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Exercise Set 15: Matplotlib

Medrano, Giovanni

R11521018

ENGR 1330 ES-15 - Homework

In [1]:
```
# Preamble script block to identify host, user, and kernel
import sys
! hostname
! whoami
print(sys.executable)
print(sys.version)
print(sys.version_info)
! pwd
```

```
DESKTOP-6HAS1BN
desktop-6has1bn\medra
C:\Users\medra\anaconda3\python.exe
3.8.5 (default, Sep  3 2020, 21:29:08) [MSC v.1916 64 bit (AMD64)]
sys.version_info(major=3, minor=8, micro=5, releaselevel='final', serial=0)
/c/Users/medra/Desktop/ENGR 1330 Summer 2 Jupyter Files/Lab15
```

In [2]:
```
# Import dependencies!

import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

Line Plots

Exercise 1

The table below contains experimental observations.

Elapsed Time (s)	Speed (m/s)
0	0
1.01	3
2.07	7
3.3	12
4.2	20
5.3	30
6.1	45.6

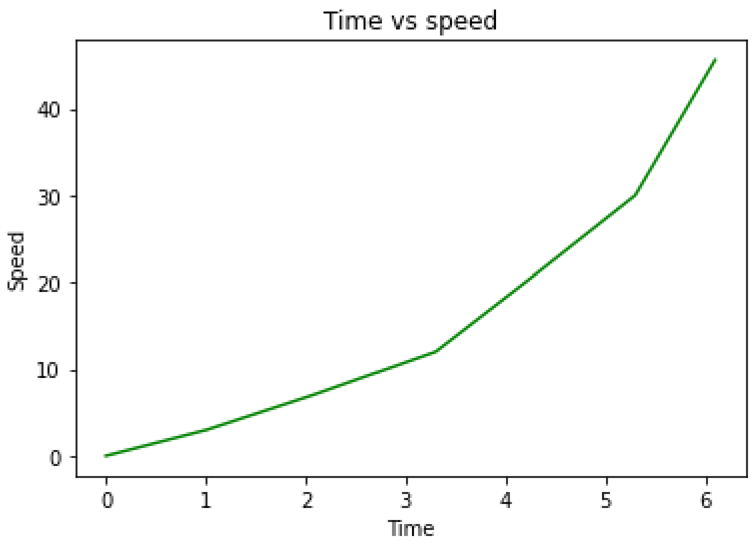
Plot the speed vs time (speed on y-axis, time on x-axis) using a line plot. From examination of the plot, estimate the speed at time t = 5.0 (eyeball estimate)

In [15]:
```
# Create two lists; time  and speed

time = [0,1.01,2.07,3.3,4.2,5.3,6.1]
speed = [0,3,7,12,20,30,45.6]
data = {'Time': time, 'Speed' : speed}
print(data)
```

```
{'Time': [0, 1.01, 2.07, 3.3, 4.2, 5.3, 6.1], 'Speed': [0, 3, 7, 12, 20, 30, 45.6]}
```

In [24]:
```
# Create a line chart of speed on y axis and time on x axis
df = pd.DataFrame(data)
print(df.head(6))

speed=df['Speed'].tolist()
time=df['Time'].tolist()

plt.xlabel("Time")
plt.title("Time vs speed")
plt.ylabel("Speed")
plt.plot(time,speed ,color='green')
plt.show()

