An Exploratory Look Aboard the Titanic

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Guiding Question

Which passengers will survive the sinking of the Titanic?

Secondary Questions

1. What characteristics separate those who survived from those who died?
2. What charactersistics make someone more likely to survive?
3. How do different characteristics of passengers vary with one another?

Data Overview

Looking at the training data froma bird-eye view, there are 891 observations representing passengers and 12 variables. Since some of the variable name are a little cryptic, an description for each is provided below.

Variable Name	Description
PassengerId	Unique identifier for each passenger
Survived	Binary; 1 = Survied & 0 = Died
Pclass	Socio-economic status; 1 = Upper, 2 = Middle & 3 = Lower
Name	Passenger Name
Sex	Male or Female
Age	Passenger Age
SibSp	Number of siblings or spouse aboard ship
Parch	Number of parents or children aboard ship
Ticket	Ticket Number
Fare	Amount paid for ticket
Cabin	Cabin number
Embarked	The town the passenger boarded the ship from; C = Cherbourg, Q = Queenstown & S = Southhampton

First and foremost, by running `str(training)` on the data, it is apparent that the first entries in the Cabin and Embarked columns are empty strings, indicating that the data is probably not perfectly clean (no surprises there). Checking to see where any Null's might be, it becomes clear that there are in fact no nulls, and that these spaces were intentionally left empty. In addition to null values, all the NA's are in the Age column; both of hese will need to be imputed intelligently when the time to create a predictive model comes around.

Table 2: Null & NA Counts

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
Null Count	0	0	0	0	0	0	0	0	0	0	0	0
NA Count	0	0	0	0	0	177	0	0	0	0	0	0

Data Cleaning

All the NA's in the data set are in the Age column. The column is close to 20% NA's so building a model on that variable won't be the best idea.

```
## [1] "19.87%"
```

2 Bayesian Survival

2.2 Does Money Sink or Swim?

Illustrating Bayes Theorem with Survival Rates and Socio-Economic Status

By creating a table with the Pclass and Survived variables, I can get a good sense of the number of passengers that lived and died, based on their Socio-Economic Status (SES). Simple summation and division returns the probabilites of a passenger living given their respective SES.

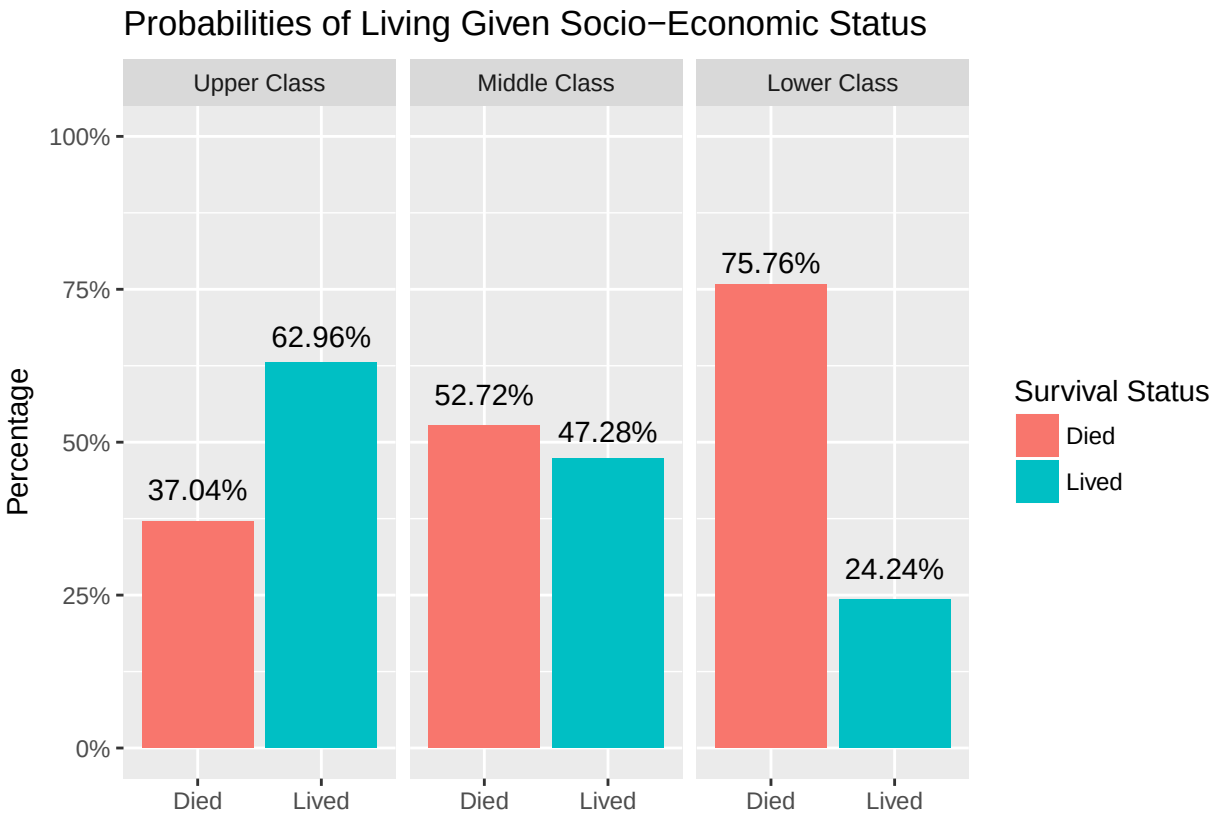
```
##          Pclass
## Survived   1   2   3
##        0  80  97 372
##        1 136  87 119
```

```
## [1] "62.96%"
```

```
## [1] "47.28%"
```

```
## [1] "24.24%"
```

