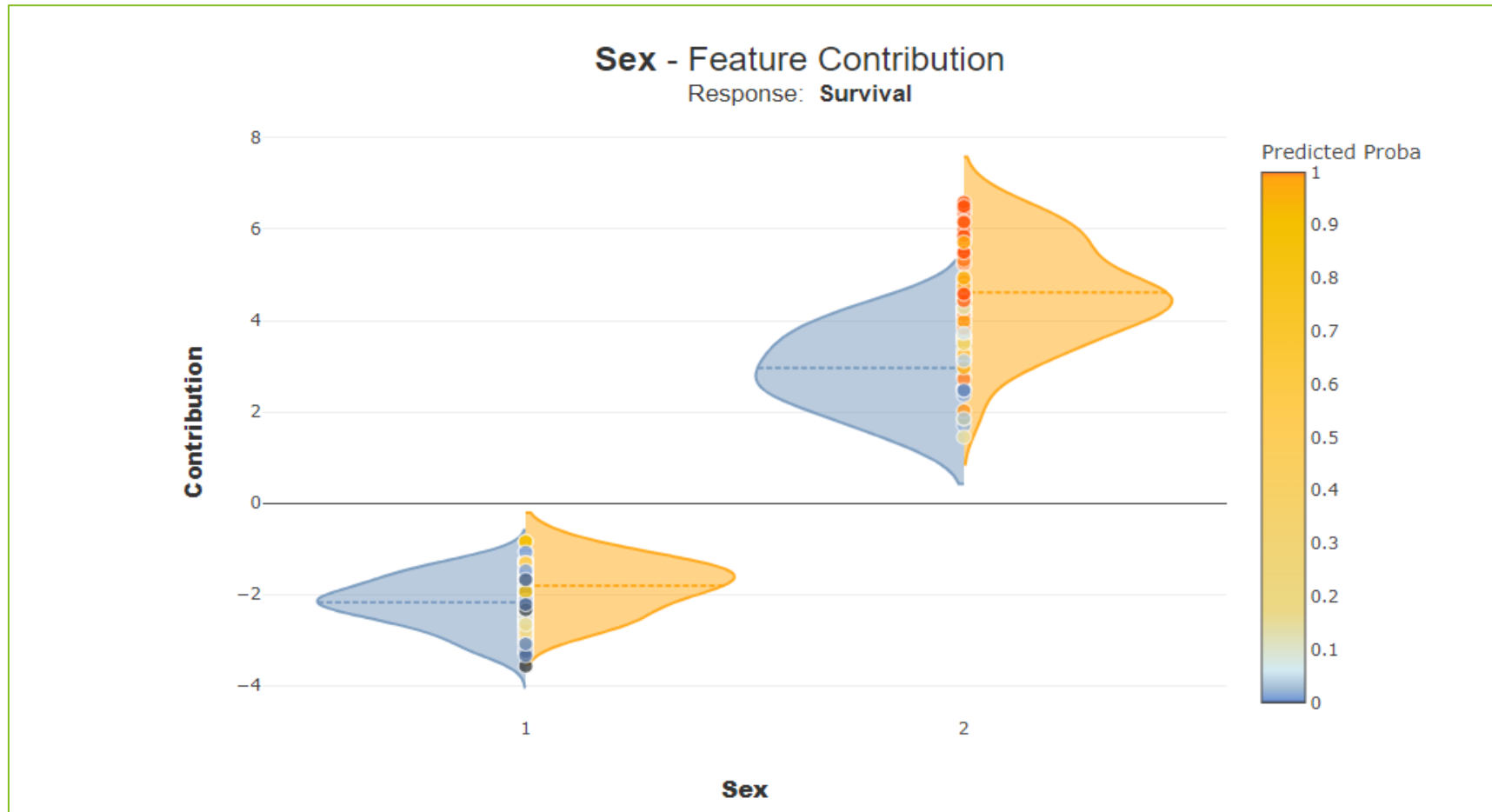
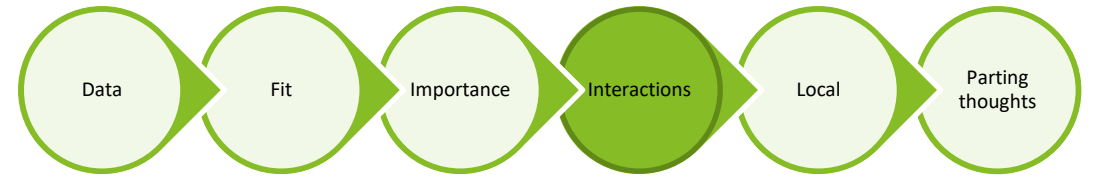
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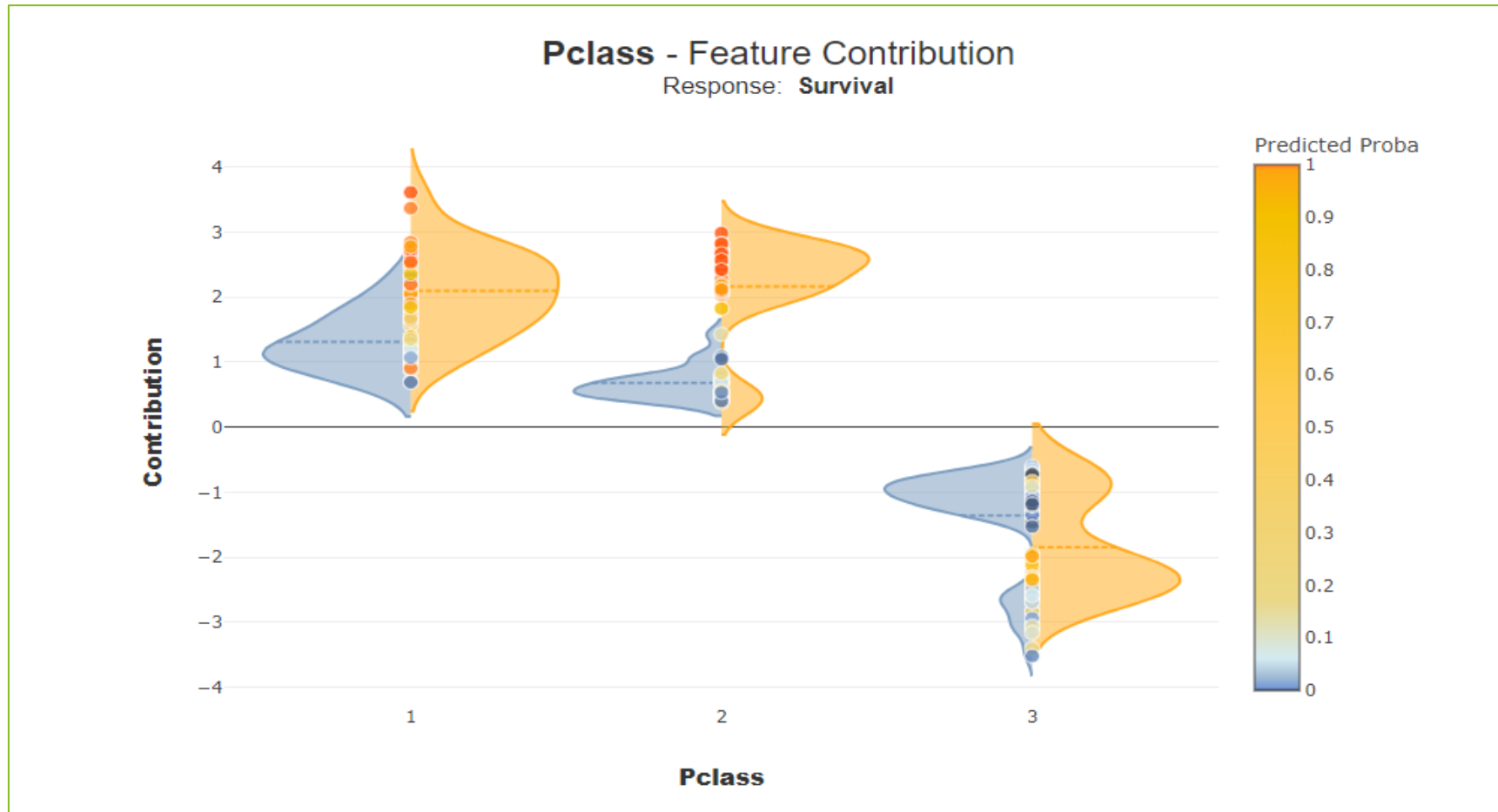
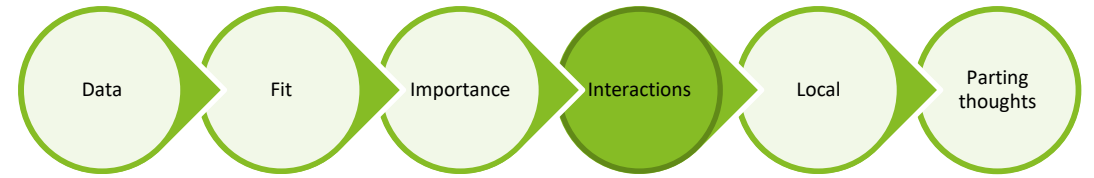