# Estimate:
print('The speed at time t= 5 is', speed[4],'m/s')
```

```
   Time  Speed
0  0.00    0.0
1  1.01    3.0
2  2.07    7.0
3  3.30   12.0
4  4.20   20.0
5  5.30   30.0
```



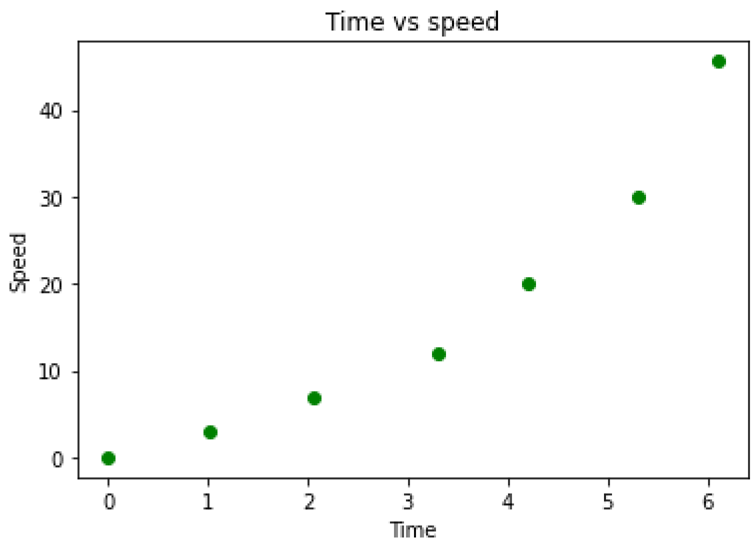
```
The speed at time t= 5 is 20.0 m/s
```

Exercise 2

Using the same series from Exercise 1, Plot the speed vs time (speed on y-axis, time on x-axis) using a scatter plot. From examination of the plot, estimate the speed at time t = 2.0 (eyeball estimate)

In [23]:
```
# Create a scatterplot chart
df = pd.DataFrame(data)
print(df.head(6))

speed=df['Speed'].tolist()
time=df['Time'].tolist()

plt.xlabel("Time")
plt.title("Time vs speed")
plt.ylabel("Speed")
plt.scatter(time,speed ,color='green')
plt.show()

# Estimate:
print('The speed at time t= 2 is', speed[1],'m/s')
```

```
   Time  Speed
0  0.00    0.0
1  1.01    3.0
2  2.07    7.0
3  3.30   12.0
4  4.20   20.0
5  5.30   30.0
```



