Matplotlib tutorial

Outlines

- What is Matplotlib?
- Matplotlib installation
- Plot
- Format string in plot option
- Scale factor
- Legend
- Bar chart
- Histogram
- Pie chart
- Save chart to a file
- Subplot

What is Matplotlib?

Matplotlib is a python 2D plotting library that is used for data visulaization. Matplotlib makes easy things easy and hard things possible. [Click here for more information (https://matplotlib.org/)](https://matplotlib.org/)

Why we need data visualization?

Human brain process image better than text specially with big data.

Matplotlib installation

There are two ways to install matplotlib:

1. After installing python, from start type cmd. Then in your cmd type
   pip install matplotlib
2. The second way is that first install anaconda and run matplotlib from it.
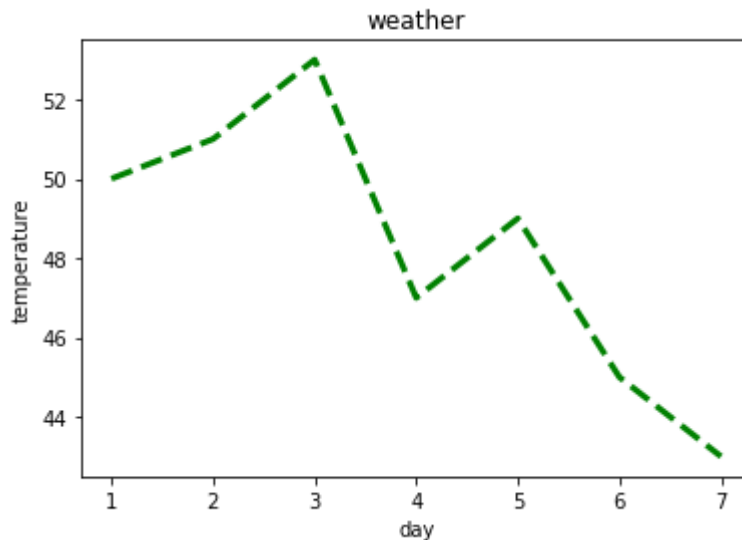
Plot

```
In [1]: import matplotlib.pyplot as plt
        %matplotlib inline
```

```
In [2]: x=[1,2,3,4,5,6,7]
        y=[50,51,53,47,49,45,43]
```

```
In [3]: plt.plot(x,y,color='green',linewidth=3,linestyle='dashed')
        plt.xlabel('day')
        plt.ylabel('temperature')
        plt.title('weather')
```
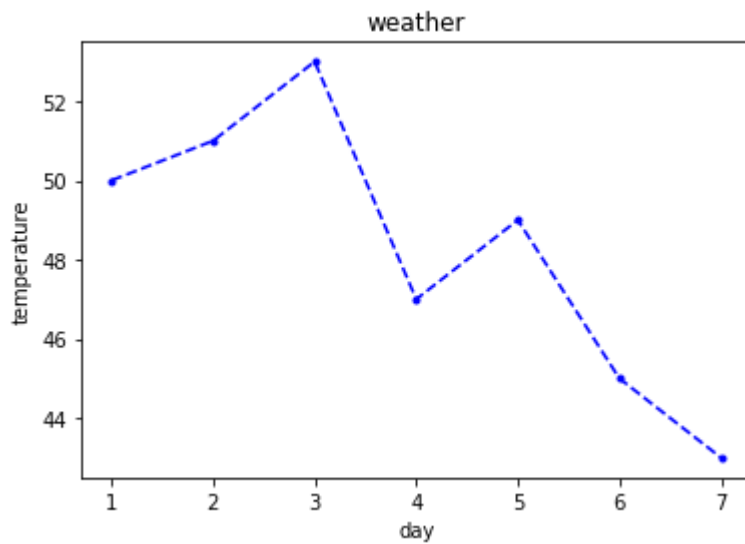
```
Out[3]: Text(0.5, 1.0, 'weather')
```