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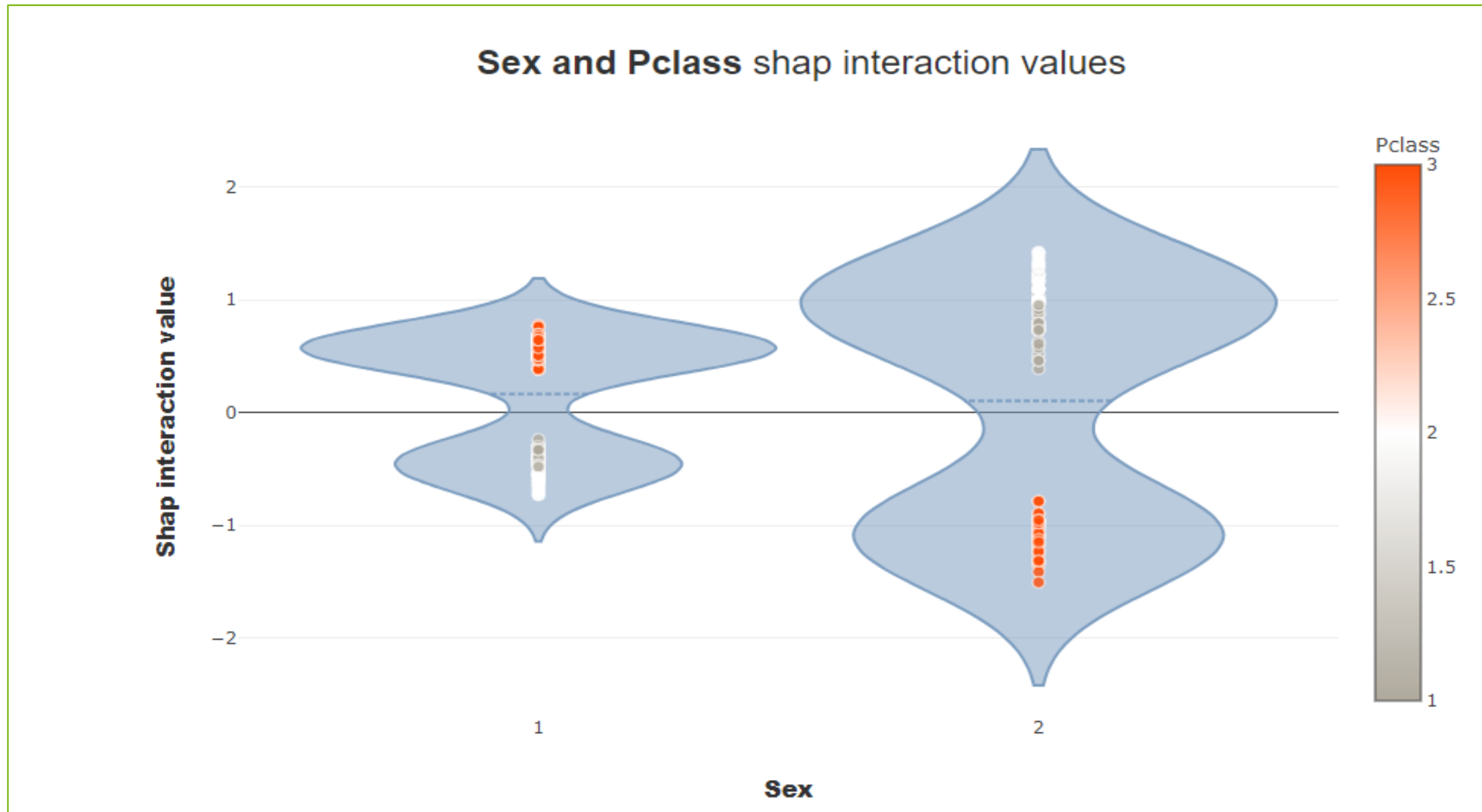
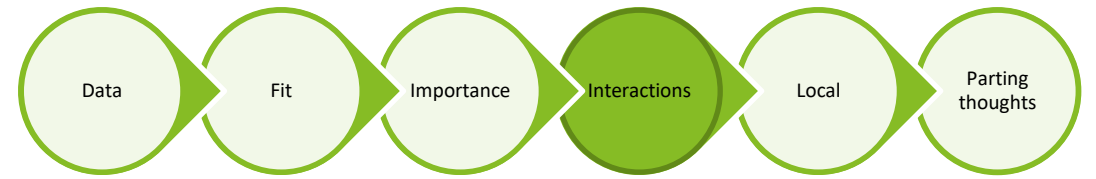
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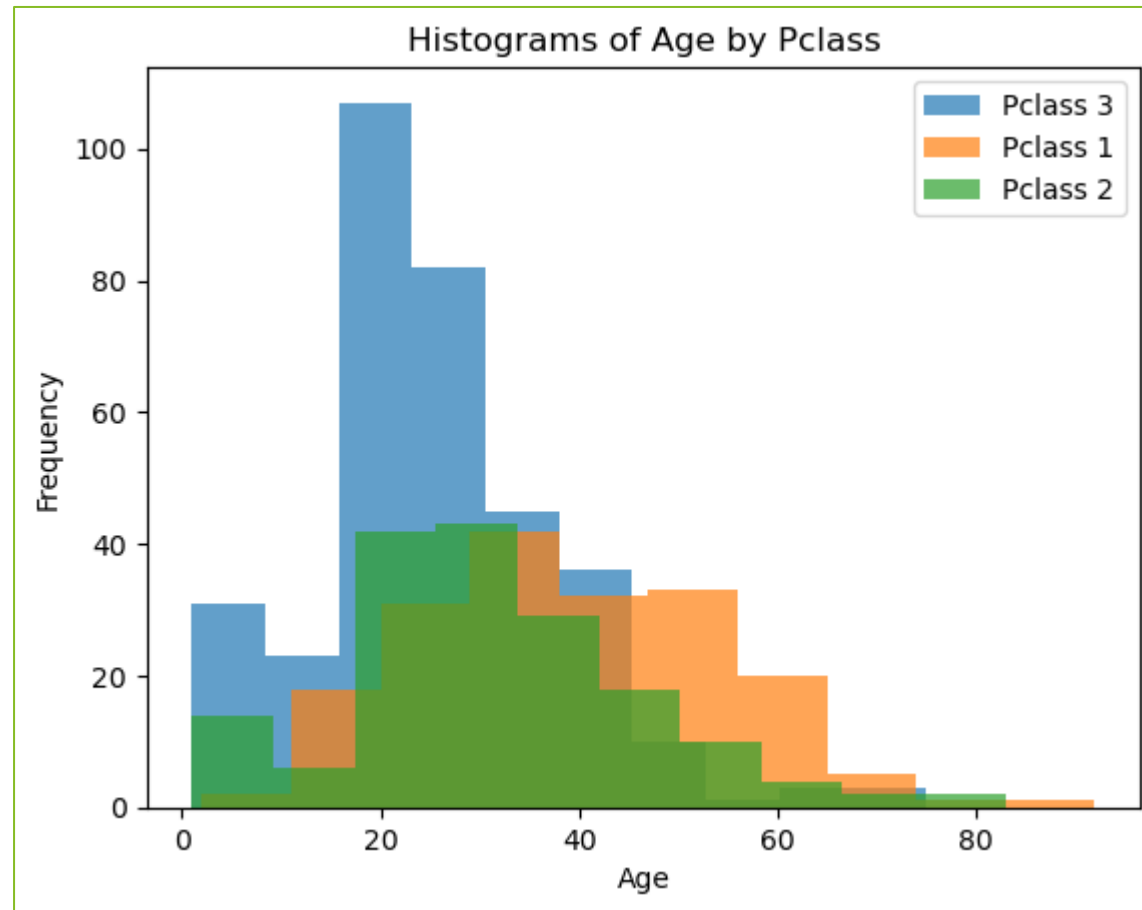
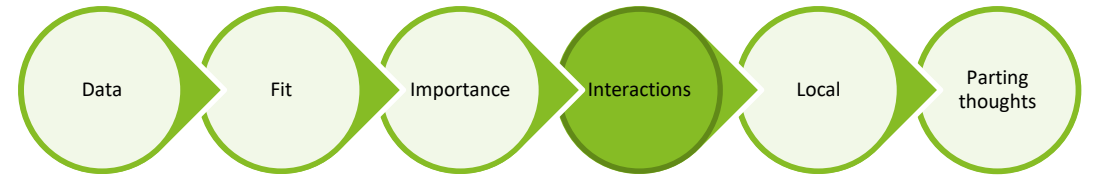
