タイタニック号データセット

December, 2020

概要

図表やグラフによるデータの整理について学びながら、タイタニック号乗船者の生死を分けた要因について考察してみましょう。

目次

1　タイタニック号について

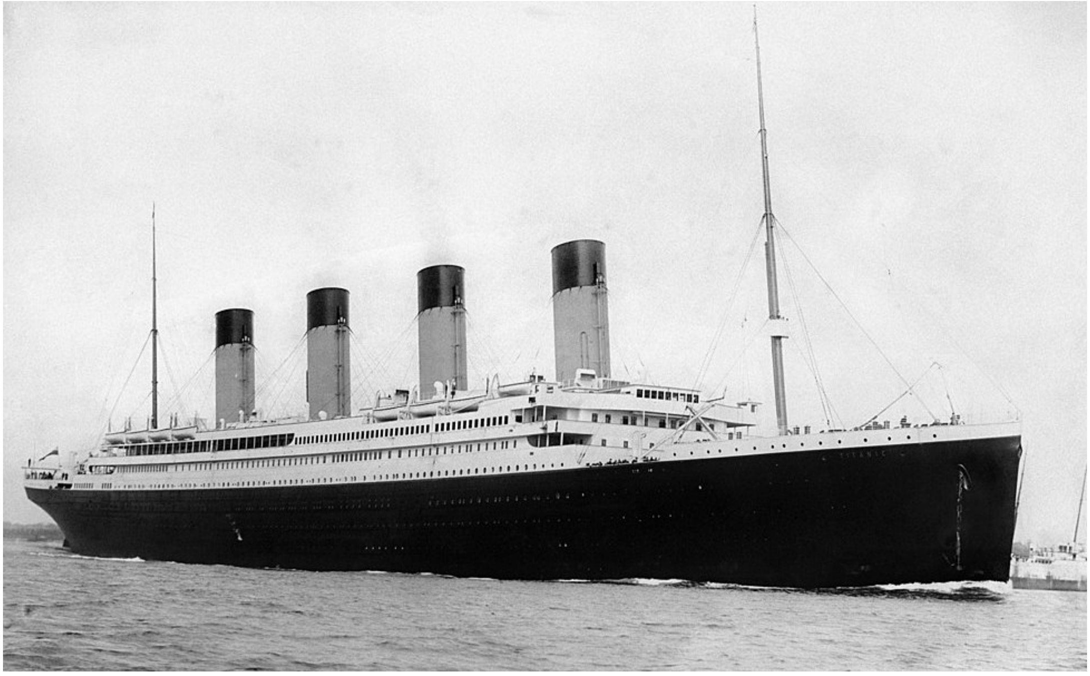
[1]:

```python
import IPython.display
IPython.display.YouTubeVideo('CHekzSiZjrY', width=960, height=540)
```

[1]:

タイタニック (客船) について

タイタニック号沈没事故について



2 タイタニック号データセット

＊データ提供元：ヴァンダービルト大学生物統計学科 [1]、kaggle[2]、seaborn[3] など。

2.1 変数

変数名	内容	キー
survival	生存状況	0 = No, 1 = Yes
pclass	チケットクラス	1 = 一等, 2 = 二等, 3 = 3 等
sex	性別	
Age	年齢	
sibsp	同乗した兄弟や配偶者の数	
parch	同乗した親や子の数	
ticket	チッケット番号	
fare	旅客運賃	
cabin	船室番号	
embarked	乗船港	C = Cherbourg（仏）, Q = Queenstown（愛）, S = Southampton（英）

2.2 乗船港

[2]:

```
import folium

Cherbourg = [49.63, -1.62]
Queenstown = [51.851, -8.2967]
Southampton = [50.89696, -1.40416]
center = [(x+y+z)/3 for (x, y, z) in zip(Cherbourg, Queenstown, Southampton)]
# center =[45, 5]

m = folium.Map(location=center, tiles='Stamen Terrain', zoom_start=6)
folium.Marker(location=Cherbourg, popup='<b>Cherbourg</b>').add_to(m)
folium.Marker(location=Queenstown, popup='<b>Queenstown () </b>').add_to(m)
folium.Marker(location=Southampton, popup='<b> Southampton</b>').add_to(m)


m
```

[2]:

```
<folium.folium.Map at 0x7fb408ec8610>
```

+
−
Leeds
Dublin
Liverpool
Sheffield
Snowdon
1085m
IRELAND
Nottingham
NETHERLAN
Haarlem
Amsterdam
UNITED
KINGDOM
Carrauntoohil
1038m
The Hague
Rotterdam
's-Hertogen
Cardiff
Bristol
Dusseldorf
Antwerpen
Brussels
BELGIUM
Amiens
LUXEMB
Rouen
Luxembourg
Saarbrücken
Caen
MANCHE
EURE
CÔTES-
D'ARMOR
Rennes
ESSONNE
AUBE
Stras
LOIRET
LOIRE-
ATLANTIQUE
Tours
CÔTE-
D'OR
CHER
Besan

Leaflet | Map tiles by Stamen Design, under CC BY 3.0. Data by © OpenStreetMap, under CC BY SA.

2.3 Init

[3]:

```
import numpy as np
import pandas as pd
# pd.set_option('display.max_rows')
import matplotlib.pyplot as plt
import seaborn as sns
sns.set(style='darkgrid', font_scale = 1.8)
plt.rcParams['figure.dpi'] = 300
%matplotlib inline
```

```
Duplicate key in file PosixPath('/Users/sunggi/opt/anaconda3/lib/python3.7/site-
packages/matplotlib/mpl-data/matplotlibrc'), line 250 ('font.family:
IPAexGothic')
```

2.4 Load

[4]:

```
df = pd.read_csv("./data/train.csv")
```

[5]:

```
titanic = sns.load_dataset("titanic")
```

2.5 データの様子

[6]:

```
df.head()
```

[6]:

```
   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
```

```
4            5         0       3

                                                Name     Sex   Age  SibSp  \
0                            Braund, Mr. Owen Harris    male  22.0      1
1  Cumings, Mrs. John Bradley (Florence Briggs Th…  female  38.0      1
2                             Heikkinen, Miss. Laina  female  26.0      0
3       Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0      1
4                           Allen, Mr. William Henry    male  35.0      0

   Parch            Ticket     Fare Cabin Embarked
0      0         A/5 21171   7.2500   NaN        S
1      0          PC 17599  71.2833   C85        C
2      0  STON/O2. 3101282   7.9250   NaN        S
3      0            113803  53.1000  C123        S
4      0            373450   8.0500   NaN        S
```

[7]:
```
# 敬称を抽出する関数
def Title(name):
    ret = 'Other'
    target = name.split(" ")
    for i in range(len(target)):
        if "." in target[i]:
            ret = target[i]
            break
    return ret
```