The same information can be displayed visually as follows.



For a simple proof of Bayes Theorem, defined as...

$$P(A|B) \ = \ \frac{P(B|A)P(A)}{P(B)}$$

...I can set **P(A) = the probability of a passenger belonging to a defined SES (X)** and **P(B) = the probability of a passenger living**. I can now rewrite the previously defined Theorm using my definitions as:

$$P(\ "X\ class\ citizen"\ |\ "Lived"\ ) \ = \ \frac{P(\ "Lived"\ |\ "X\ class\ citizen"\ )\ P(\ "X\ class\ citizen"\ )}{(\ "Lived"\ )}$$

Now that I have found both **P("X class citizen")** (objects upper_prob, middle_prob and lower_prob) and **P("Lived")** (object prob_lived), and I have **P("Lived"|"X class ctiizen")** (objects upper_class, middle_class and lower_class), I can solve for **P("X class citizen"|"Lived")**...

P("Upper class citizen" | "Lived") = upper_class X upper_prob

prop_lived

P("Middle class citizen" | "Lived") = middle_class X middle_prob

prop_lived

P("Lower class citizen" | "Lived") = lower_class X lower_prob

prop_lived

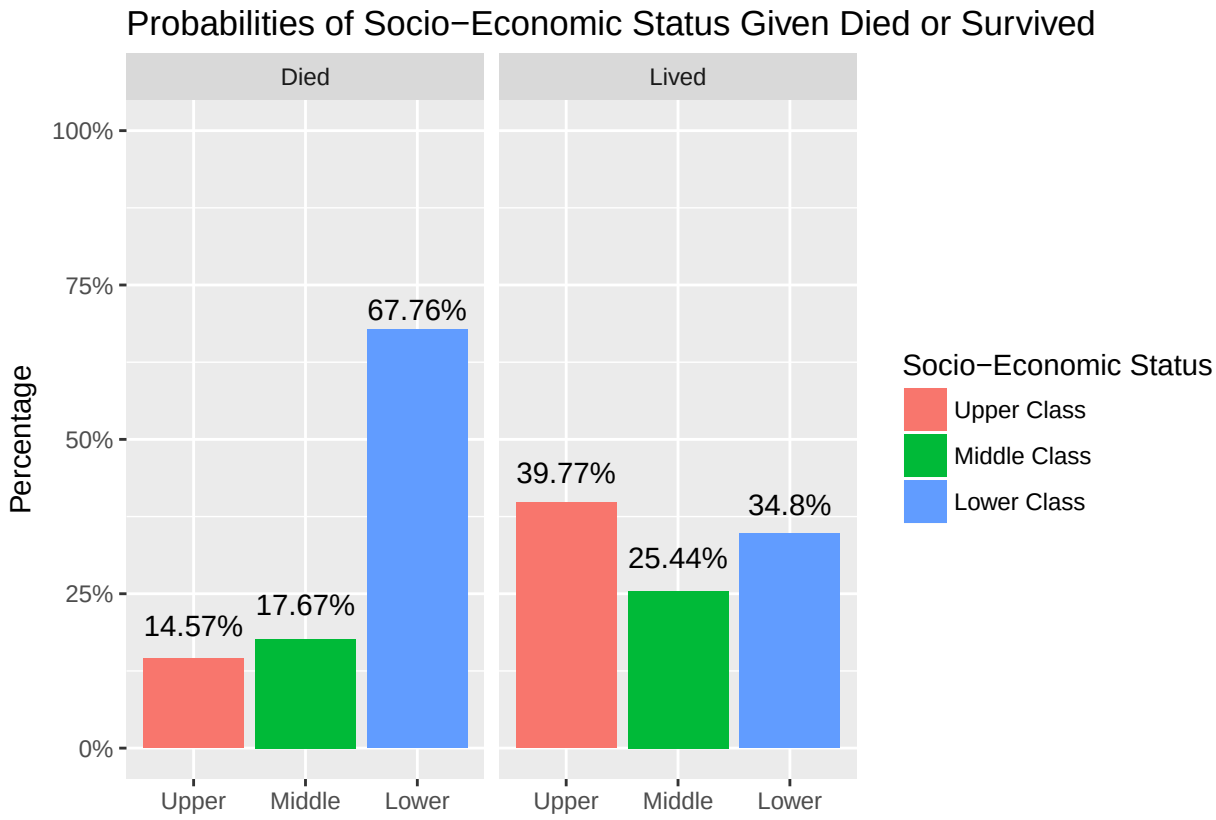
The "shorthand" way of finding these probabilites can be accomplished by dividing the the number of X class passengers that lived by the total number of passengers that lived using the pclass_table.

```
## [1] TRUE
```

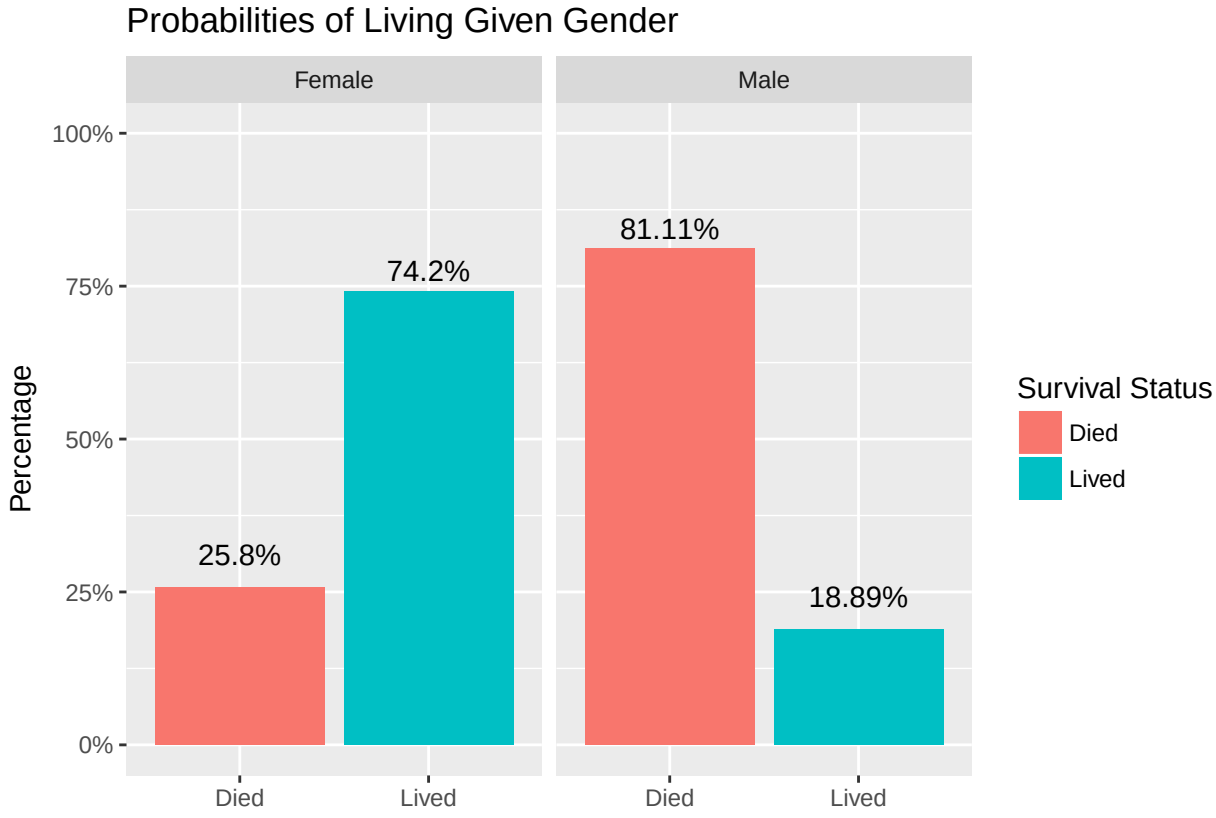
```
## [1] TRUE
```

```
## [1] TRUE
```