```
The speed at time t= 2 is 3.0
```

Exercise 3

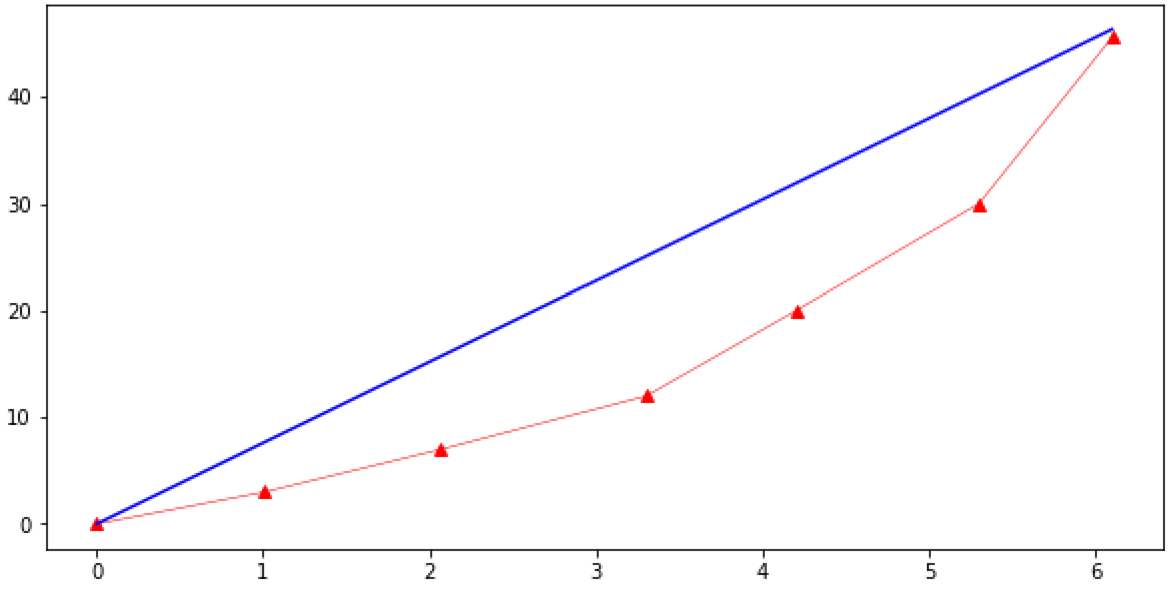
Using the same series from Exercise 1, Plot the speed vs time (speed on y-axis, time on x-axis) using a line plot. Plot a second line based on the linear model

$$y = mx + b$$

where

$$b=0~\text{and}~m=7.6$$

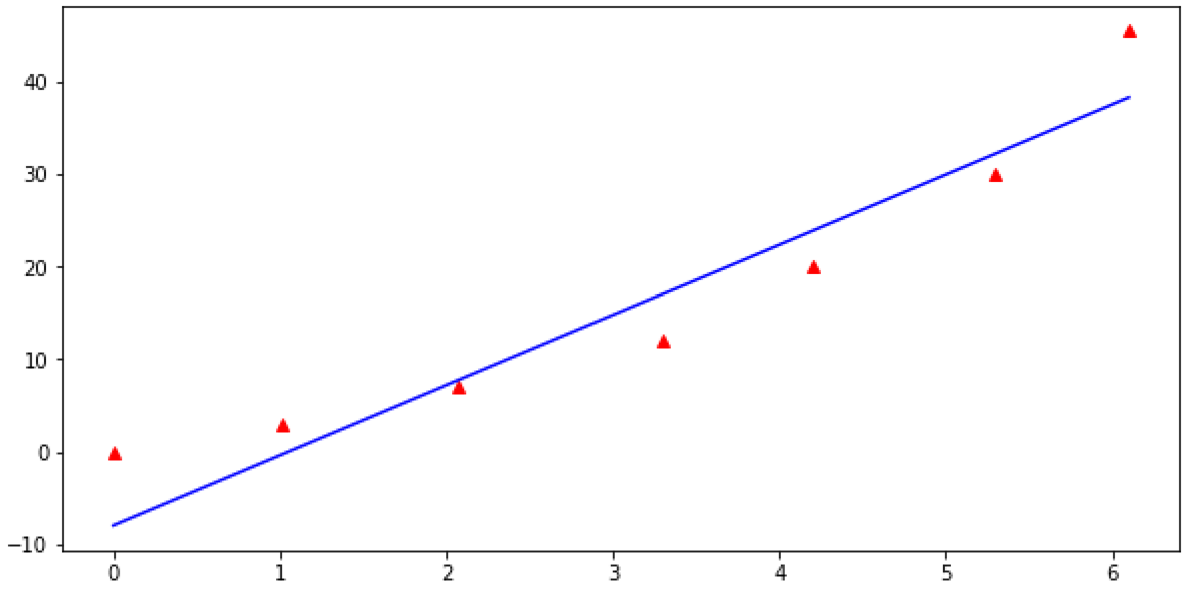
In [25]:
```
# Code and run your solution here:
def ymodel(xmodel,slope,intercept):
    ymodel = slope*xmodel+intercept
    return(ymodel)

yseries = []
slope = 7.6
intercept = 0.0

for i in range(0,len(time)):
    yseries.append(ymodel(time[i],slope,intercept))
# Create a markers only line chart
mydata = plt.figure(figsize = (10,5)) # build a square drawing canvass from figure clas
plt.plot(time, speed, c='red', marker='^',linewidth=0.5) # basic line plot
plt.plot(time, yseries, c='blue')
plt.show()
```



Exercise 4

Using trial and error try to improve the 'fit' of the model, by adjusting values of $$m~\text{and}~b$$.

In [26]:
```
# Code and run your solution here:
yseries = []
slope = 7.6
intercept = -8.0