[8]:
```
df['Title'] = df['Name'].apply(Title)
```

[9]:
```
df['Title'].unique()
```

[9]:
```
array(['Mr.', 'Mrs.', 'Miss.', 'Master.', 'Don.', 'Rev.', 'Dr.', 'Mme.',
       'Ms.', 'Major.', 'Lady.', 'Sir.', 'Mlle.', 'Col.', 'Capt.',
       'Countess.', 'Jonkheer.'], dtype=object)
```

[10]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 13 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   PassengerId  891 non-null    int64
 1   Survived     891 non-null    int64
 2   Pclass       891 non-null    int64
 3   Name         891 non-null    object
 4   Sex          891 non-null    object
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64
 7   Parch        891 non-null    int64
 8   Ticket       891 non-null    object
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object
 11  Embarked     889 non-null    object
 12  Title        891 non-null    object
dtypes: float64(2), int64(5), object(6)
memory usage: 90.6+ KB
```

[11]:
```
df.describe(include='all')
```

[11]:
```
        PassengerId    Survived      Pclass                         Name  \
count    891.000000  891.000000  891.000000                          891
unique          NaN         NaN         NaN                          891
top             NaN         NaN         NaN  Lindqvist, Mr. Eino William
freq            NaN         NaN         NaN                            1
mean     446.000000    0.383838    2.308642                          NaN
std      257.353842    0.486592    0.836071                          NaN
min        1.000000    0.000000    1.000000                          NaN
25%      223.500000    0.000000    2.000000                          NaN
50%      446.000000    0.000000    3.000000                          NaN
75%      668.500000    1.000000    3.000000                          NaN
max      891.000000    1.000000    3.000000                          NaN

         Sex         Age       SibSp       Parch  Ticket        Fare Cabin  \
count    891  714.000000  891.000000  891.000000     891  891.000000   204
unique     2         NaN         NaN         NaN     681         NaN   147
top     male         NaN         NaN         NaN  347082         NaN    G6
freq     577         NaN         NaN         NaN       7         NaN     4
mean     NaN   29.699118    0.523008    0.381594     NaN   32.204208   NaN
std      NaN   14.526497    1.102743    0.806057     NaN   49.693429   NaN
min      NaN    0.420000    0.000000    0.000000     NaN    0.000000   NaN
25%      NaN   20.125000    0.000000    0.000000     NaN    7.910400   NaN
50%      NaN   28.000000    0.000000    0.000000     NaN   14.454200   NaN
75%      NaN   38.000000    1.000000    0.000000     NaN   31.000000   NaN
max      NaN   80.000000    8.000000    6.000000     NaN  512.329200   NaN

       Embarked Title
count       889   891
unique        3    17
top           S   Mr.
freq        644   517
mean        NaN   NaN
std         NaN   NaN
min         NaN   NaN
25%         NaN   NaN
50%         NaN   NaN
75%         NaN   NaN
max         NaN   NaN
```

[12]:

```
df.drop(['PassengerId', 'Name', 'Ticket', 'Cabin'], axis=1, inplace=True)
```

[13]:

```
df[['Survived', 'Pclass']] = df[['Survived', 'Pclass']].astype(str)
```

2.6 欠損値

[14]:

```
df.isna().sum()
```

[14]:

```
Survived      0
Pclass        0
Sex           0
Age         177
SibSp         0
Parch         0
Fare          0
Embarked      2
Title         0
dtype: int64
```

[15]:

```
df[df.isna().sum(axis=1)>0].head()
```

[15]:

```
   Survived Pclass     Sex  Age  SibSp  Parch     Fare Embarked  Title
5         0      3    male  NaN      0      0   8.4583        Q    Mr.
17        1      2    male  NaN      0      0  13.0000        S    Mr.
19        1      3  female  NaN      0      0   7.2250        C   Mrs.
26        0      3    male  NaN      0      0   7.2250        C    Mr.
28        1      3  female  NaN      0      0   7.8792        Q  Miss.
```

[16]:

```
df.dropna(subset=['Embarked'], inplace=True)
```

3　単変量分析

```
[17]: print(df.columns.values)
```

```
['Survived' 'Pclass' 'Sex' 'Age' 'SibSp' 'Parch' 'Fare' 'Embarked' 'Title']
```

```
[18]: cat = ['Survived', 'Pclass', 'Sex', 'Embarked', 'Title']
      num = ['Age', 'SibSp', 'Parch', 'Fare']
      print('NOE: cat=', len(cat))
      print('NOE: num=', len(num))
```

```
NOE: cat= 5
NOE: num= 4
```

3.1　質的変数

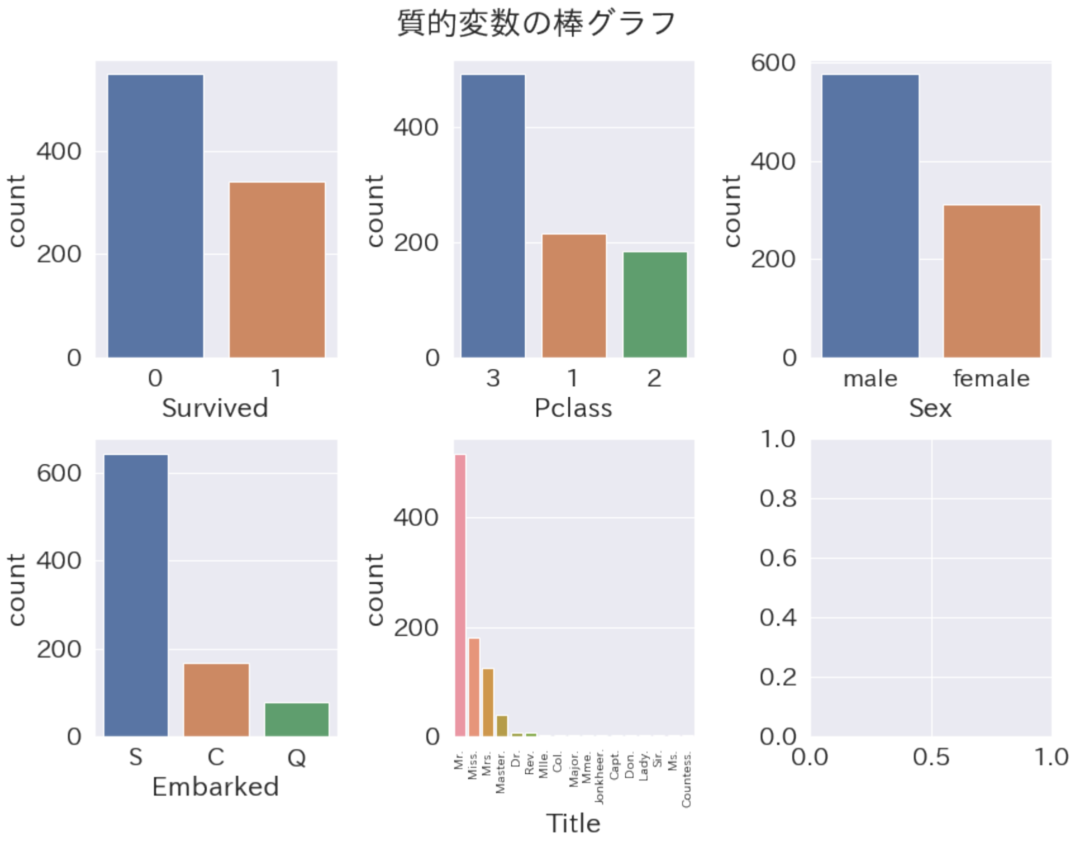
3.1.1　水準数・最頻値