Tip: **If you get this error by using plt.xlabel TypeError: 'str' object is not callable restart your kernel**

Format string in plot option
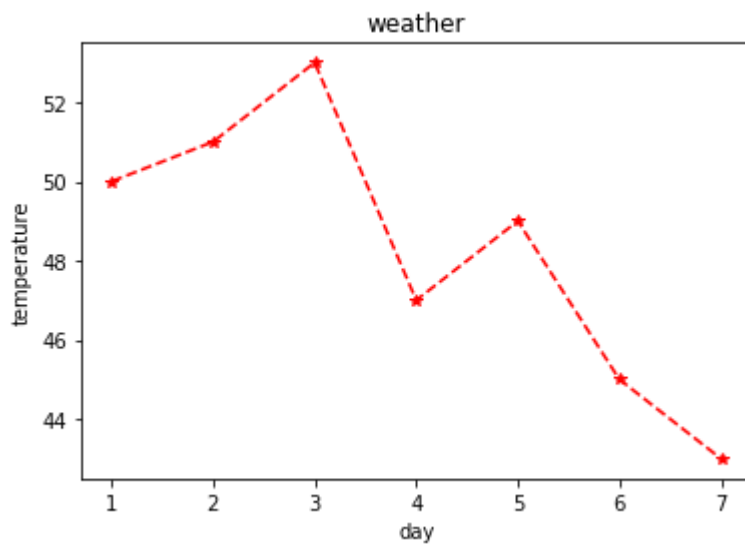
```
In [4]: plt.plot(x,y,'b--.')
        plt.xlabel('day')
        plt.ylabel('temperature')
        plt.title('weather')
```

Out[4]: Text(0.5, 1.0, 'weather')


```
In [5]: plt.plot(x,y,'--*r')
        plt.xlabel('day')
        plt.ylabel('temperature')
        plt.title('weather')
```

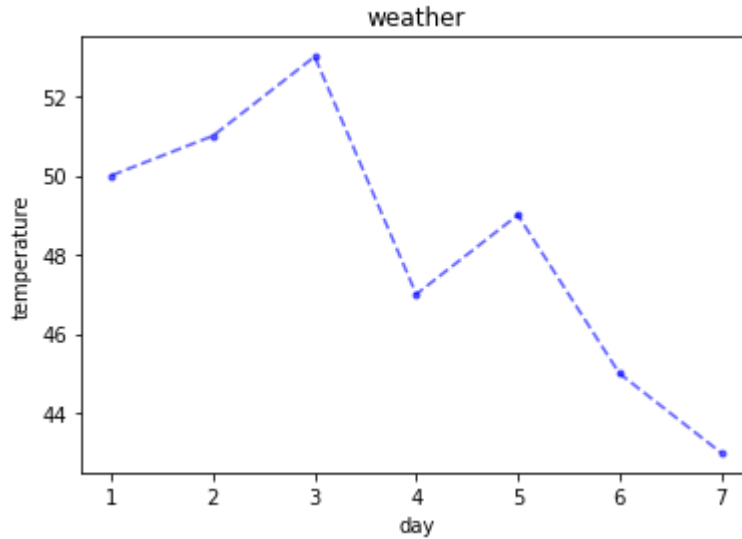Out[5]: Text(0.5, 1.0, 'weather')

Scale factor

0 < alpha < 1

```
In [7]: plt.plot(x,y,'b--.',alpha=0.6)
        plt.xlabel('day')
        plt.ylabel('temperature')
        plt.title('weather')
```

Out[7]: Text(0.5, 1.0, 'weather')

link for additional options on plot
(https://matplotlib.org/stable/api/_as_gen/matplotlib.pyplot.plot.html)

