Analysis of Titanic data

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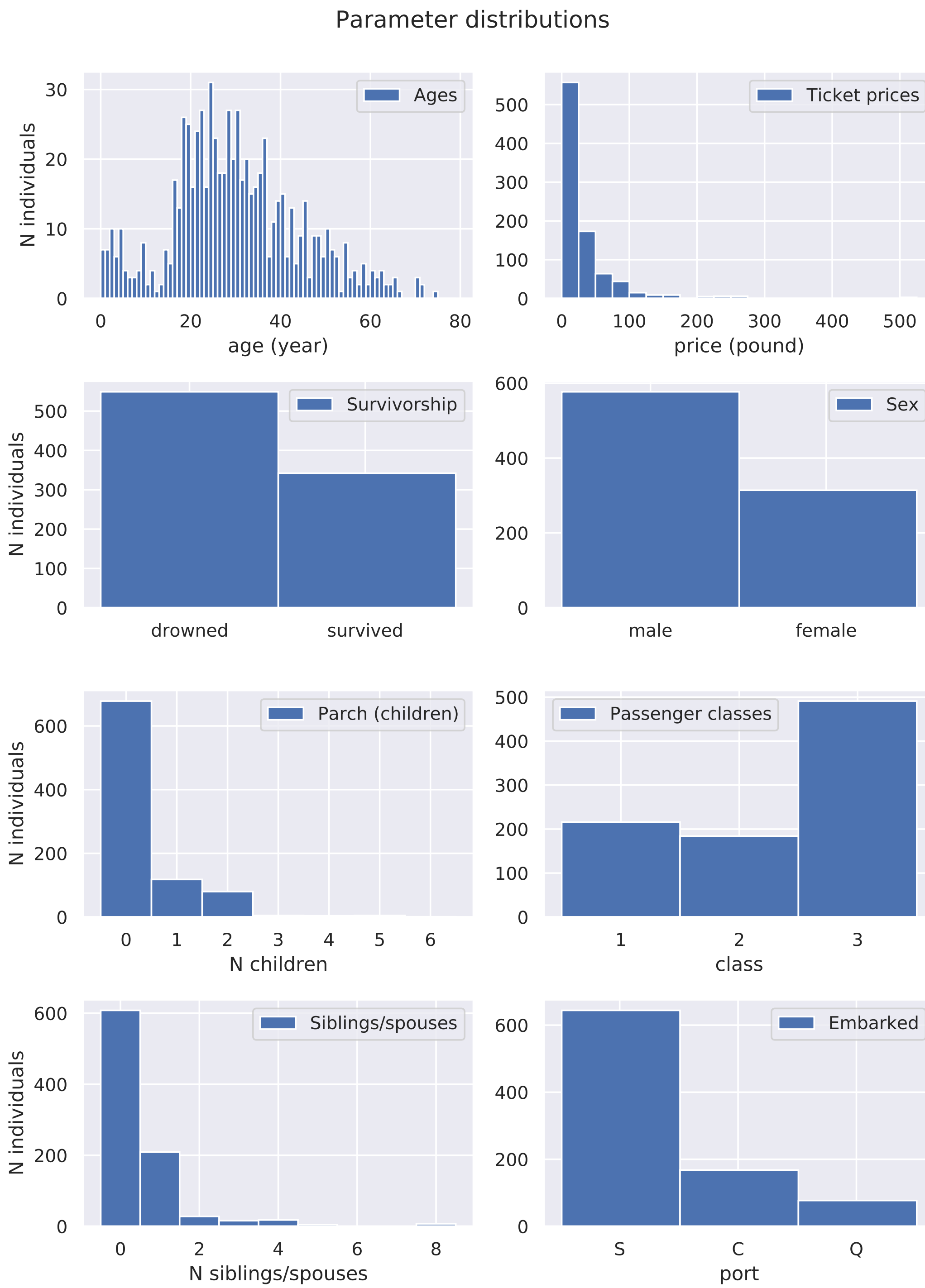
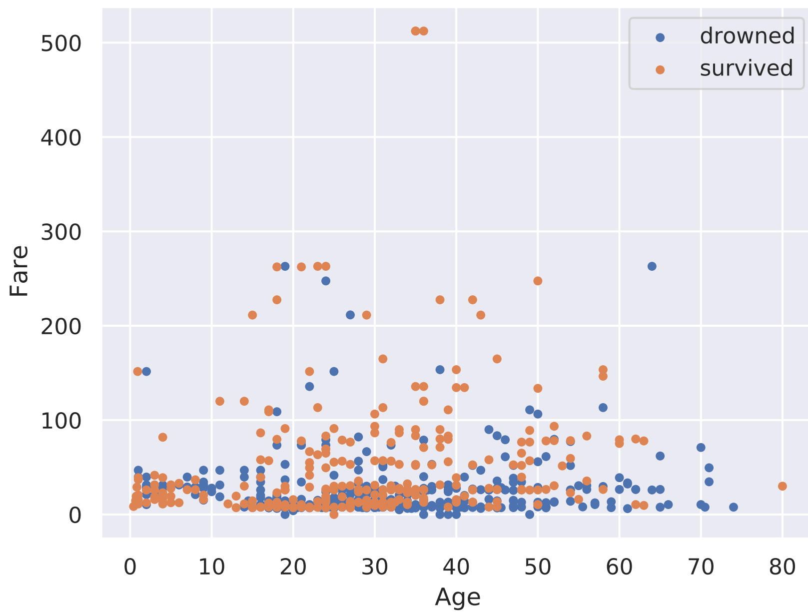
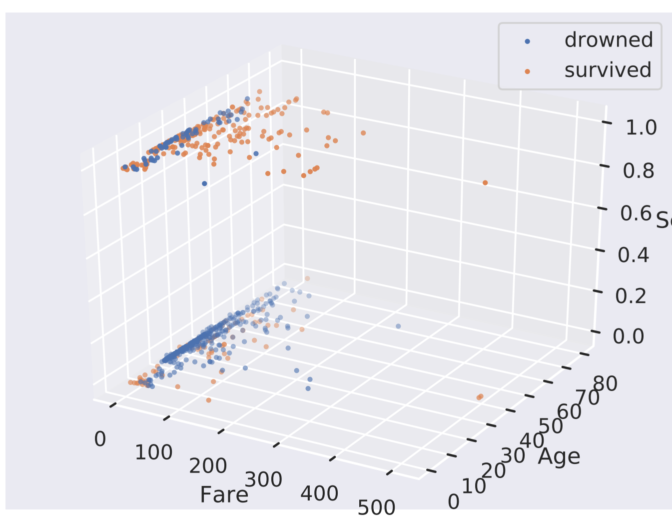