A graphic illustrating said results.



Using the same code as above, with a few minor adjustments I can make similar graphs with other qualitative variables, such as the sex of the passenger.



3 Cabin Classification

It seems logical that looking at *where* each passenger was when the Titanic started sinking could provide some insight as to why some lived and others did not. The "Sinking" section on the Titanic Wikipedia Page states that the iceberg was struck at 11:40 pm. Considering the time of night, combined with the likely cold air temperature, I think it is safe to say that most passengers were inside, if not in their rooms sleeping.

Finding out where each passenger was will be a two fold process:

1. Subsetting on the Deck they were on, noted by the letter in the Cabin column.
2. Subsetting where on that deck they were, noted by the number in the Cabin column.

An important note is that the vast majority of the passengers did not have an entry in the Cabin column. (There aren't any NA's, the entries are not even filled with spaces, they are simply "nothing"). In order to subset these observations, I used the ouput from a "nothing" observation in the logical statement.

After subsetting, summing the number of rows in each subset, *which should equal 891, the total number of observations,* returns 894. A little searching led to finding the duplicates, show below.

```
## [1] 894
```

```
##     PassengerId Survived Pclass                                          Name
## 76           76        0      3                      Moen, Mr. Sigurd Hansen
## 129         129        1      3                           Peter, Miss. Anna
## 700         700        0      3   Humblen, Mr. Adolf Mathias Nicolai Olsen
## 716         716        0      3 Soholt, Mr. Peter Andreas Lauritz Andersen
##        Sex Age SibSp Parch Ticket    Fare Cabin Embarked
## 76    male  25     0     0 348123  7.6500 F G73        S
## 129 female  NA     1     1   2668 22.3583 F E69        C
## 700   male  42     0     0 348121  7.6500 F G63        S
## 716   male  19     0     0 348124  7.6500 F G73        S
```

```
##     PassengerId Survived Pclass
## 129         129        1      3
## 356         356        0      3
## 398         398        0      2
## 407         407        0      3
## 477         477        0      2
## 534         534        1      3
## 681         681        0      3
## 716         716        0      3
## 727         727        1      2
## 844         844        0      3
## 858         858        1      1
## 861         861        0      3
##                                           Name    Sex  Age SibSp Parch
## 129                          Peter, Miss. Anna female   NA     1     1
## 356                 Vanden Steen, Mr. Leo Peter   male 28.0     0     0
## 398                     McKane, Mr. Peter David   male 46.0     0     0
## 407            Widegren, Mr. Carl/Charles Peter   male 51.0     0     0
## 477                     Renouf, Mr. Peter Henry   male 34.0     1     0
## 534      Peter, Mrs. Catherine (Catherine Rizk) female   NA     0     2
## 681                          Peters, Miss. Katie female   NA     0     0
## 716  Soholt, Mr. Peter Andreas Lauritz Andersen   male 19.0     0     0
## 727 Renouf, Mrs. Peter Henry (Lillian Jefferys) female 30.0     3     0
## 844                 Lemberopolous, Mr. Peter L   male 34.5     0     0
## 858                     Daly, Mr. Peter Denis    male 51.0     0     0
```

```
## 861                     Hansen, Mr. Claus Peter   male 41.0     2     0
##     Ticket    Fare Cabin Embarked
## 129   2668 22.3583 F E69        C
## 356 345783  9.5000              S
## 398  28403 26.0000              S
## 407 347064  7.7500              S
## 477  31027 21.0000              S
## 534   2668 22.3583              C
## 681 330935  8.1375              Q
## 716 348124  7.6500 F G73        S
## 727  31027 21.0000              S
## 844   2683  6.4375              C
## 858 113055 26.5500   E17        S
## 861 350026 14.1083              S
```