Legend

```
In [8]: days = [1,2,3,4,5,6,7]
        max_t = [51,50,53,47,49,47,45]
        min_t = [43,42,40,44,33,35,37]
        avg_t = [45,48,48,46,40,42,41]
```

```
In [23]: plt.xlabel('days')
         plt.ylabel('temperature')
         plt.title('weather')
         plt.plot(days,max_t,label='Max')
         plt.plot(days,min_t,label='Min')
         plt.plot(days,avg_t,label='Avg')
         plt.legend(loc='best',shadow=True,fontsize='large')
         # loc='best' i.e. matplotlib module decide where is the best place for legend.
         plt.grid()
```
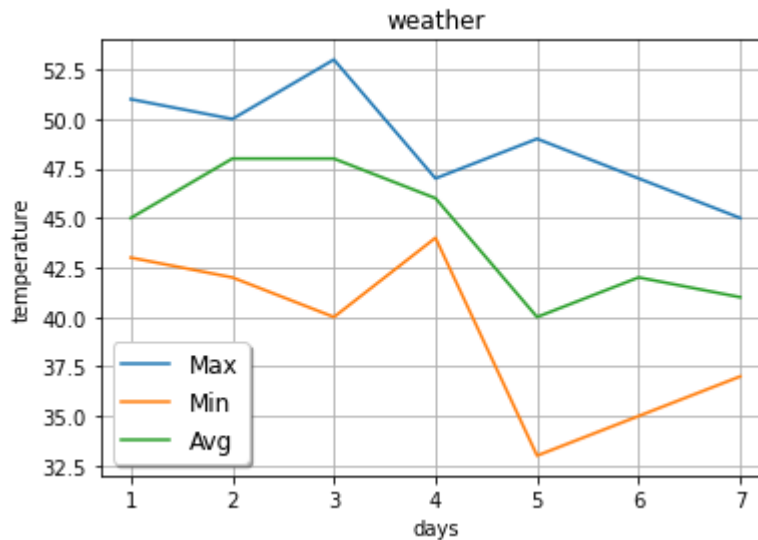

Chech this link for more information
(https://matplotlib.org/stable/api/_as_gen/matplotlib.pyplot.legend.html)

