Worksheet 02

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Topics

- Effective Programming

Effective Programming

a) What is a drawback of the top down approach?

No runable code until the end.

b) What is a drawback of the bottom up approach?

Requires much more planning. Risk wasting a lot of time, making code that you don't end up needing.

c) What are 3 things you can do to have a better debugging experience?

0. Don't Panic
1. Read the error message
2. Re-read the code and understand it, trace the code
3. Sanity check, is everything set up properly
4. Ask the internet

d) (Optional) Follow along with the live coding. You can write your code here:

In [26]:

```
# 8 Queen Puzzle

class Board:

    def __init__(self):
        self.board = [["" for _ in range(8)] for _ in range(8)]

    def __repr__(self):
        res = ""
        for row in range(len(self.board)):
            for col in range(len(self.board)):
                res += self.board[row][col]
                res += " | "
            res += "\n"
        return res

    def set_queen_at(self, row, col):
        self.board[row][col] = "Q"

    def unset_queen_at(self, row):
        self.board[row] = ["" for _ in range(len(self.board))]

    def is_valid_move(self):
        return true

    def find_solution(self):
        row = 0
        col = 0

        while row < len(self.board):
            if self.is_valid_move(row, col): #Implement
                self.set_queen_at(row, col)
                row += 1
                col = 0
            else:
                col += 1
                if col >= 8:
                    # Can't place a queen on this row, so backtrack
                    col = self.get_queen_on_row(row-1) # Implement
                    col += 1

test = Board()
test.set_queen_at(1,1)
```

```
# test.unset_queen_at(1)
print(test)
```

```
 |  |  |  |  |  |  |  |
 | Q |  |  |  |  |  |  |
 |  |  |  |  |  |  |  |
 |  |  |  |  |  |  |  |
 |  |  |  |  |  |  |  |
 |  |  |  |  |  |  |  |
 |  |  |  |  |  |  |  |
 |  |  |  |  |  |  |  |
```

Exercise

This exercise will use the Titanic dataset (https://www.kaggle.com/c/titanic/data) (https://www.kaggle.com/c/titanic/data (https://www.kaggle.com/c/titanic/data)). Download the file named `train.csv` and place it in the same folder as this notebook.

The goal of this exercise is to practice using pandas (https://pypi.org/project/pandas/) methods. If your:

1. code is taking a long time to run
2. code involves for loops or while loops
3. code spans multiple lines

look through the pandas documentation for alternatives. This cheat sheet (https://pandas.pydata.org/Pandas_Cheat_Sheet.pdf) may come in handy.

a) Complete the code below to read in a filepath to the `train.csv` and returns the DataFrame.

In [11]:

```
import pandas as pd

df = pd.read_csv("train.csv")
df.describe()
```

Out[11]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

b) Complete the code so it returns the number of rows that have at least one empty column value

In [13]:

```
# print(str(df.isnull().sum()))

empty_rows = str(df.isnull().any(axis = "columns").sum())
print(empty_rows)
```

```
708
```

c) Complete the code below to remove all columns with more than 200 NaN values

In [14]:

```
df = df.dropna(axis = 1, thresh = len(df) - 200)
df.columns
```

Out[14]:

```
Index(['PassengerId', 'Survived', 'Pclass', 'Name', 'Sex', 'Age', 'SibSp',
       'Parch', 'Ticket', 'Fare', 'Embarked'],
      dtype='object')
```

d) Complete the code below to replaces `male` with 0 and `female` with 1

In [16]:

```
df['Sex'] = df.apply(lambda x : 0 if x["Sex"] == "male" else 1, axis = 1)
df.head()
```

Out[16]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarked
0	1	0	3	Braund, Mr. Owen Harris	0	22.0	1	0	A/5 21171	7.2500	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	1	38.0	1	0	PC 17599	71.2833	C
2	3	1	3	Heikkinen, Miss. Laina	1	26.0	0	0	STON/O2. 3101282	7.9250	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	1	35.0	1	0	113803	53.1000	S
4	5	0	3	Allen, Mr. William Henry	0	35.0	0	0	373450	8.0500	S

e) Complete the code below to add four columns `First Name` , `Middle Name` , `Last Name` , and `Title` corresponding to the value in the `name` column.

For example: `Braund, Mr. Owen Harris` would be:

First Name	Middle Name	Last Name	Title
Owen	Harris	Braund	Mr

Anything not clearly one of the above 4 categories can be ignored.