Parameter distributions
Ages
N individuals
age (year)
Ticket prices
price (pound)
Survivorship
drowned
survived
Sex
male
female
Parch (children)
N children
Passenger classes
class
Siblings/spouses
N siblings/spouses
Embarked
S
C
Q
port


drowned
survived
Fare
Age
0
100
200
300
400
500
0
10
20
30
40
50
60
70
80


drowned
survived
Sex
Age
Fare
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
50
60
70
80
0
100
200
300
400
500

Bayesian probability analysis

Let us look at which piece of data about an individual gives us most information about the likelihood of survival, given our dataset D.

For some choice of $x = 0, 1$, $y = 0, 1$, we have by Bayes rule:

$$\text{Prob}(\text{survived} = x|\text{sex} = y, D) \propto \text{Prob}(\text{sex} = y|\text{survived} = x, D) \cdot \text{Prob}(\text{survived} = x|D) \tag{1}$$

We can calculate

$$\text{Prob}(\text{survived} = x|D) = \frac{N_{\text{survived}=x}}{N_{\text{total passengers}}}, \tag{2}$$

and similarly

$$\text{Prob}(\text{sex} = y|\text{survived} = x, D) = \frac{N_{\text{survived}=x,\text{sex}=y}}{N_{\text{total survivors}}} \tag{3}$$

with the condition

$$\text{Prob}(\text{survived} = 0|\text{sex} = y, D) + \text{Prob}(\text{survived} = 1|\text{sex} = y, D) = 1 \tag{4}$$

as we only have those two options.

$$\begin{aligned} p(A, B|D) &= p(A|B, D)p(B|D) \\ p(B, A|D) &= p(B|A, D)p(A|D) \end{aligned} \tag{5}$$

and

$$p(A, B|D) = p(B, A|D) \tag{6}$$

meaning

$$p(A|B, D) = \frac{p(B|A, D)p(A|D)}{p(B|D)} \tag{7}$$

Training a neural network to predict survival