for i in range(0,len(time)):
    yseries.append(ymodel(time[i],slope,intercept))
# Create a markers only line chart
mydata = plt.figure(figsize = (10,5)) # build a square drawing canvass from figure clas
plt.plot(time, speed, c='red', marker='^',linewidth=0) # basic scatter plot
plt.plot(time, yseries, c='blue')
plt.show()
```



Exercise 5

Use pandas to read a dataframe from the file `http://54.243.252.9/engr-1330-webroot/8-Labs/Lab15/census_18.csv` . Then produce a line plot of the counts by age for the 2010 census, x-axis will be the series `age` , y-axis will be the census values for `2010` .

In [27]:
```
######### CODE TO AUTOMATICALLY DOWNLOAD THE DATABASE ################
import requests # import needed modules to interact with the internet
# make the connection to the remote file (actually its implementing "bash curl -O http:/
remote_url = 'http://54.243.252.9/engr-1330-webroot/8-Labs/Lab15/census_18.csv' # a csv
response = requests.get(remote_url) # Gets the file contents puts into an object
output = open('census_18.csv', 'wb') # Prepare a destination, local
output.write(response.content) # write contents of object to named local file
output.close() # close the connection
```

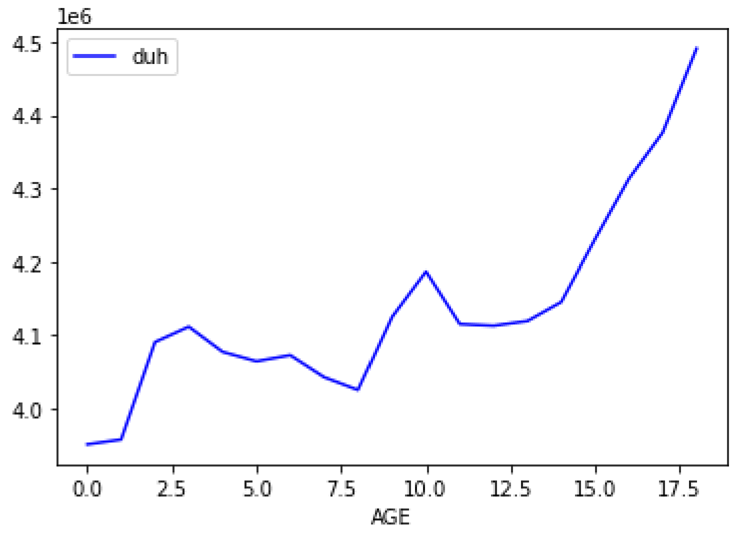
In [29]:
```
# Code and run your file read here
df = pd.read_csv('census_18.csv')
df.head()
```

Out[29]:

	AGE	2010	2014
0	0	3951330	3949775
1	1	3957888	3949776
2	2	4090862	3959664
3	3	4111920	4007079
4	4	4077551	4005716

In [30]:
```
# Code and run your plot here
df.plot.line(x="AGE", y="2010", label="duh", c="blue")
```

Out[30]:
```
<AxesSubplot:xlabel='AGE'>
```

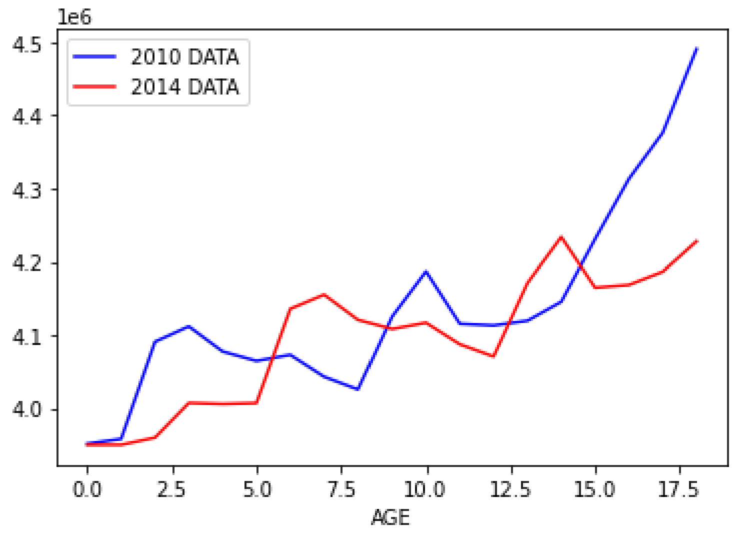


Exercise 6

Using your dataframe from exercise 5, plot both the 2010 and 2014 census values by age. Plot the 2010 distribution in blue and the 2014 distribution in red.