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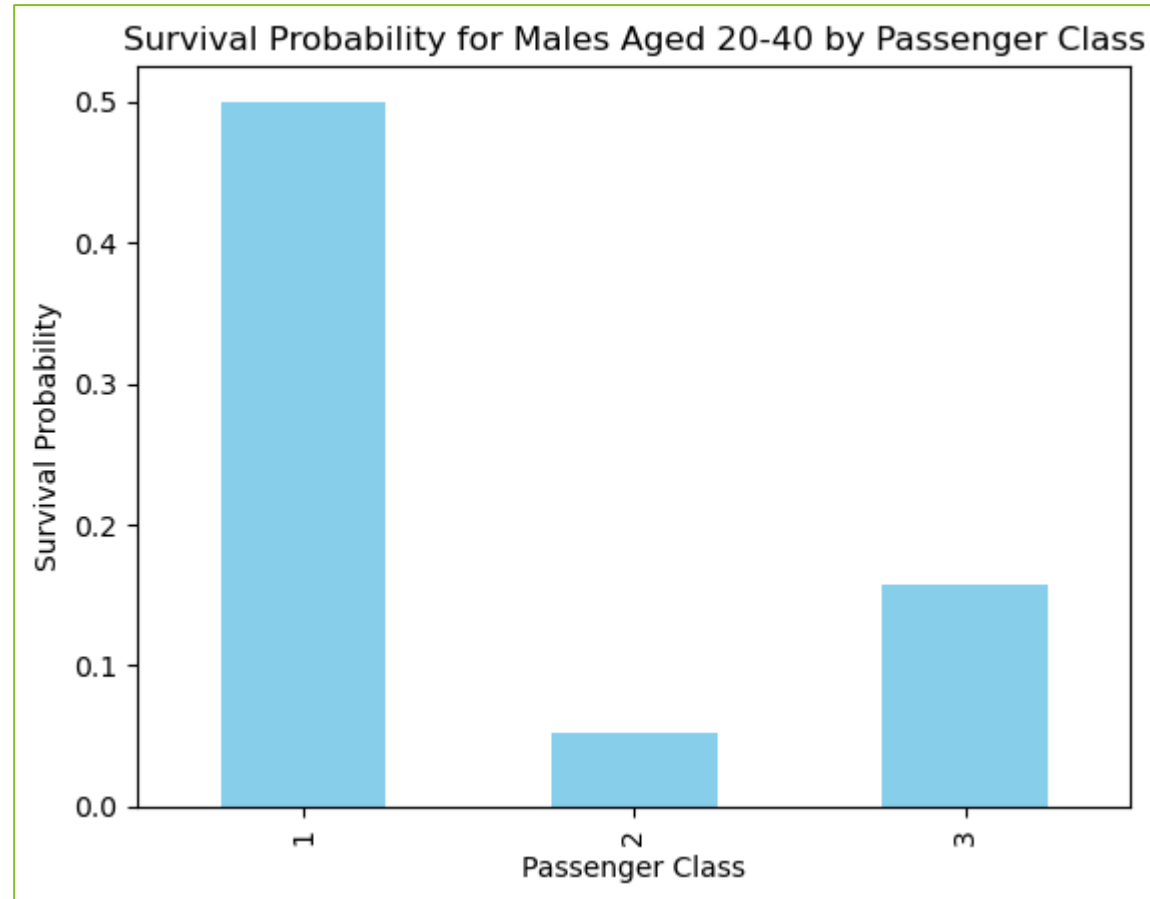
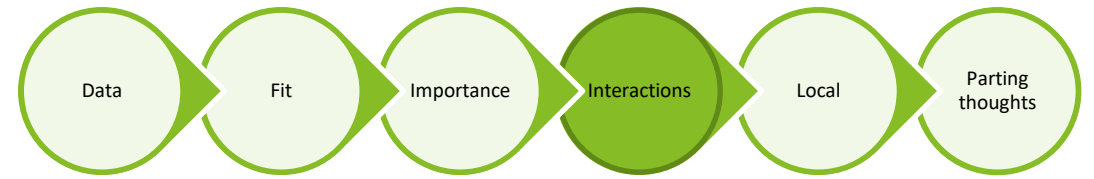
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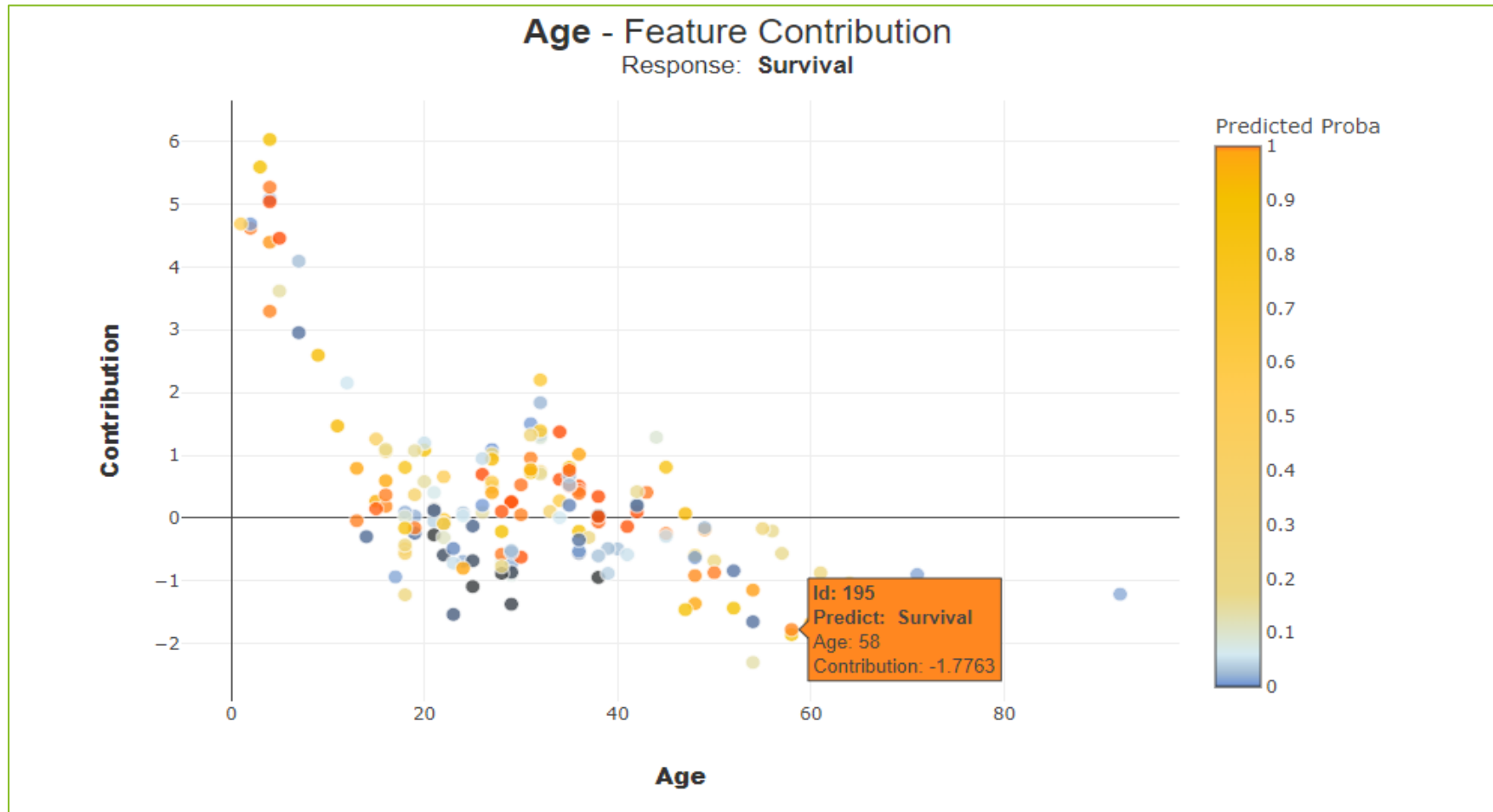
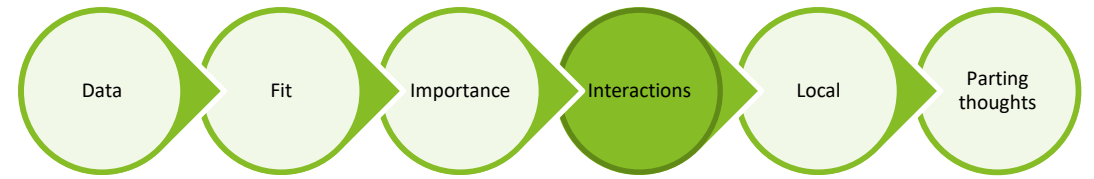