To decide which subset to assign these observations too, looking at the Embarked and Ticket columns for those observations in the g_class subset, I can see that everyone in this cabin class embarked from Southampton and had similar ticket

```
##         1
## 0.4666667
```

```
##         1
## 0.7446809
```

```
##         1
## 0.5932203
```

```
##         1
## 0.7575758
```

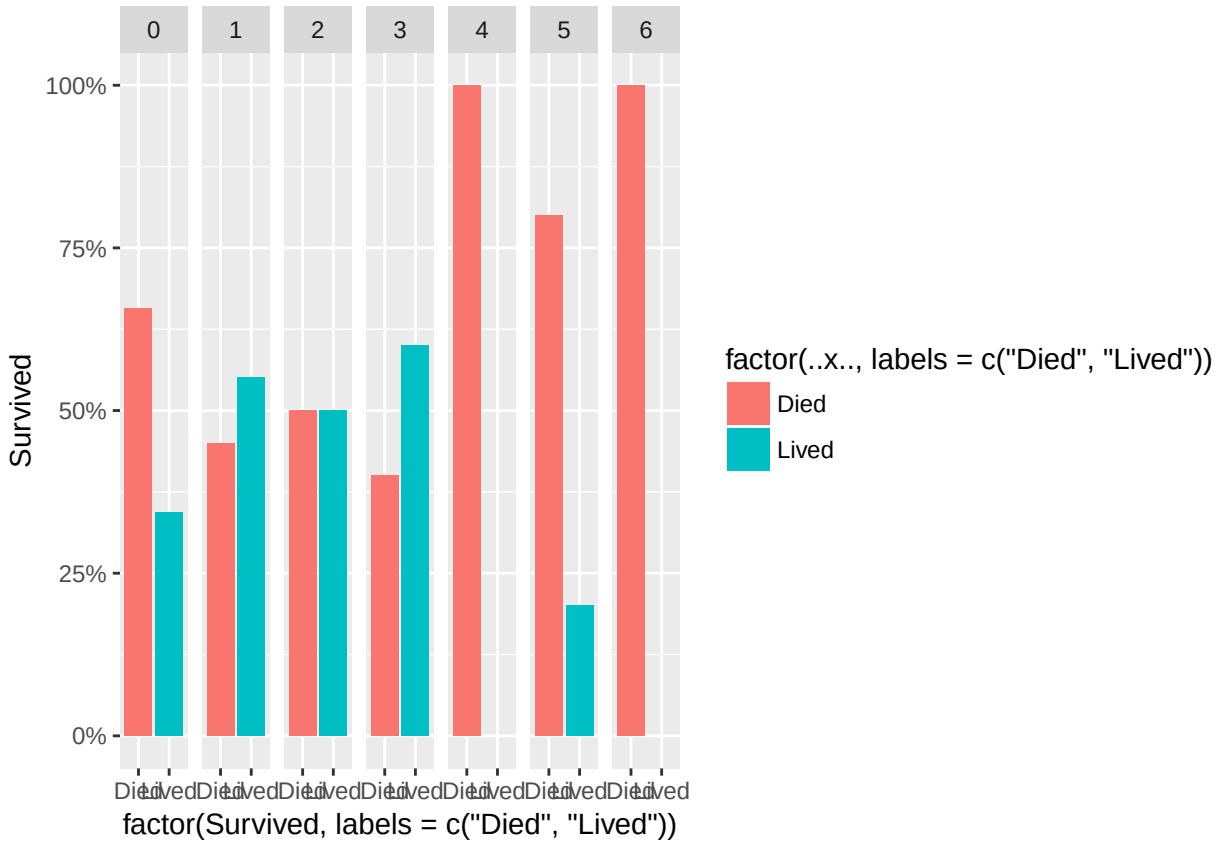
```
##         1
## 0.7575758
```

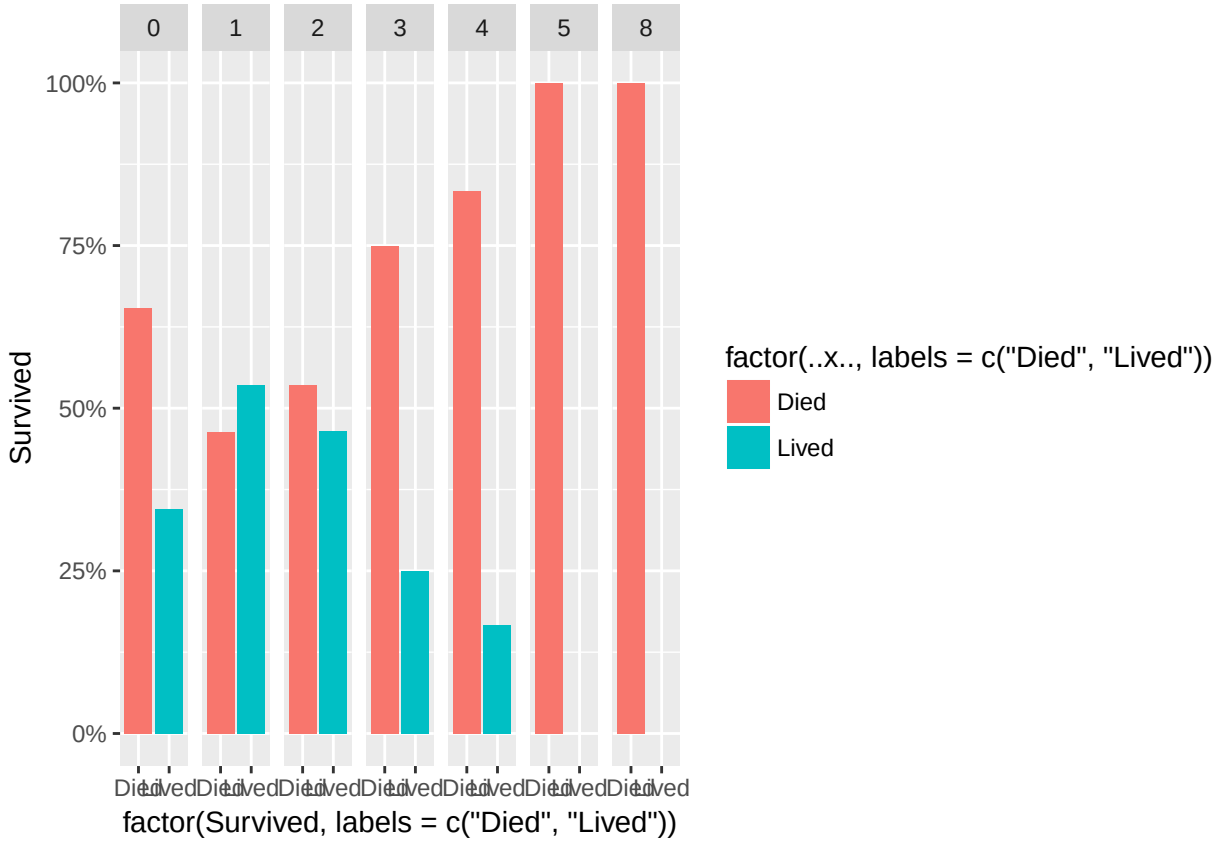
```
##         1
## 0.6153846
```

```
##         1
## 0.2857143
```

```
##         1
## 0.2998544
```

```
##
##       0   1
##   0 445 233
##   1  53  65
##   2  40  40
##   3   2   3
##   4   4   0
##   5   4   1
##   6   1   0
```


0
1
2
3
4
5
6
100%
75%
50%
25%
0%
Survived
Died
Lived
factor(Survived, labels = c("Died", "Lived"))
factor(..x.., labels = c("Died", "Lived"))
Died
Lived


0
1
2
3
4
5
8
100%
75%
50%
25%
0%
Survived
Died
Lived
factor(Survived, labels = c("Died", "Lived"))
factor(..x.., labels = c("Died", "Lived"))
Died
Lived