```
[19]: df[cat].describe()
```

```
[19]:        Survived Pclass   Sex Embarked Title
      count       889    889   889      889   889
      unique        2      3     2        3    17
      top           0      3  male        S   Mr.
      freq        549    491   577      644   517
```

3.1.2　棒グラフ

```
[20]: nor, noc = 2, 3
      fig, axs = plt.subplots(nor, noc, figsize=(12, 9))
      for i in range(nor):
          for j in range(noc):
              k = noc*i + j
              if k < len(cat):
                  sns.countplot(x=cat[k], data=df, order=df[cat[k]].value_counts().index,␣
       ↪ax=axs[i, j])
      fig.tight_layout()
      fig.suptitle('質的変数の棒グラフ', fontsize=25)
      fig.subplots_adjust(top=0.92)
      labels = axs[1,1].get_xticklabels()
      axs[1,1].set_xticklabels(labels, rotation='vertical', fontsize=10)
      plt.show()
```



3.2 量的変数

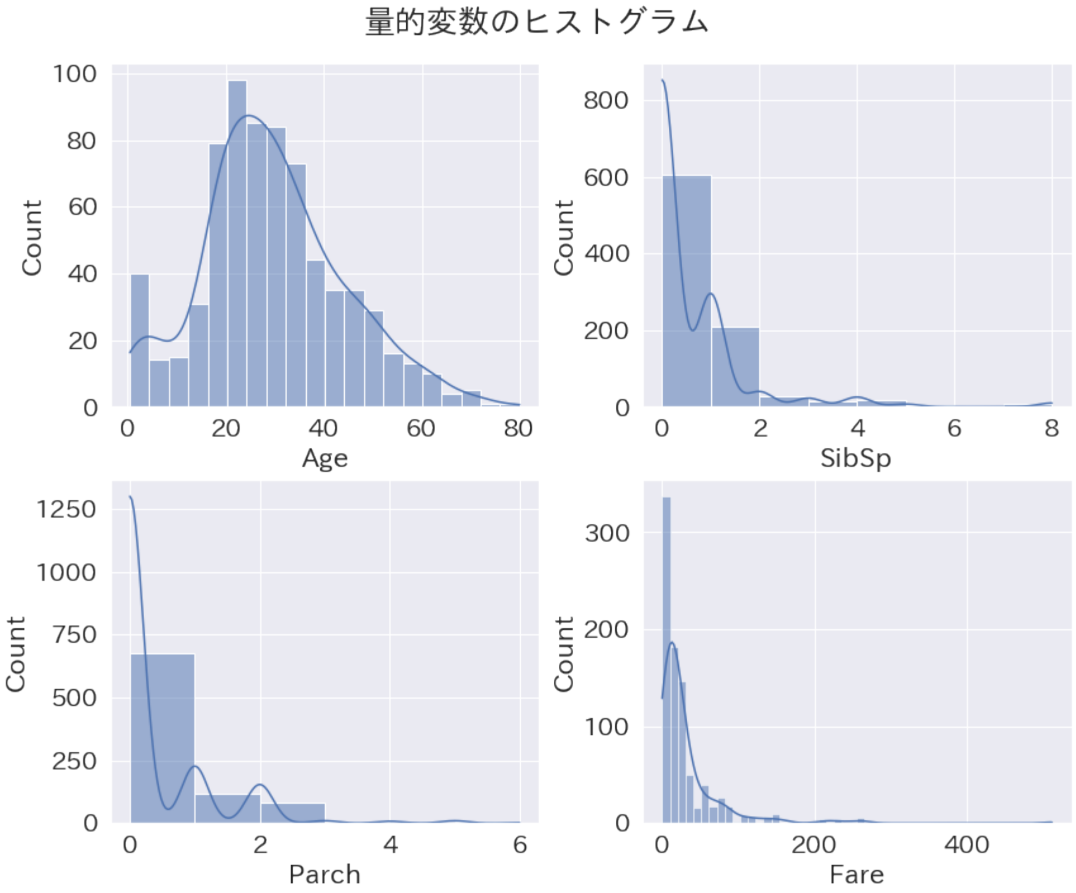
3.2.1 平均・標準偏差・５数要約

[21]:
```
round(df[num].describe())
```

[21]:
```
         Age  SibSp  Parch   Fare
count  712.0  889.0  889.0  889.0
mean    30.0    1.0    0.0   32.0
std     14.0    1.0    1.0   50.0
min      0.0    0.0    0.0    0.0
25%     20.0    0.0    0.0    8.0
50%     28.0    0.0    0.0   14.0
75%     38.0    1.0    0.0   31.0
max     80.0    8.0    6.0  512.0
```

3.2.2 ヒストグラム

[22]:
```
nor, noc = 2, 2
fig, axs = plt.subplots(nor, noc, figsize=(12, 10))
for i in range(nor):
    for j in range(noc):
        k = noc*i + j
        if k < len(num):
            sns.histplot(data=df, x=num[k], kde=True, bins=[20,8,6,50][k], ax=axs[i, j])
fig.tight_layout()
fig.suptitle('量的変数のヒストグラム', fontsize=25)
fig.subplots_adjust(top=0.92)
plt.show()
```



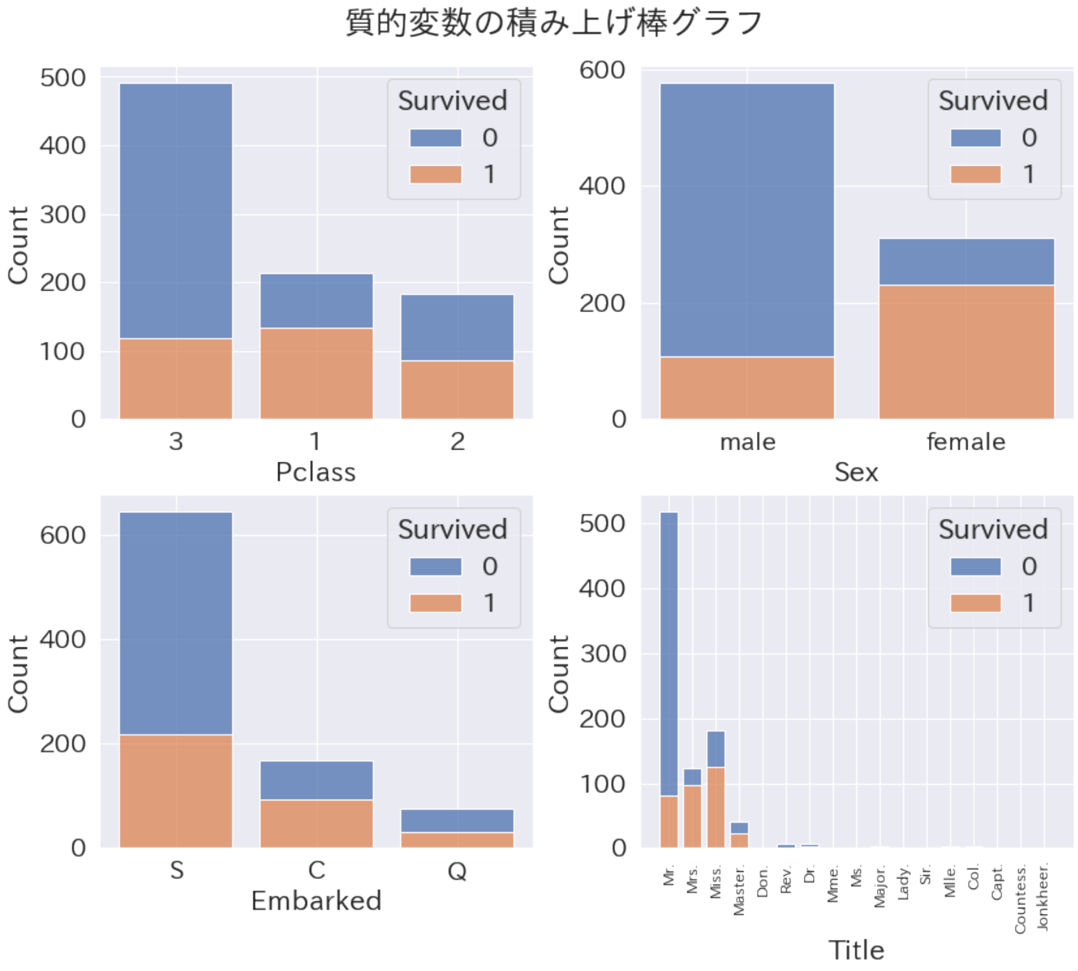
4　多変量分析

4.1　質的変数

4.1.1　積み上げ棒グラフ

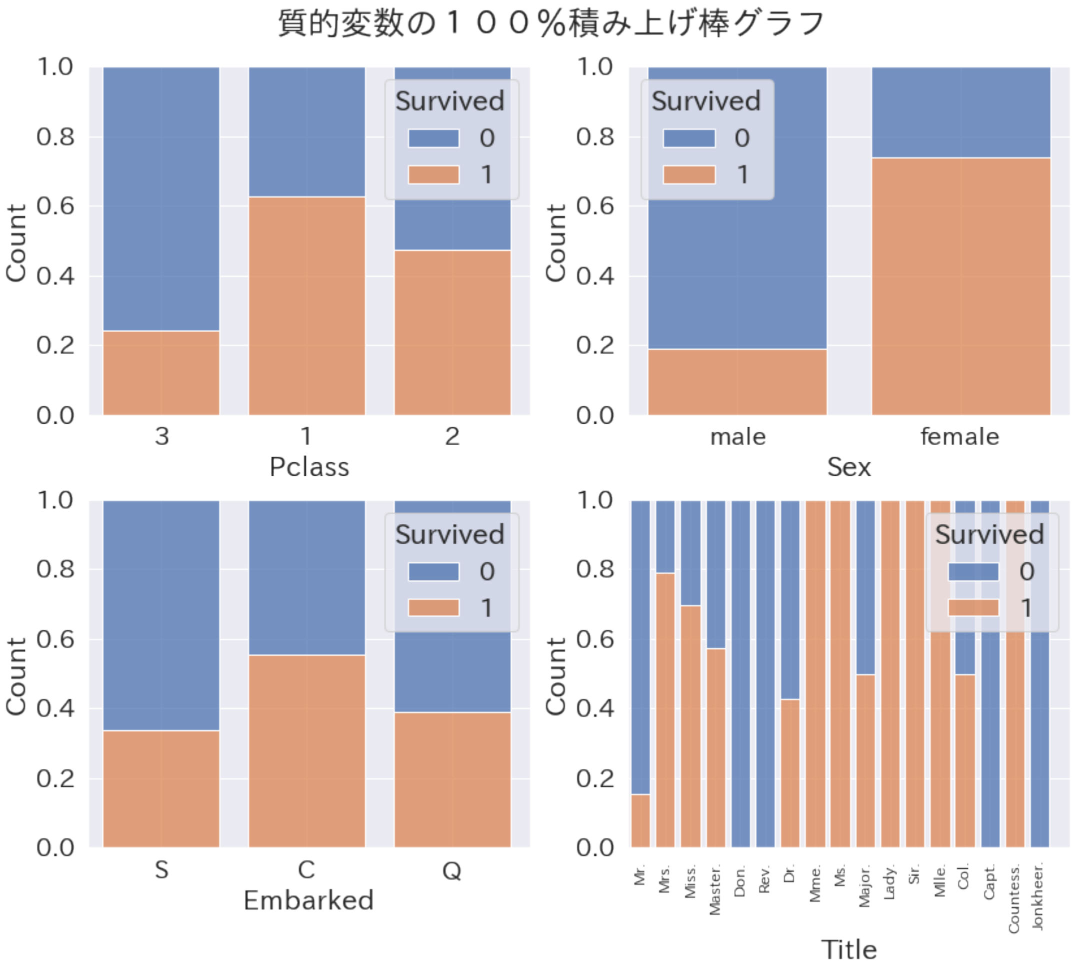
[23]:

```
nor, noc = 2, 2
fig, axs = plt.subplots(nor, noc, figsize=(12, 10))
for i in range(nor):
    for j in range(noc):
        k = noc*i + j
        sns.histplot(data=df, x=cat[k+1], hue='Survived', multiple='stack', shrink=.8,␣
 ↪ax=axs[i, j])
fig.tight_layout()
fig.suptitle('質的変数の積み上げ棒グラフ', fontsize=25)
fig.subplots_adjust(top=0.92)
labels = axs[1,1].get_xticklabels()
plt.setp(labels, rotation=90, fontsize=12)
plt.show()
```



4.1.2　100 %積み上げ棒グラフ

[24]:
```
nor, noc = 2, 2
fig, axs = plt.subplots(nor, noc, figsize=(12, 10))
for i in range(nor):
    for j in range(noc):
        k = noc*i + j
        sns.histplot(data=df, x=cat[k+1], hue='Survived', multiple='fill', shrink=.8, ax=axs[i, j])
fig.tight_layout()
fig.suptitle('質的変数の１００%積み上げ棒グラフ', fontsize=25)
fig.subplots_adjust(top=0.92)
labels = axs[1,1].get_xticklabels()
plt.setp(labels, rotation=90, fontsize=12)
plt.show()
```

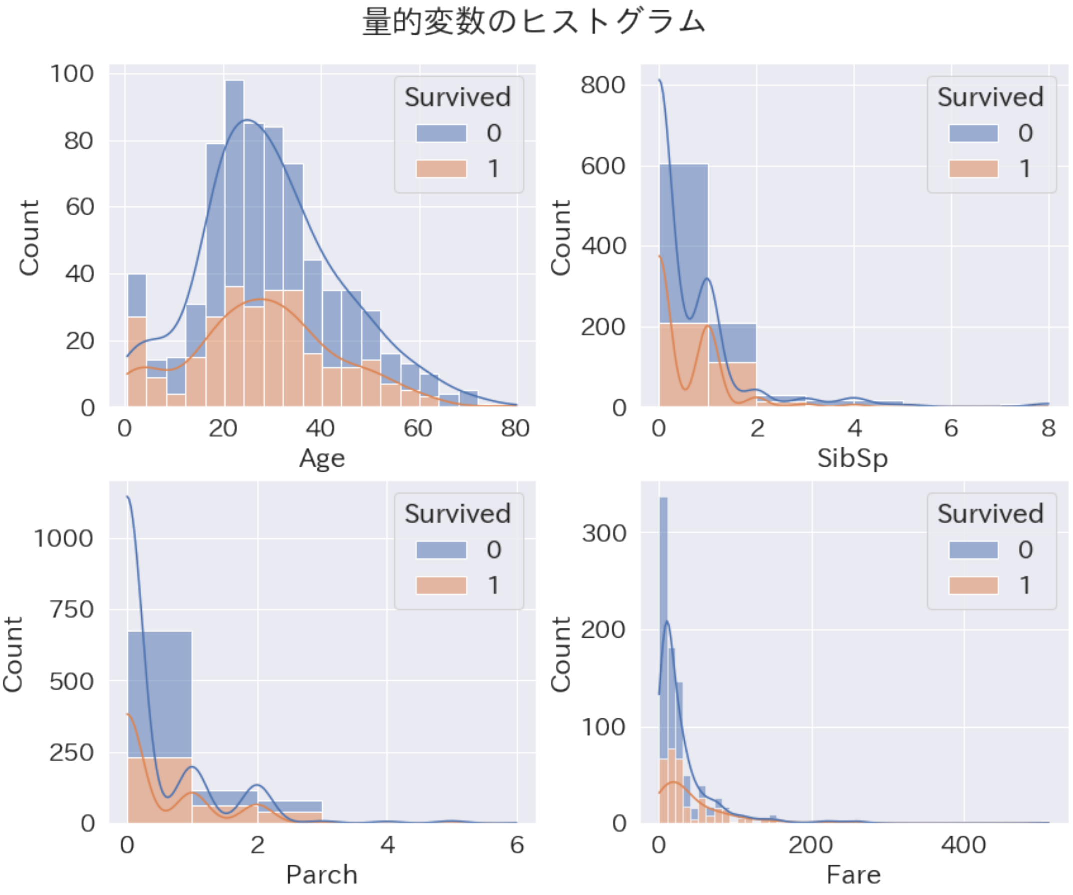


4.2　量的変数

4.2.1　ヒストグラム

[25]:

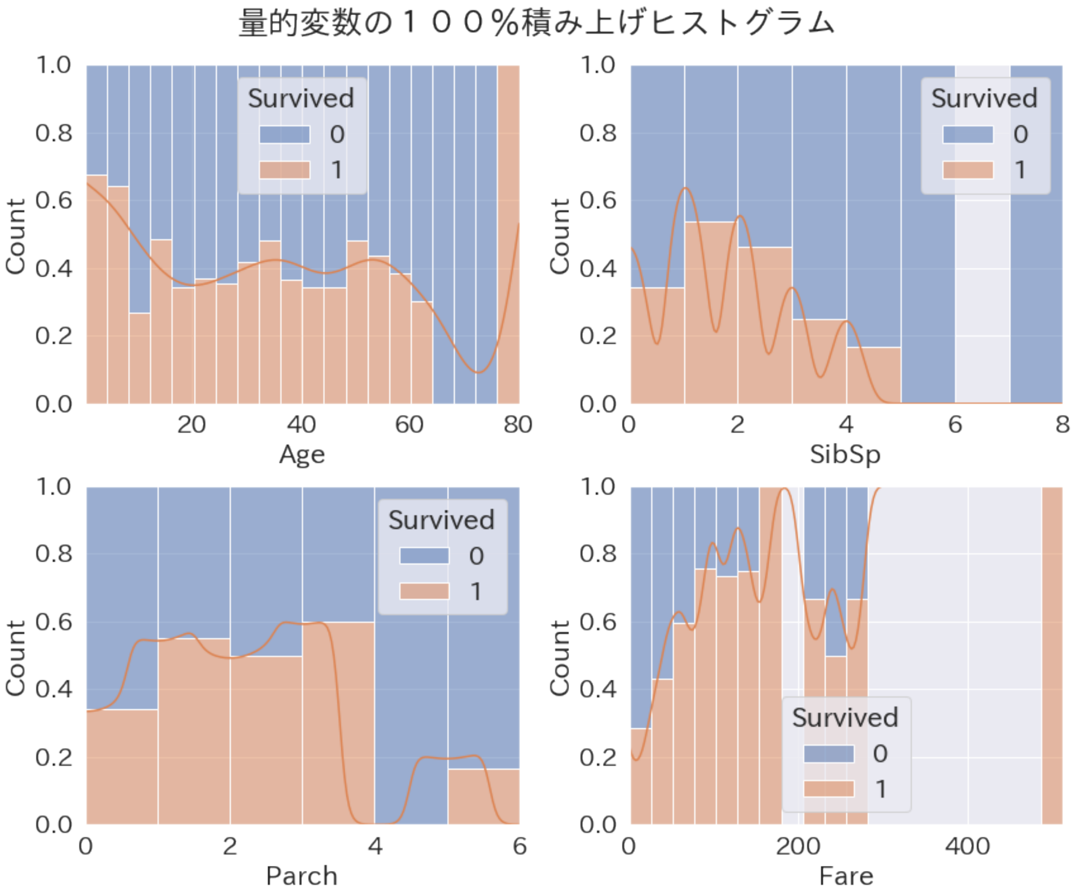
```
nor, noc = 2, 2
fig, axs = plt.subplots(nor, noc, figsize=(12, 10))
for i in range(nor):
    for j in range(noc):
        k = noc*i + j
        sns.histplot(data=df, x=num[k], hue='Survived', multiple='stack', kde=True,␣
 ↪bins=[20,8,6,50][k], ax=axs[i, j])
fig.tight_layout()
fig.suptitle('量的変数のヒストグラム', fontsize=25)
fig.subplots_adjust(top=0.92)
plt.show()
```



4.2.2　100 %積み上げヒストグラム

[26]:

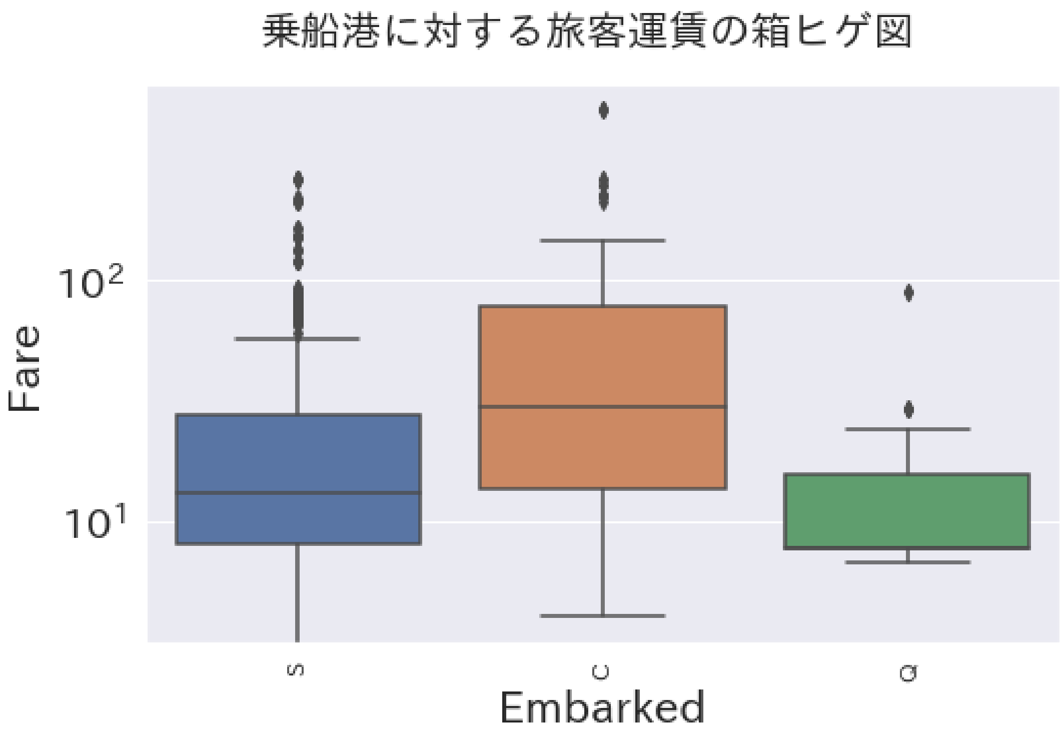
```
nor, noc = 2, 2
fig, axs = plt.subplots(nor, noc, figsize=(12, 10))
for i in range(nor):
    for j in range(noc):
        k = noc*i + j
        sns.histplot(data=df, x=num[k], hue='Survived', multiple='fill',␣
 ↪bins=[20,8,6,20][k], kde=True,ax=axs[i, j])
fig.tight_layout()
fig.suptitle('量的変数の１００%積み上げヒストグラム', fontsize=25)
fig.subplots_adjust(top=0.92)
plt.show()
```



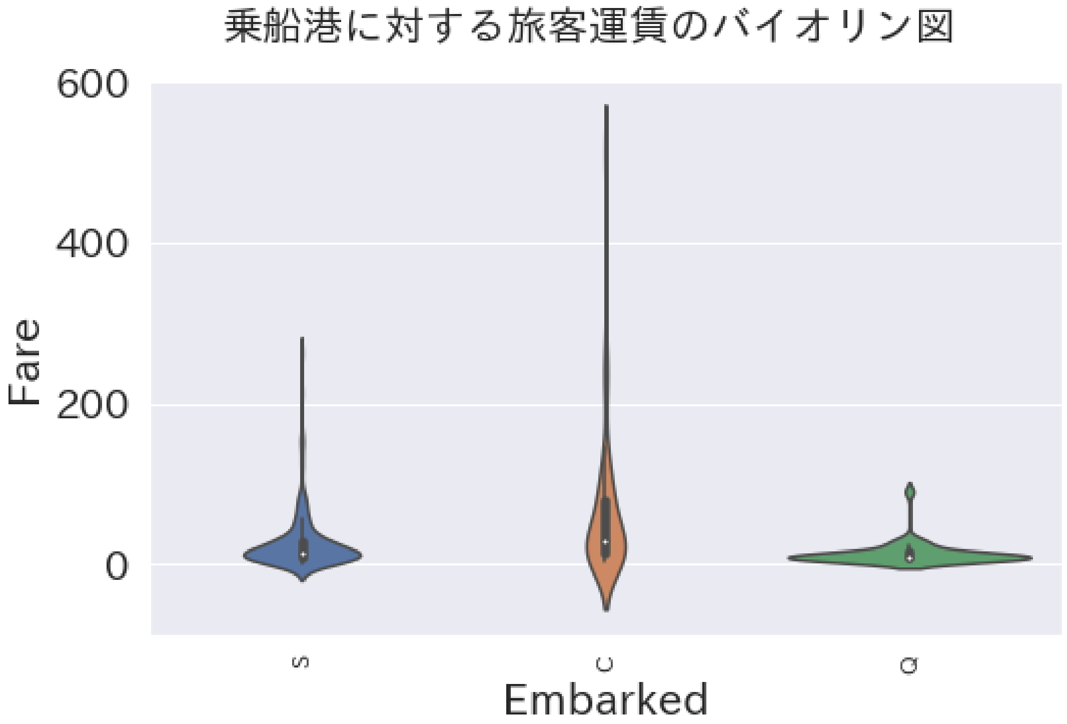
4.2.3 箱ヒゲ図とバイオリン図

[27]:

```
fig, ax = plt.subplots(figsize=(8, 5))
sns.boxplot(x='Embarked', y='Fare', data=df, ax=ax)
labels = ax.get_xticklabels()
ax.set_xticklabels(labels, rotation='vertical', fontsize=12)
ax.set_yscale("log")
plt.suptitle('乗船港に対する旅客運賃の箱ヒゲ図', fontsize=20)
plt.show()
```

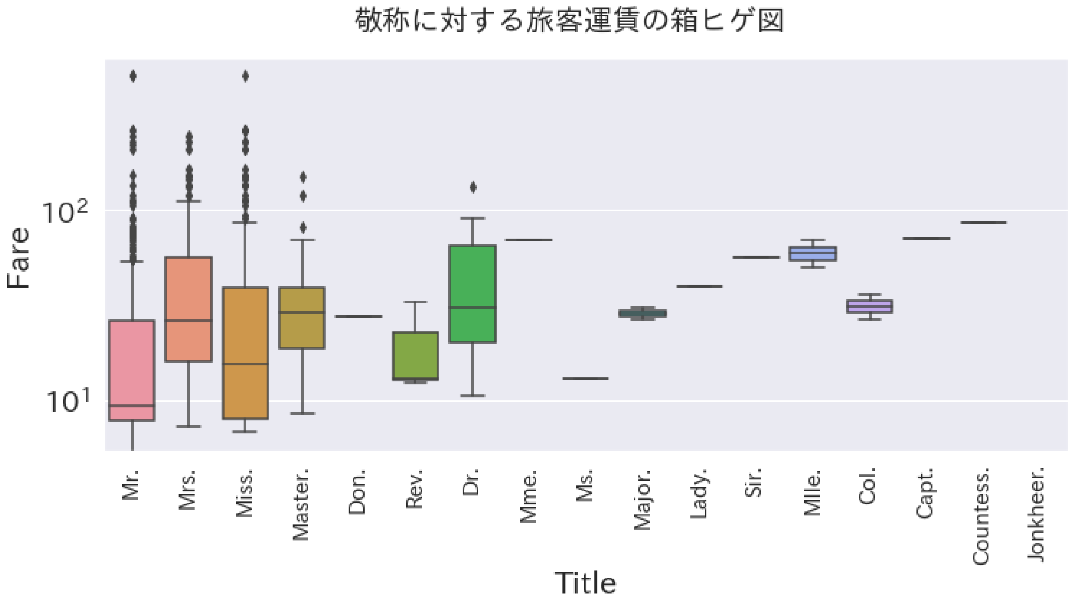


```
[28]: fig, ax = plt.subplots(figsize=(8, 5))
      sns.violinplot(x='Embarked', y='Fare', data=df, ax=ax)
      labels = ax.get_xticklabels()
      ax.set_xticklabels(labels, rotation='vertical', fontsize=12)
      # ax.set_yscale("log")
      plt.suptitle('乗船港に対する旅客運賃のバイオリン図', fontsize=20)
      plt.show()
```



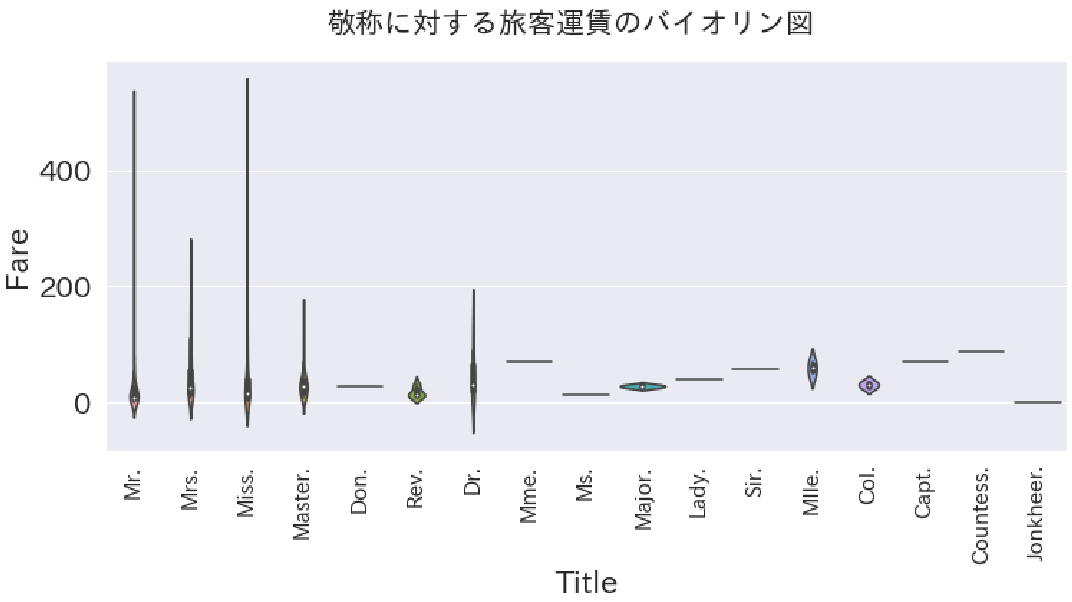
[29]:

```
fig, ax = plt.subplots(figsize=(12, 5))
sns.boxplot(x='Title', y='Fare', data=df, ax=ax)
labels = ax.get_xticklabels()
ax.set_xticklabels(labels, rotation='vertical', fontsize=15)
ax.set_yscale("log")
plt.suptitle('敬称に対する旅客運賃の箱ヒゲ図', fontsize=20)
plt.show()
```



[30]:

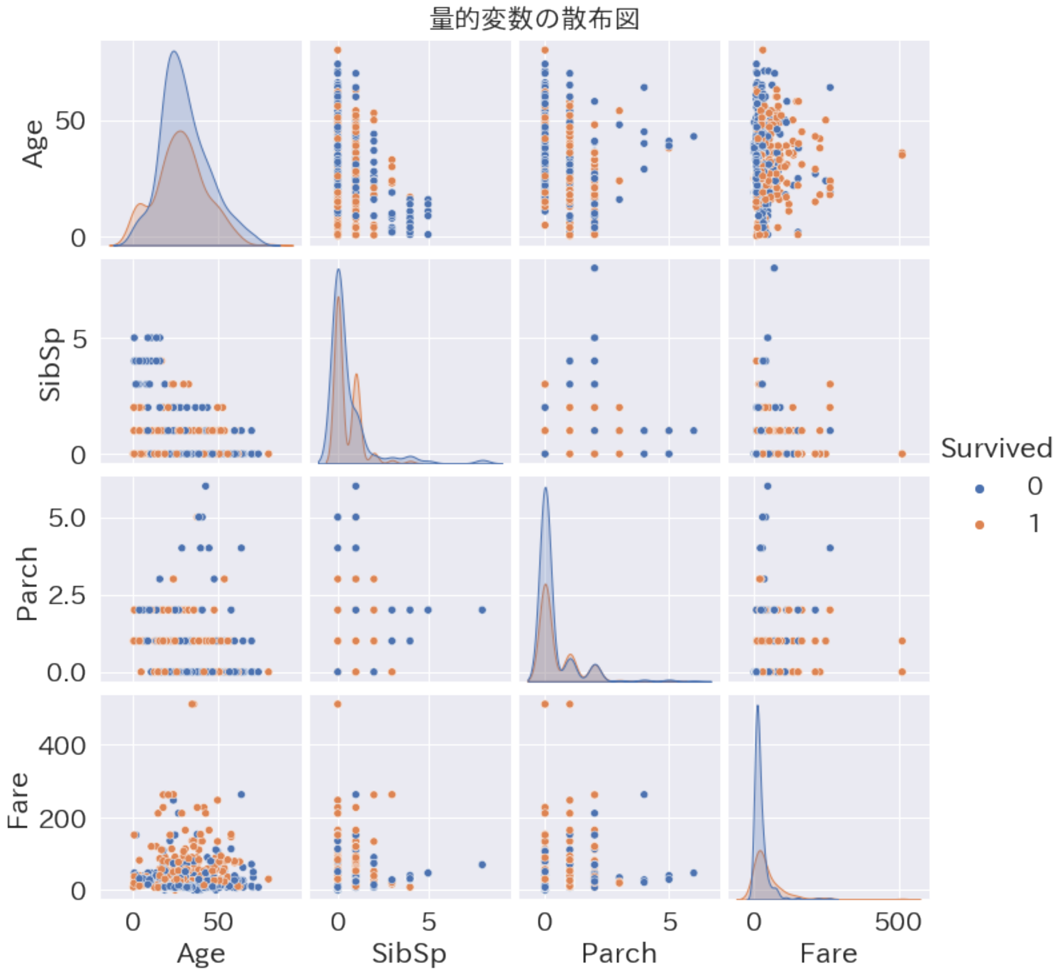
```
fig, ax = plt.subplots(figsize=(12, 5))
sns.violinplot(x='Title', y='Fare', data=df, ax=ax)
labels = ax.get_xticklabels()
ax.set_xticklabels(labels, rotation='vertical', fontsize=15)
#ax.set_yscale("log")
plt.suptitle(' 敬称に対する旅客運賃のバイオリン図', fontsize=20)
plt.show()
```



4.2.4 散布図

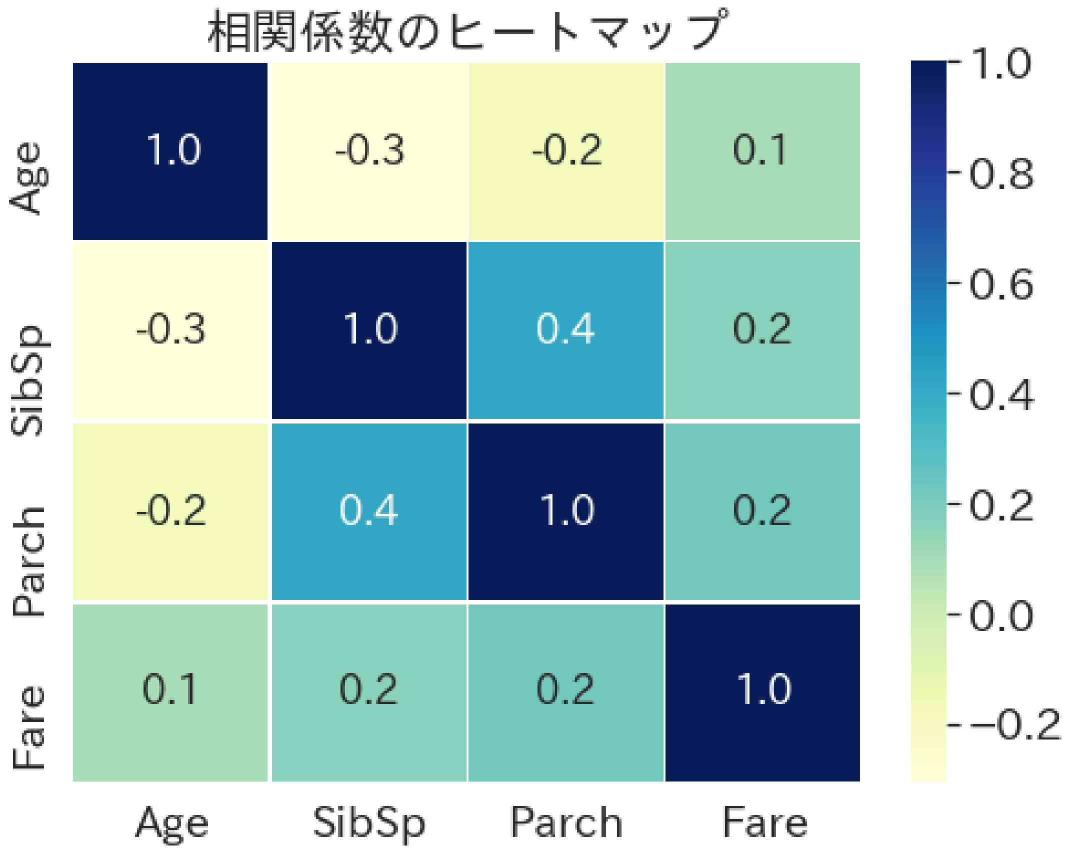
[31]:

```
sns.pairplot(df, hue="Survived", height=2.5)
plt.suptitle(' 量的変数の散布図', fontsize=20, y=1.02)
plt.show()
```



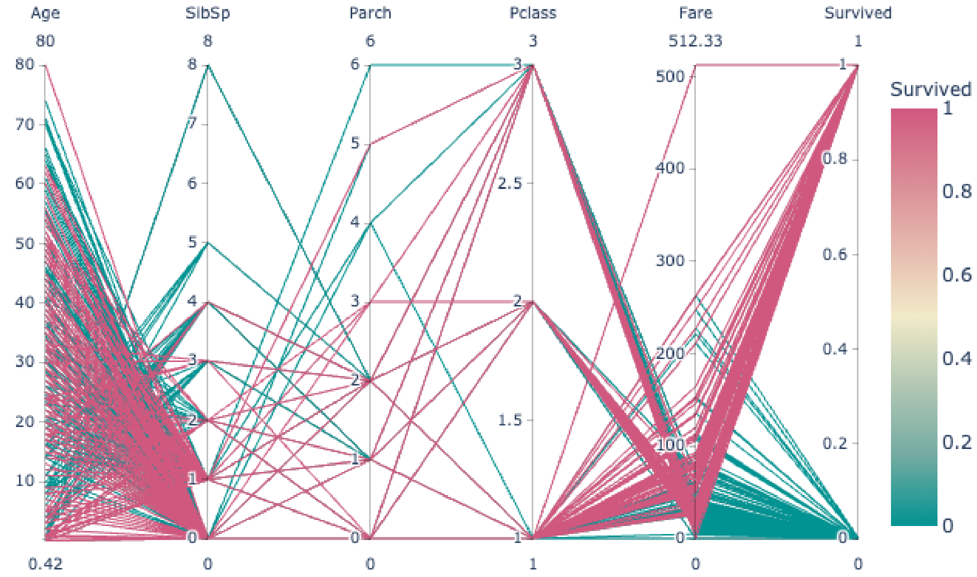
4.2.5 相関係数のヒートマップ

[32]:
```
corr = df.corr()
plt.subplots(figsize=(8, 6))
sns.heatmap(corr, linewidth=.5, annot=True, annot_kws={"size": 18}, cmap='YlGnBu', fmt='.
 ↪1f')
plt.title('相関係数のヒートマップ')
plt.show()
```



4.2.6 並行座標プロット

[33]:
```
df[['Survived', 'Pclass']] = df[['Survived', 'Pclass']].astype(int)
import plotly.express as px
fig = px.parallel_coordinates(df, color="Survived",
                              dimensions=['Age', 'SibSp', 'Parch', 'Pclass', 'Fare',␣
 ↪'Survived'],
                              color_continuous_scale=px.colors.diverging.Tealrose,
                              color_continuous_midpoint=0.5)
fig.show()
```


Age
80
0.42
80
70
60
50
40
30
20
10
SibSp
8
0
7
6
5
4
3
2
1
Parch
6
0
5
4
3
2
1
Pclass
3
1
2.5
2
1.5
Fare
512.33
0
500
400
300
200
100
Survived
1
0
0.8
0.6
0.4
0.2
Survived
1
0.8
0.6
0.4
0.2
0

参考文献

[1] Vanderbilt Biostatistics Datasets
https://hbiostat.org/data/

[2] kaggle: Titanic - Machine Learning from Disaster
https://www.kaggle.com/c/titanic

[3] seaborn
https://seaborn.pydata.org/index.html