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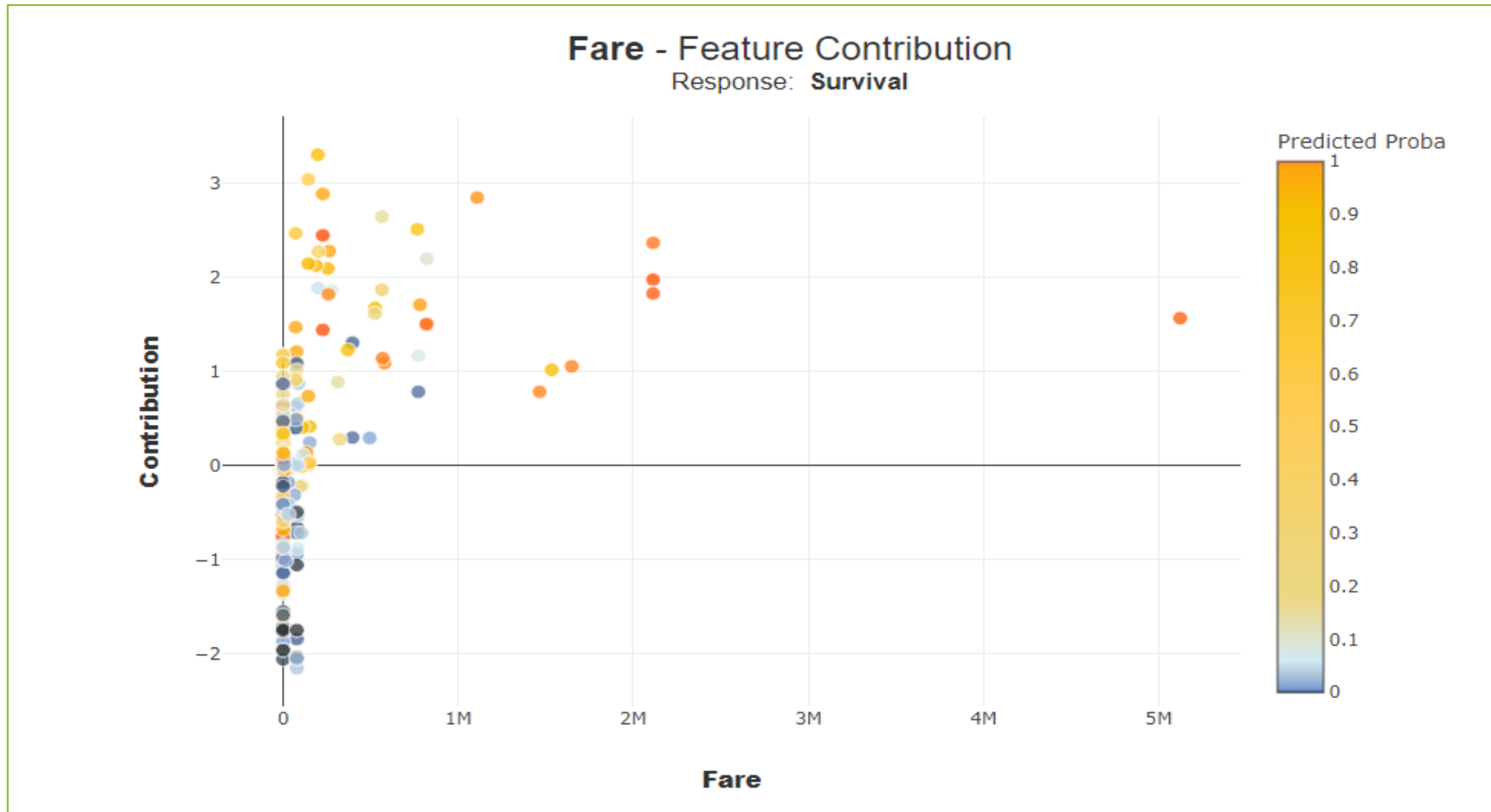
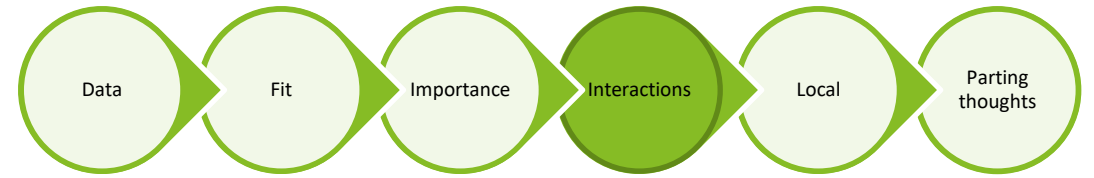
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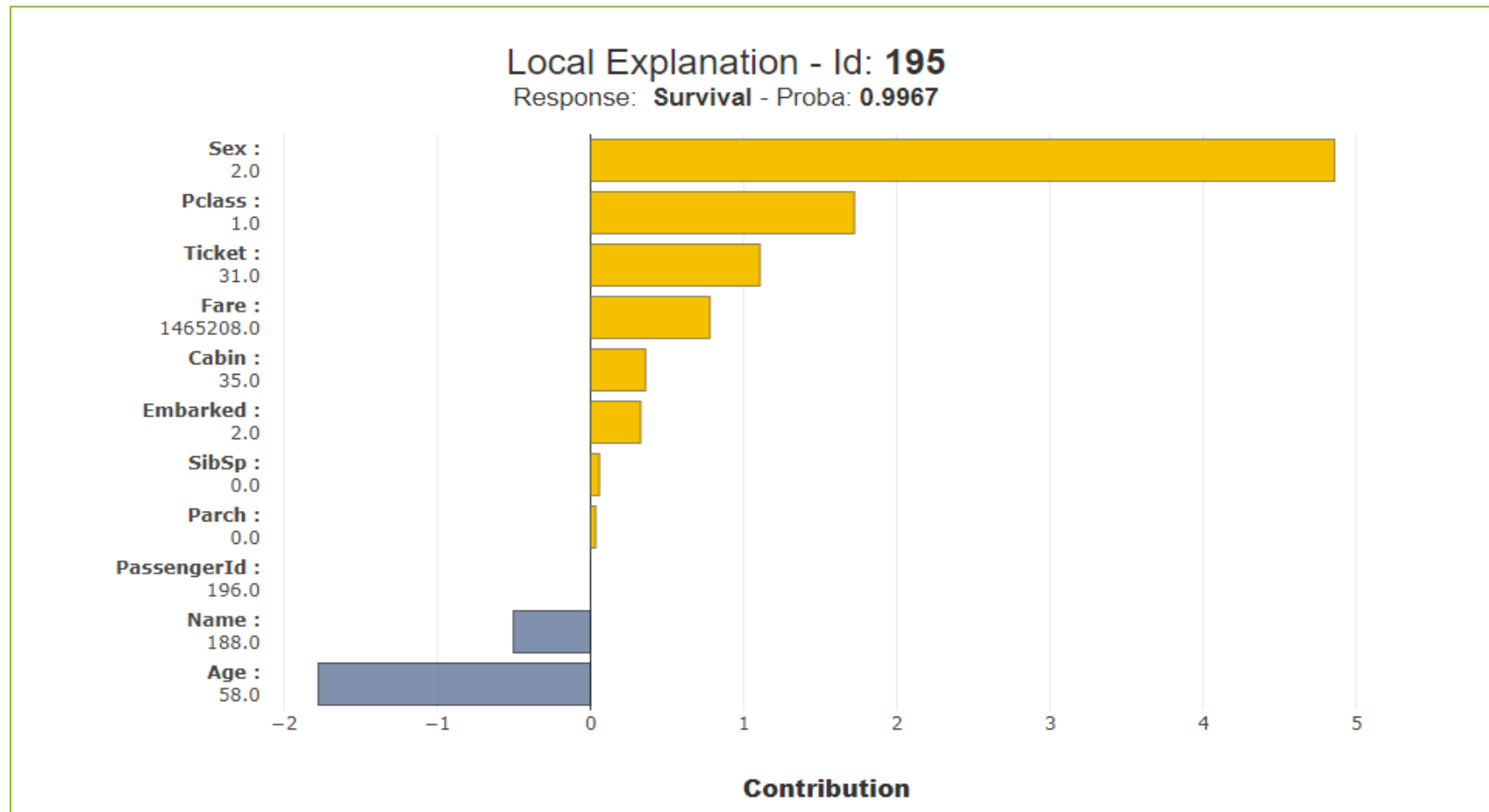