Bar chart

```
In [24]: import matplotlib.pyplot as plt
         import numpy as np
         %matplotlib inline
```
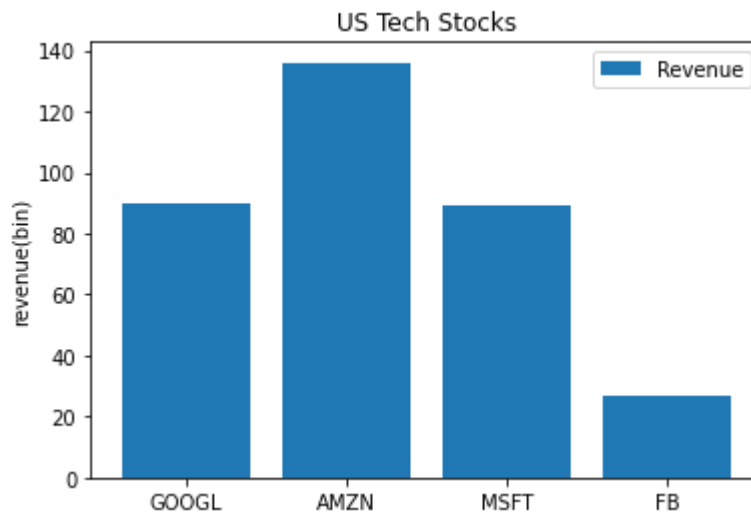
```
In [41]: company =['GOOGL','AMZN','MSFT','FB']
         revenue=[90,136,89,27]
```

```
In [42]: xpos=np.arange(len(company))
         xpos
```

```
Out[42]: array([0, 1, 2, 3])
```

```
In [43]: plt.xticks(xpos,company)
         plt.ylabel('revenue(bin)')
         plt.title('US Tech Stocks')
         plt.bar(xpos,revenue,label='Revenue')
         plt.legend()
```
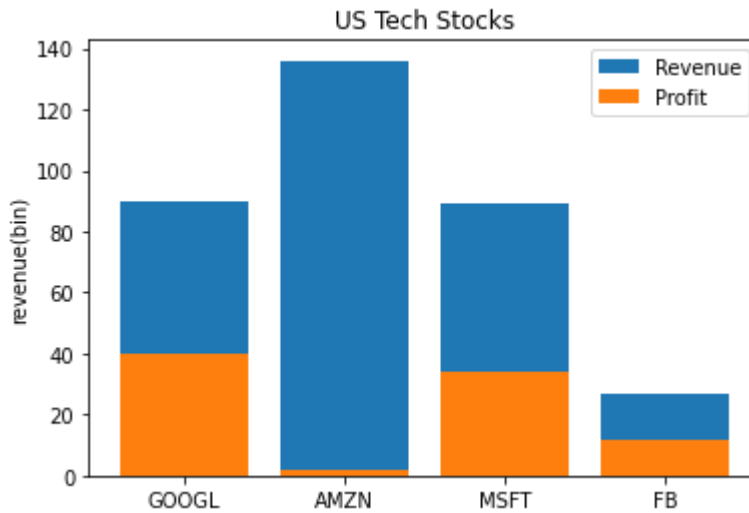
Out[43]: <matplotlib.legend.Legend at 0xa9dd7c0>


```
In [44]: profit=[40,2,34,12]
```
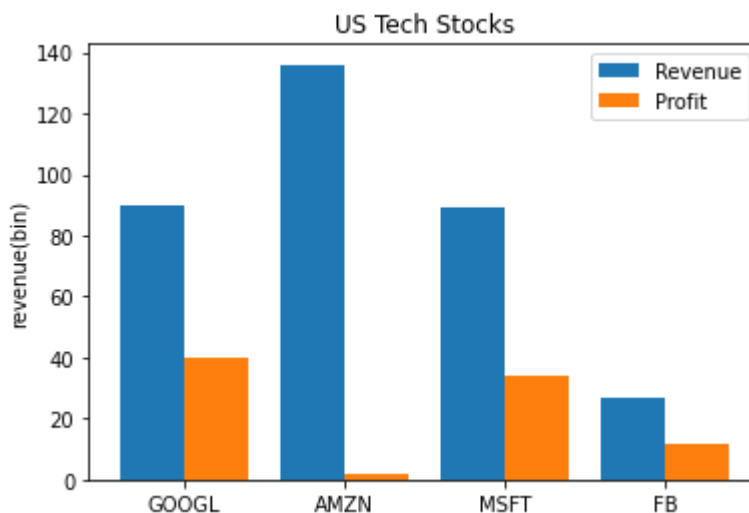
```
In [45]: plt.xticks(xpos,company)
         plt.ylabel('revenue(bin)')
         plt.title('US Tech Stocks')
         plt.bar(xpos,revenue,label='Revenue')
         plt.bar(xpos,profit,label='Profit')
         plt.legend()
```

Out[45]: <matplotlib.legend.Legend at 0xaa2ff70>
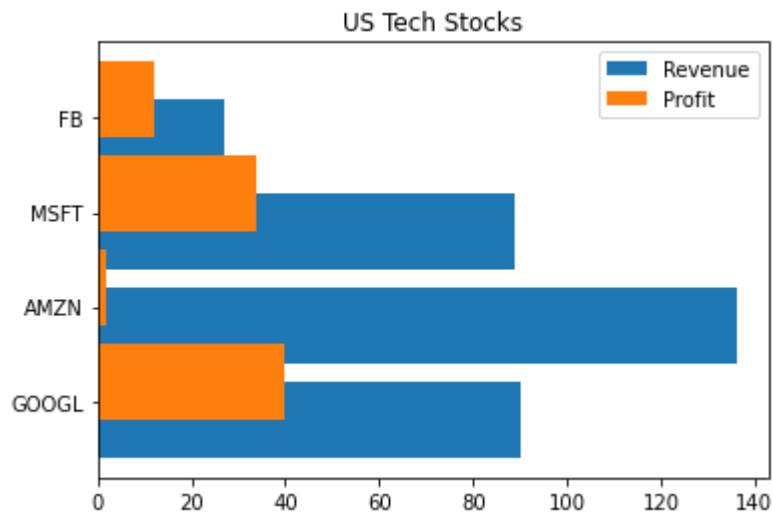


```
In [52]: plt.xticks(xpos,company)
         plt.ylabel('revenue(bin)')
         plt.title('US Tech Stocks')
         plt.bar(xpos-0.2,revenue,width=0.4,label='Revenue')
         plt.bar(xpos+0.2,profit,width=0.4,label='Profit')
         plt.legend()
```

Out[52]: <matplotlib.legend.Legend at 0xa8a2ee0>

`plt.yticks(xpos,company)`
`plt.title('US Tech Stocks')`
`plt.barh(xpos-0.2,revenue,label='Revenue')`
`plt.barh(xpos+0.2,profit,label='Profit')`
`plt.legend()`

Out[54]: `<matplotlib.legend.Legend at 0xab87e20>`

Histogram

1. How many patients are normal?
2. How many of them are pre-diabetic?
3. How many are diabetic?

blood-sugar	patient status
80-100	Normal
100-125	Pre-diabetic
above 125	Diabetic

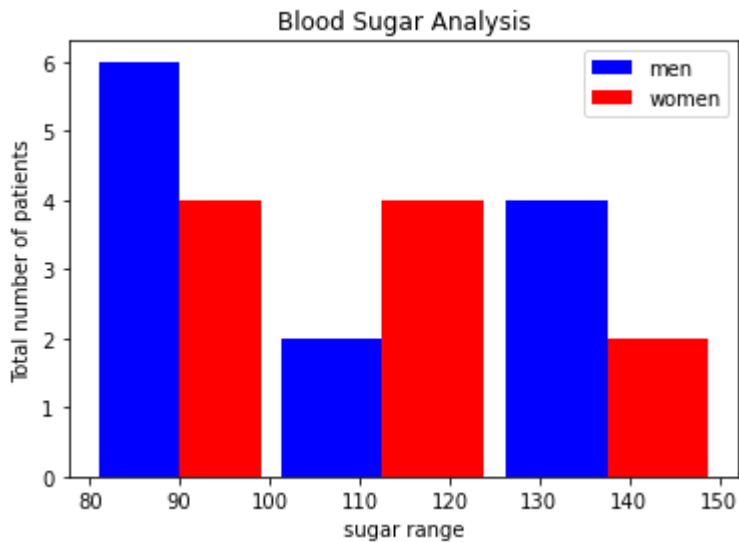```
In [64]: blood_sugar = [113,85,90,150,149,88,93,115,135,80,77,82,129]
         plt.hist(blood_sugar,bins=[80,100,125,150],rwidth=0.9,color='g')
```

Out[64]: (array([6., 2., 4.]),
         array([ 80, 100, 125, 150]),
         <BarContainer object of 3 artists>)
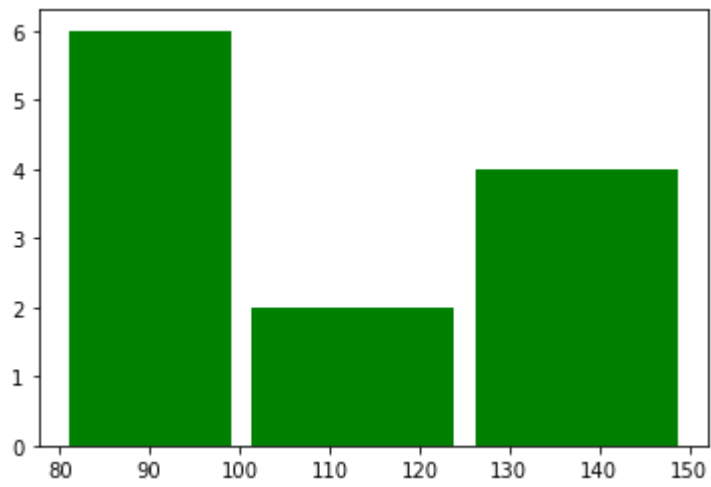
```
In [67]: blood_sugar_men=[113,85,90,150,149,88,93,115,135,80,77,82,129]
         blood_sugar_women=[67,98,89,120,133,150,84,69,89,79,120,112,100]
         plt.xlabel('sugar range')
         plt.ylabel('Total number of patients')
         plt.title('Blood Sugar Analysis')
         plt.hist([blood_sugar_men,blood_sugar_women],bins=[80,100,125,150],rwidth=0.9,col
                  label=['men','women'])
         plt.legend()
```

Out[67]: <matplotlib.legend.Legend at 0xa9ee5e0>


```
In [69]: blood_sugar_men=[113,85,90,150,149,88,93,115,135,80,77,82,129]
         blood_sugar_women=[67,98,89,120,133,150,84,69,89,79,120,112,100]
         plt.xlabel('sugar range')
         plt.ylabel('Total number of patients')
         plt.title('Blood Sugar Analysis')
         plt.hist([blood_sugar_men,blood_sugar_women],bins=[80,100,125,150],rwidth=0.9,col
                  label=['men','women'],orientation='horizontal')
         plt.legend()
```

Out[69]: <matplotlib.legend.Legend at 0xbf2b7f0>
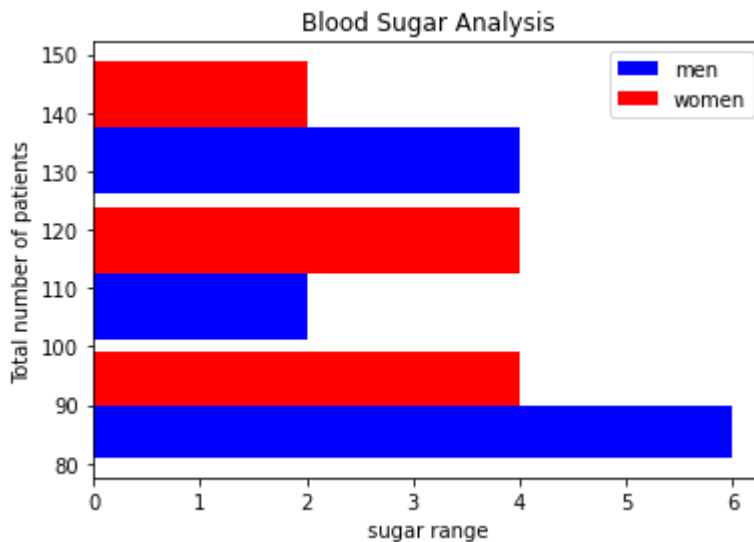
Pie chart

In order to track down the home expences I want to know how much percentage individual item is taking out of total expense having a pie chart is useful.
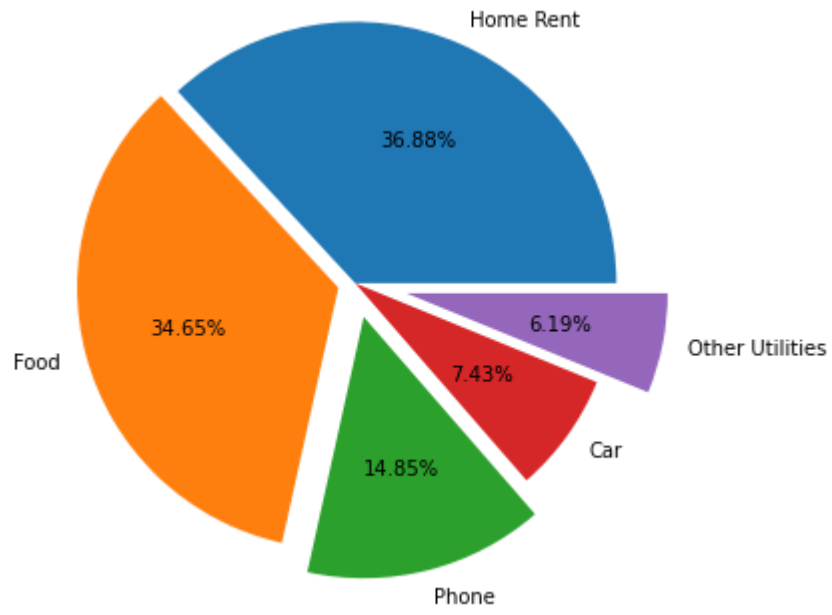
expense label	expense value
Home Rent	1490
Food	1400
Phone	600
Car	300
Other Utilities	250
Total	2960

```
In [70]: exp_vals = [1490,1400,600,300,250]
         exp_labels = ['Home Rent', 'Food','Phone','Car','Other Utilities']
```
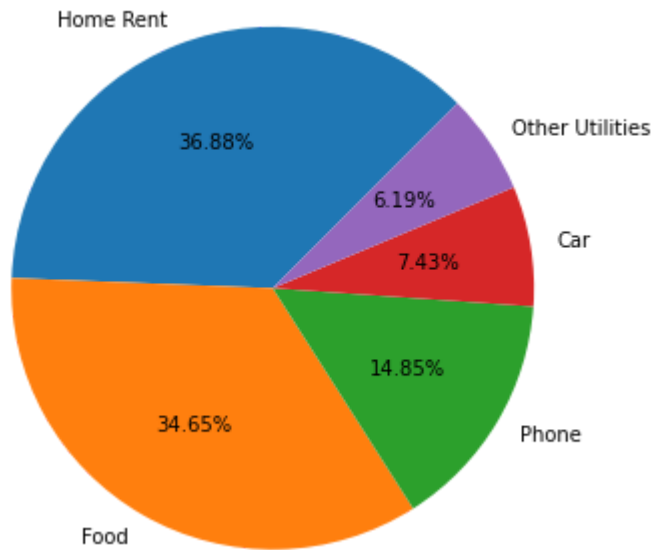
```
In [75]: plt.pie(exp_vals,labels=exp_labels,radius=1.5,autopct='%0.2f%%')
         plt.show()
```
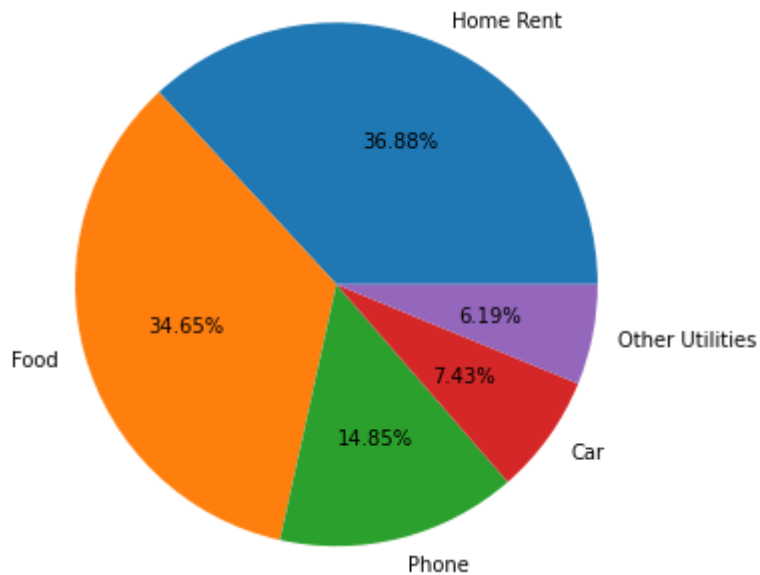
```
plt.pie(exp_vals,labels=exp_labels,radius=1.5,autopct='%0.2f%%',explode=[0,0.1,0
plt.show()
```
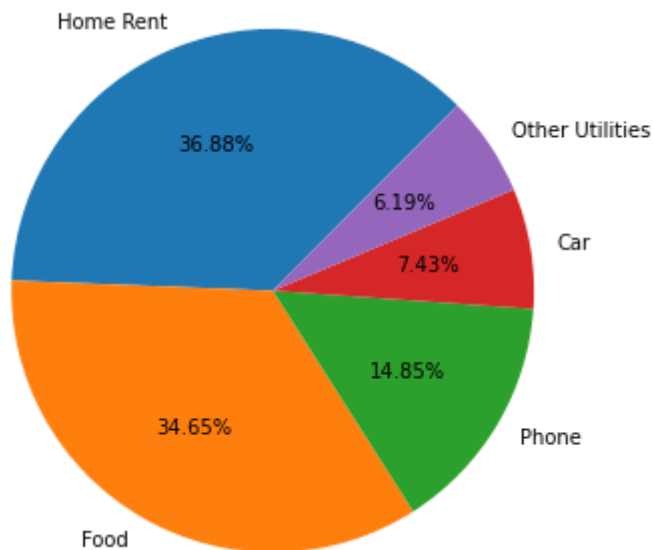
In [80]:
```python
plt.pie(exp_vals,labels=exp_labels,radius=1.5,autopct='%0.2f%%',startangle=45)
plt.show()
```


Save Chart to a file

In [90]:
```python
plt.pie(exp_vals,labels=exp_labels,radius=1.5,autopct='%0.2f%%',startangle=45)
plt.savefig('D:/Data_Science/My Github/Maplotlib-tutorial/Pictures/piechart.png'
        bbox_inches='tight',pad_inches=2,transparent=True)
```
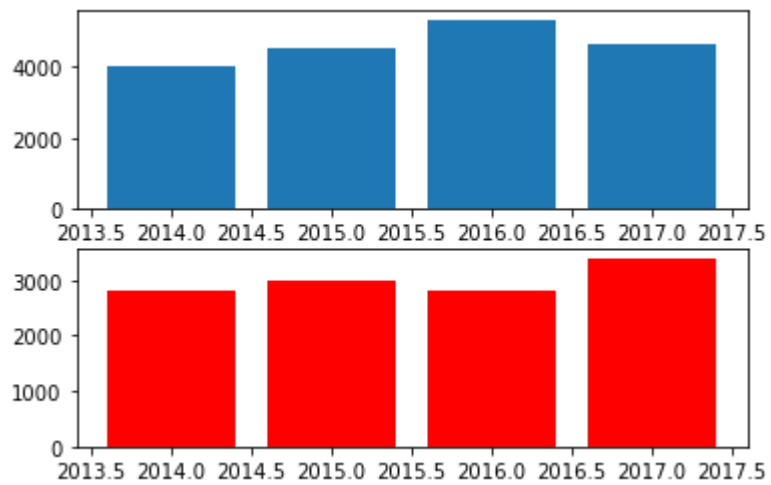

Subplot

In [91]:
```python
year=[2014,2015,2016,2017]
income=[4000,4500,5300,4600]
expense=[2800,3000,2800,3400]
```

In [94]:
```python
plt.subplot(2,1,1)
plt.bar(year,income)
plt.subplot(2,1,2)
plt.bar(year,expense,color='r')
```

Out[94]: <BarContainer object of 4 artists>

Date	Author
2021-07-21	**Ehsan Zia**