```
In [31]:
# Code and run your plot here
ax = df.plot.line(x="AGE", y="2010", label="2010 DATA", c="blue") # fill in the paramet
df.plot.line(x="AGE", y="2014", label="2014 DATA", c="red", ax=ax)
```

```
Out[31]: <AxesSubplot:xlabel='AGE'>
```



Bar Charts

Exercise 7

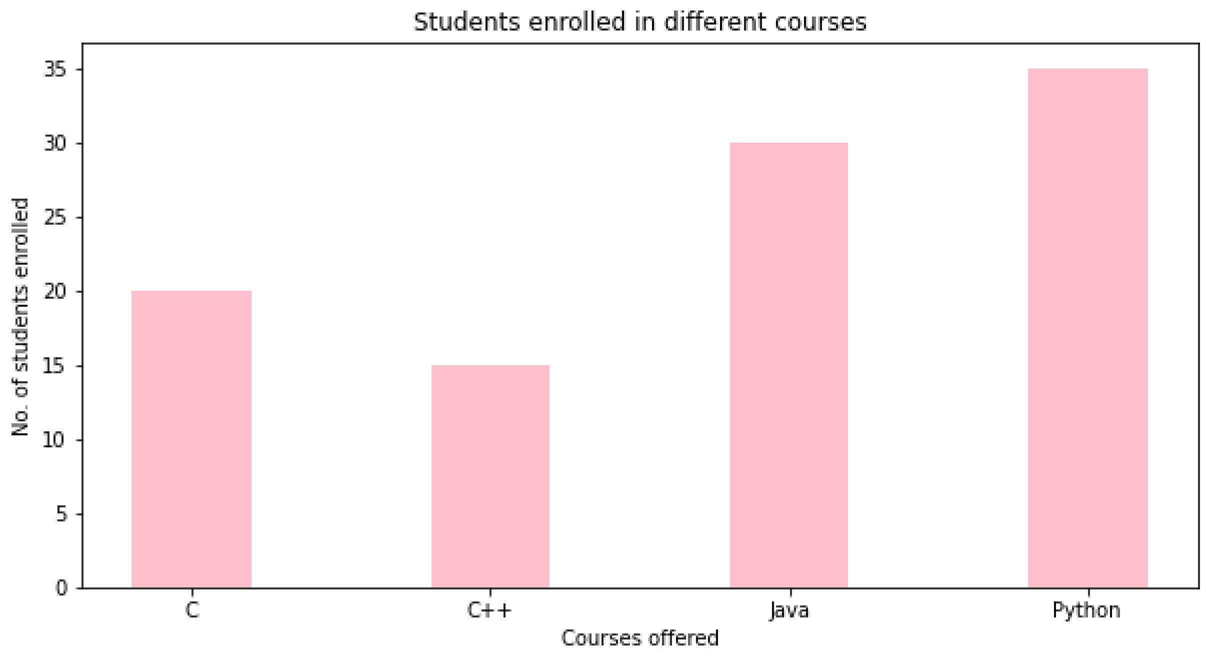
Consider the data set "data" defined as