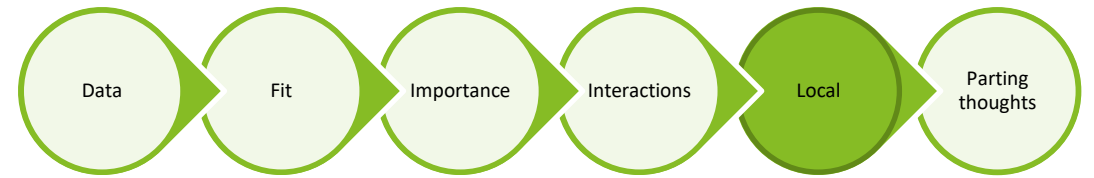
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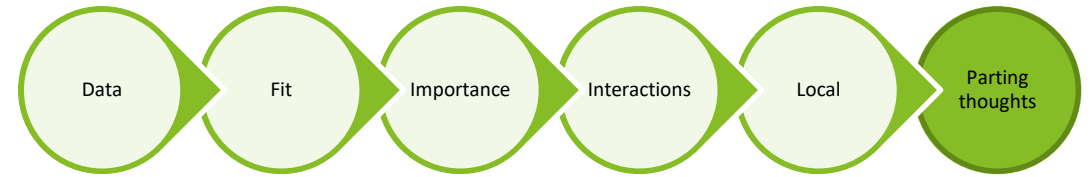
The Titanic Problem



The Titanic Problem



The Titanic problem



The visible

- Nice graphics
- Charts are dynamic
 - One can pinpoint individual observations
- Seamlessly integrated in Python flow
- Focus on interactions
- Global and local perspectives

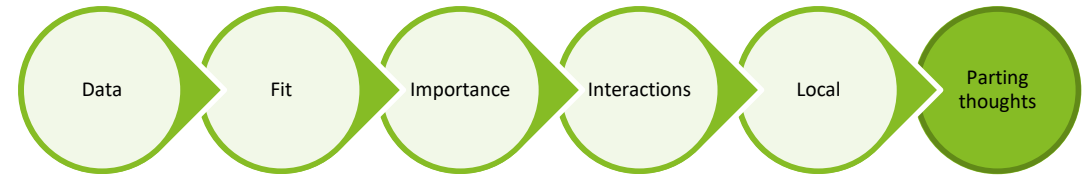


The invisible

- Perspective “after the fact”
 - Based on input data and predictions
 - Throughput process not visible
 - Understanding not fully realized
- Unsure how gradient boosting is different from other classifiers, e.g. SVM
- Interactions limited to 2nd order
 - Can lead to wrong conclusions!
- Narrative is necessary
 - “Personas” can be helpful
 - “Business” knowledge
- Not an automated process
 - No underlying “directional” intelligence
 - No “autonomy”
- The tool “sec” gives only very limited amount of “understanding”



So where is the “real” intelligence?



Please, for the same dataset, filter on only males of Age between 20 and 40. Please then generate a graph of survival probabilities per passenger class

To filter the dataset for only males aged between 20 and 40 and then generate a graph of survival probabilities per passenger class, you can follow these steps:

```
python Copy code

import pandas as pd
import matplotlib.pyplot as plt

# Sample DataFrame with "Pclass," "Age," "Sex," and "Survived" columns
data = {'Pclass': [1, 2, 3, 1, 2, 1, 3, 2, 3],
        'Age': [35, 25, 28, 45, 30, 40, 22, 32, 38],
        'Sex': ['male', 'male', 'male', 'male', 'male', 'male', 'male', 'male', 'mal
        'Survived': [1, 0, 1, 1, 1, 0, 0, 0, 1]}
df = pd.DataFrame(data)

# Filter for males aged between 20 and 40
filtered_data = df[(df['Sex'] == 'male') & (df['Age'] >= 20) & (df['Age'] <= 40)]

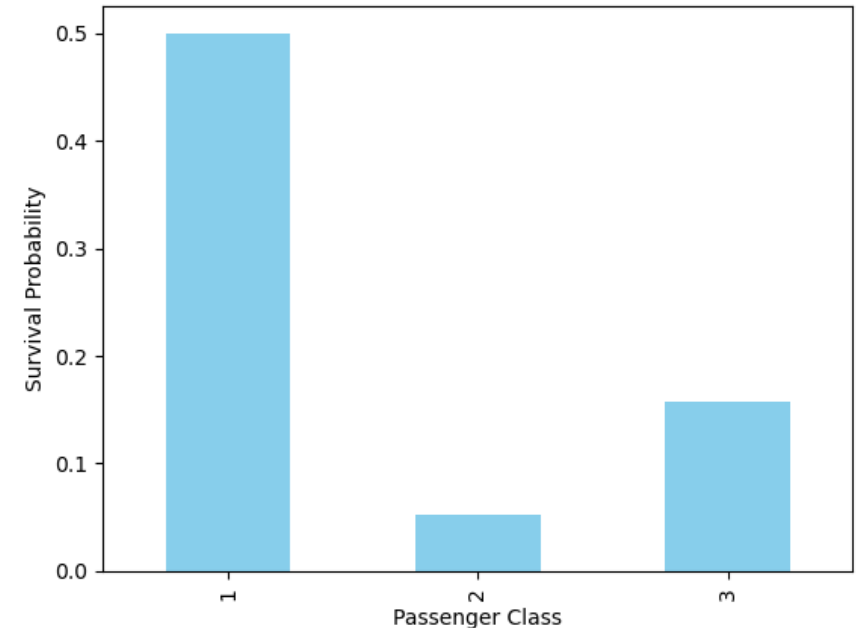
# Calculate and plot survival probabilities per passenger class
survival_probabilities = filtered_data.groupby('Pclass')['Survived'].mean()
survival_probabilities.plot(kind='bar', color='skyblue')
plt.xlabel('Passenger Class')
plt.ylabel('Survival Probability')
plt.title('Survival Probability for Males Aged 20-40 by Passenger Class')
plt.show()
```

Regenerate

```
jupyter Titanic Last Checkpoint: 39 minutes ago (autosaved)
File Edit View Insert Cell Kernel Widgets Help
+ %< > Run Code
In [10]: # Filter for males aged between 20 and 40
filtered_data = df[(df['Sex'] == 'male') & (df['Age'] >= 20) & (df['Age'] <= 40)]

# Calculate and plot survival probabilities per passenger class
survival_probabilities = filtered_data.groupby('Pclass')['Survived'].mean()
survival_probabilities.plot(kind='bar', color='skyblue')
plt.xlabel('Passenger Class')
plt.ylabel('Survival Probability')
plt.title('Survival Probability for Males Aged 20-40 by Passenger Class')
plt.show()
```

Survival Probability for Males Aged 20-40 by Passenger Class





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