In [41]:

```python
name_array = df["Name"].str.split(pat = " ")
last_name = name_array[2][0]
# df[['First Name', 'Middle Name', 'Last Name', 'Title']] = df["Name"].str.split(pat = " ")
# df.head()
print(name_array)
print(last_name)
```

```
0                            [Braund,, Mr., Owen, Harris]
1       [Cumings,, Mrs., John, Bradley, (Florence, Bri...
2                              [Heikkinen,, Miss., Laina]
3       [Futrelle,, Mrs., Jacques, Heath, (Lily, May, ...
4                           [Allen,, Mr., William, Henry]
                              ...                        
886                              [Montvila,, Rev., Juozas]
887                     [Graham,, Miss., Margaret, Edith]
888        [Johnston,, Miss., Catherine, Helen, "Carrie"]
889                            [Behr,, Mr., Karl, Howell]
890                               [Dooley,, Mr., Patrick]
Name: Name, Length: 891, dtype: object
Heikkinen,
```

f) Complete the code below to replace all missing ages with the average age

In [17]:

```python
df['Age'] = df["Age"].fillna(df['Age'].mean())
df.head()
```

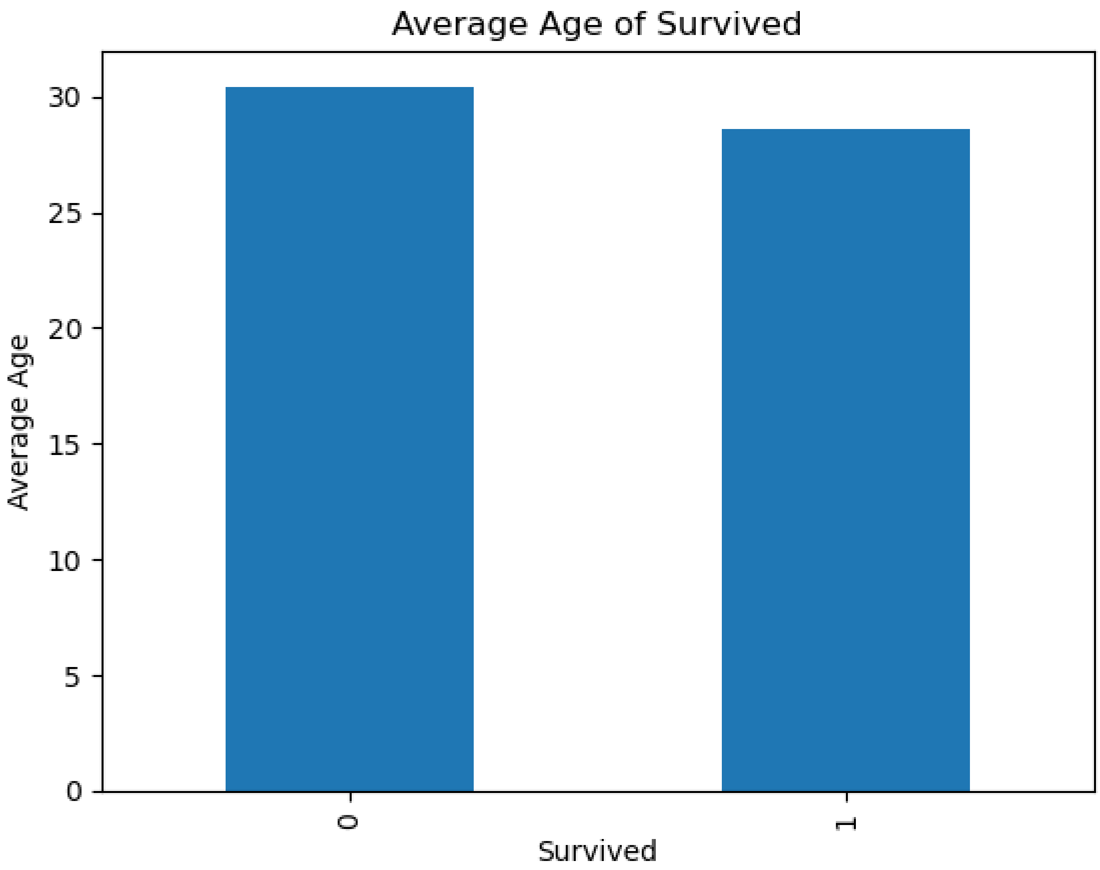
Out[17]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarked
0	1	0	3	Braund, Mr. Owen Harris	0	22.0	1	0	A/5 21171	7.2500	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	1	38.0	1	0	PC 17599	71.2833	C
2	3	1	3	Heikkinen, Miss. Laina	1	26.0	0	0	STON/O2. 3101282	7.9250	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	1	35.0	1	0	113803	53.1000	S
4	5	0	3	Allen, Mr. William Henry	0	35.0	0	0	373450	8.0500	S

g) Plot a bar chart of the average age of those that survived and did not survive. Briefly comment on what you observe.

In [18]:
```
avg = df.groupby("Survived")["Age"].mean()
avg.plot(kind="bar", title = "Average Age of Survived", xlabel = "Survived", ylabel = "Average Age")
```

Out[18]:
```
<AxesSubplot:title={'center':'Average Age of Survived'}, xlabel='Survived', ylabel='Average Age'>
```



In [20]:
```
# Seems like the average age of the survivors is younger than the average of the deceased.
```

In [ ]:
```
```