```
data = {'C':20, 'C++':15, 'Java':30, 'Python':35}
```

which lists student count by programming language in some school.

Produce a bar chart of number of students in each language, where language is the classification, and student count is the variable.

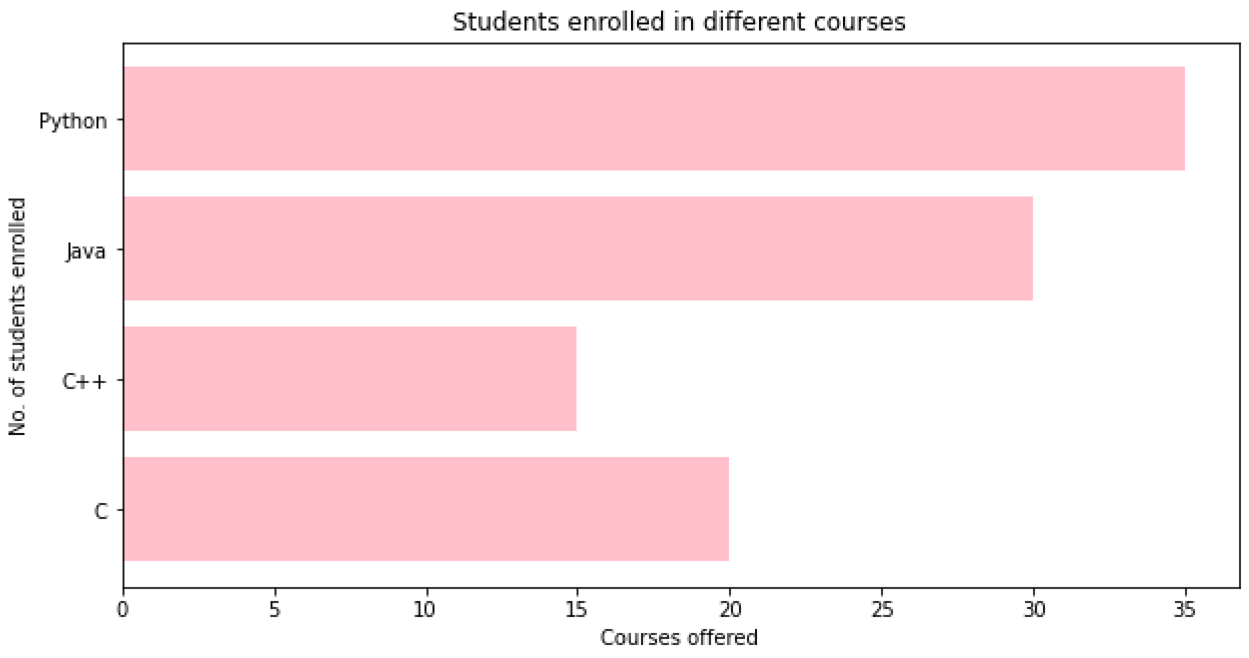
In [33]:
```
# Code and run your solution here

import numpy as np
import matplotlib.pyplot as plt


# creating the dataset
data = {'C':20, 'C++':15, 'Java':30,
        'Python':35}
courses = list(data.keys())
values = list(data.values())

fig = plt.figure(figsize = (10, 5))

# creating the bar plot
plt.bar(courses, values, color ='pink',
        width = 0.4)

plt.xlabel("Courses offered")
plt.ylabel("No. of students enrolled")
plt.title("Students enrolled in different courses")
plt.show()
```



Exercise 8

Repeat Exercise 7 but use a horizontal bar chart.

In [36]:
```
# Code and run your solution here
data = {'C':20, 'C++':15, 'Java':30,
        'Python':35}
courses = list(data.keys())
values = list(data.values())

fig = plt.figure(figsize = (10, 5))

# creating the bar plot
plt.barh(courses, values, color ='pink')

plt.xlabel("Courses offered")
plt.ylabel("No. of students enrolled")
plt.title("Students enrolled in different courses")
plt.show()
```



In [ ]: