[ ]
```
#Description: This program uses the Money Flow Index to determine when to buy and sell stock
```

[ ]
```
#Import the libraries
import warnings
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
plt.style.use('fivethirtyeight')
warnings.filterwarnings('ignore')
```

[ ]
```
#Load the tesla stock data
from google.colab import files
files.upload()
```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

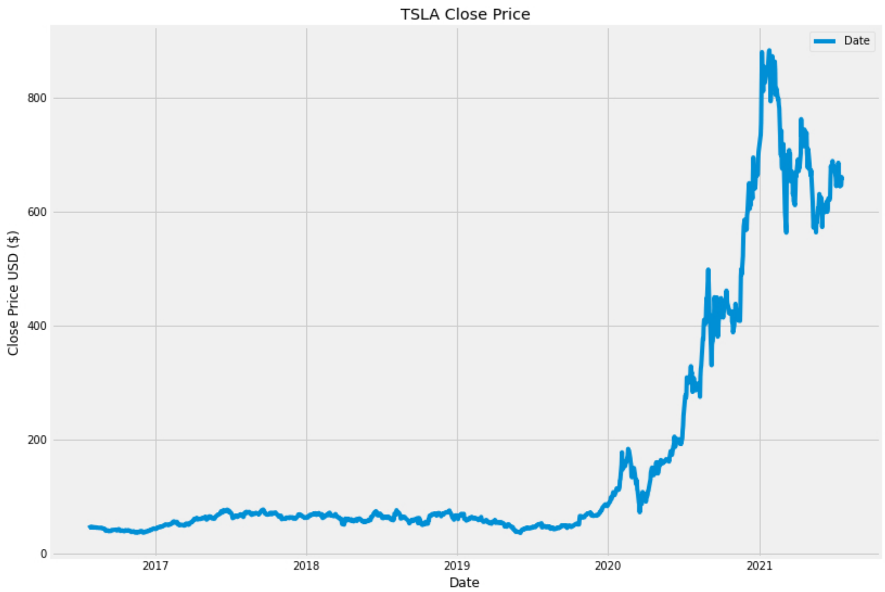
```
Saving TSLA.csv to TSLA.csv
{'TSLA.csv': b'Date,Open,High,Low,Close,Adj Close,Volume\n2016-07-22,44.397999,44.900002,43.776001,44.453999,44.453999,12898500\n2016-07-25,44.453999,46.278000,44.
```

[ ]
```
#Get the data
df = pd.read_csv('TSLA.csv')
#Set the index
df=df.set_index(pd.DatetimeIndex(df['Date'].values))
df
```

	Date	Open	High	Low	Close	Adj Close	Volume
2016-07-22	2016-07-22	44.397999	44.900002	43.776001	44.453999	44.453999	12898500
2016-07-25	2016-07-25	44.453999	46.278000	44.273998	46.001999	46.001999	22453500
2016-07-26	2016-07-26	45.537998	46.000000	45.060001	45.902000	45.902000	17150000
2016-07-27	2016-07-27	45.868000	46.672001	45.383999	45.698002	45.698002	14445000
2016-07-28	2016-07-28	45.590000	46.152000	45.320000	46.122002	46.122002	12095500
...	...	...	...	...	...	...	...
2021-07-15	2021-07-15	658.390015	666.140015	637.880005	650.599976	650.599976	20209600
2021-07-16	2021-07-16	654.679993	656.700012	642.200012	644.219971	644.219971	16339800
2021-07-19	2021-07-19	629.890015	647.200012	621.289978	646.219971	646.219971	21297100
2021-07-20	2021-07-20	651.989990	662.390015	640.500000	660.500000	660.500000	15442700
2021-07-21	2021-07-21	659.609985	664.859985	650.289978	655.289978	655.289978	13910800

1258 rows × 7 columns

[ ]
```
#Visually show the data
plt.figure(figsize=(12.2, 9))
plt.plot(df['Close'], label='Close Price')
plt.title('TSLA Close Price')
plt.xlabel('Date')
plt.ylabel('Close Price USD ($)')
plt.legend(df.columns.values, loc='upperleft')
plt.show()
```



[ ]
```
#Calculate the typical price
typical_price = (df['Close'] + df['High'] + df['Low']) / 3
typical_price
```

```
2016-07-22     44.376667
2016-07-25     45.517999
2016-07-26     45.654000
2016-07-27     45.918001
```

```
2016-07-28     45.864667
                  ...
2021-07-15    651.539999
2021-07-16    647.706665
2021-07-19    638.236654
2021-07-20    654.463338
2021-07-21    656.813314
Length: 1258, dtype: float64
```

```
[ ] #Get the period (Note Money Flow Index Use the period of 14 days)
    period = 14
```

```
[ ] #Calculate the money flow
    money_flow = typical_price = df['Volume']
    money_flow
```

```
2016-07-22    12898500
2016-07-25    22453500
2016-07-26    17150000
2016-07-27    14445000
2016-07-28    12095500
                ...
2021-07-15    20209600
2021-07-16    16339800
2021-07-19    21297100
2021-07-20    15442700
2021-07-21    13910800
Name: Volume, Length: 1258, dtype: int64
```

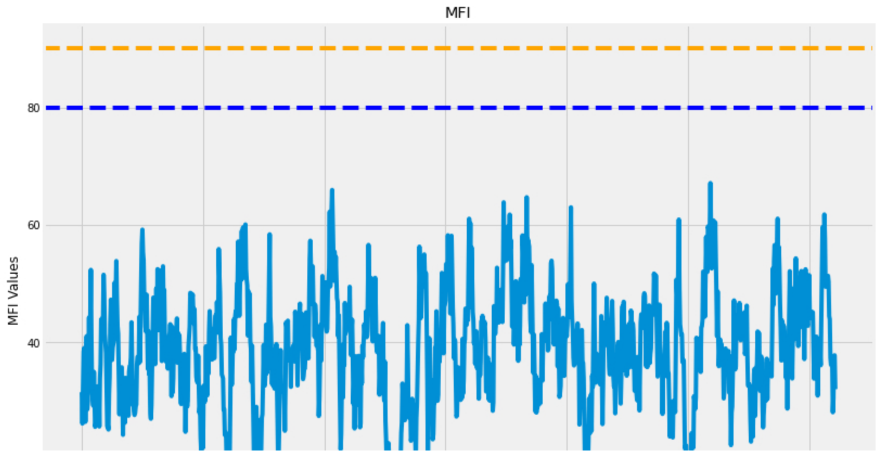
```
[ ] #Get all of the positive and negative money flows
    positive_flow = []
    negative_flow = []

    #Loop through the typical price
    for i in range(1, len(typical_price)):
      if typical_price[i] > typical_price[i-1]:
        positive_flow.append(money_flow[i-1])
        negative_flow.append(0)
      elif typical_price[i] < typical_price[i-1]:
        negative_flow.append(money_flow[i-1])
        positive_flow.append(0)
      else:
        positive_flow.append(0)
        negative_flow.append(0)
```

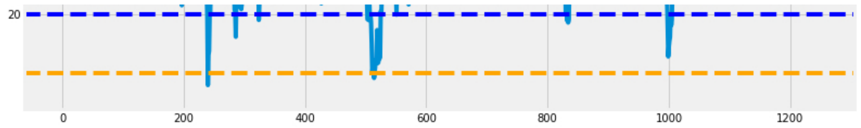
```
[ ] #Get all of the positive and negative money flows within the time period
    positive_mf = []
    negative_mf = []

    for i in range(period-1, len(positive_flow)):
      positive_mf.append( sum(positive_flow[i + 1-period : i+1]))

    for i in range(period-1, len(negative_flow)):
      negative_mf.append( sum(negative_flow[i + 1-period : i+1]))
```

```
[ ] #Calculate the money flow index
    mfi = 100 * (np.array(positive_mf) / (np.array(positive_mf) + np.array(negative_mf) ))
    mfi
```

```
array([31.56259957, 26.22287006, 32.28386867, ..., 37.79276552,
       37.83571534, 32.08330036])
```

```
#Visually show the MFI
df2 = pd.DataFrame()
df2['MFI'] = mfi
#Create the plot

plt.figure(figsize=(12.2, 9))
plt.plot(df2['MFI'], label='MFI')
plt.axhline(10, linestyle= '--', color = 'orange')
plt.axhline(20, linestyle= '--', color = 'blue')
plt.axhline(80, linestyle= '--', color = 'blue')
plt.axhline(90, linestyle= '--', color = 'orange')
plt.title('MFI')

plt.ylabel('MFI Values')

plt.show()
```





```
[ ]  #Create a new data frame
     new_df = pd.DataFrame()
     new_df = df[period:]
     new_df['MFI'] = mfi
```

```
[ ]  #Show the new data frame
     new_df
```

	Date	Open	High	Low	Close	Adj Close	Volume	MFI
2016-08-11	2016-08-11	45.234001	45.514000	44.681999	44.981998	44.981998	9404500	31.562600
2016-08-12	2016-08-12	45.082001	45.330002	44.807999	45.122002	45.122002	9067500	26.222870
2016-08-15	2016-08-15	45.203999	45.900002	44.986000	45.118000	45.118000	10171500	32.283869
2016-08-16	2016-08-16	45.098000	45.438000	44.681999	44.722000	44.722000	11335500	38.479356
2016-08-17	2016-08-17	44.866001	44.966000	44.560001	44.647999	44.647999	8935500	39.085400
...	...	...	...	...	...	...	...	...
2021-07-15	2021-07-15	658.390015	666.140015	637.880005	650.599976	650.599976	20209600	28.144774
2021-07-16	2021-07-16	654.679993	656.700012	642.200012	644.219971	644.219971	16339800	30.501153
2021-07-19	2021-07-19	629.890015	647.200012	621.289978	646.219971	646.219971	21297100	37.792766
2021-07-20	2021-07-20	651.989990	662.390015	640.500000	660.500000	660.500000	15442700	37.835715
2021-07-21	2021-07-21	659.609985	664.859985	650.289978	655.289978	655.289978	13910800	32.083300

1244 rows × 8 columns

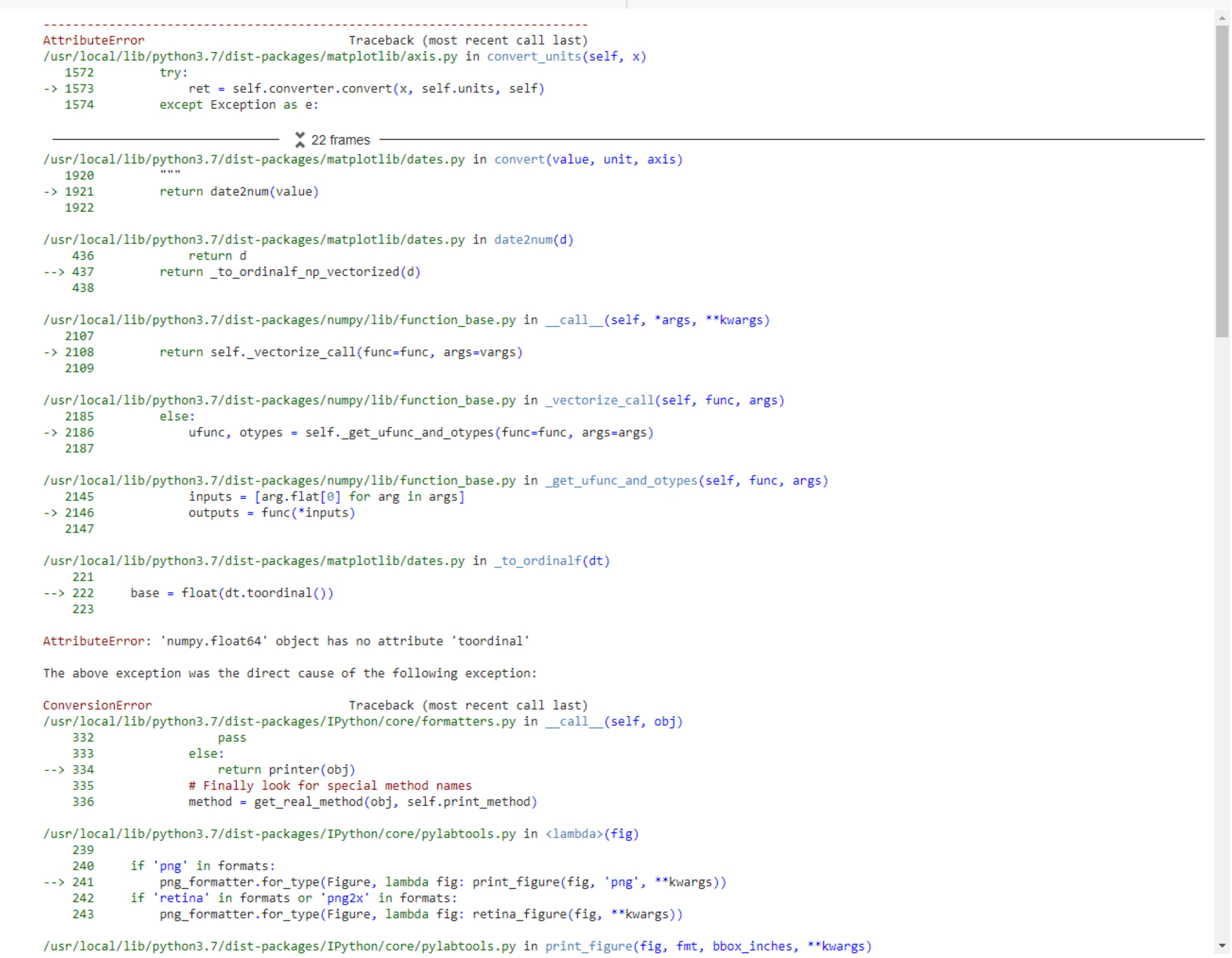
```
[ ]  #Create a function to get the buy and sell signals
     def get_signal(data, high, low):
       buy_signal = []
       sell_signal = []

       for i in range(len(data['MFI'])):
         if data['MFI'][i] > high:
           buy_signal.append(np.nan)
           sell_signal.append(data['Close'][i])

         elif data['MFI'][i] < low:
           buy_signal.append(data['Close'][i])
           sell_signal.append(np.nan)

         else:
           sell_signal.append(np.nan)
           buy_signal.append(np.nan)
       return (buy_signal, sell_signal)
```

```
[ ]  #Add new columns (Buy & Sell)
     new_df['Buy'] = get_signal(new_df, 80, 20)[0]
     new_df['Sell'] = get_signal(new_df, 80, 20)[1]
     #show the data
     new_df
```

	Date	Open	High	Low	Close	Adj Close	Volume	MFI	Buy	Sell
2016-08-11	2016-08-11	45.234001	45.514000	44.681999	44.981998	44.981998	9404500	31.562600	NaN	NaN
2016-08-12	2016-08-12	45.082001	45.330002	44.807999	45.122002	45.122002	9067500	26.222870	NaN	NaN
2016-08-15	2016-08-15	45.203999	45.900002	44.986000	45.118000	45.118000	10171500	32.283869	NaN	NaN
2016-08-16	2016-08-16	45.098000	45.438000	44.681999	44.722000	44.722000	11335500	38.479356	NaN	NaN
2016-08-17	2016-08-17	44.866001	44.966000	44.560001	44.647999	44.647999	8935500	39.085400	NaN	NaN
...	...	...	...	...	...	...	...	...	...	...
2021-07-15	2021-07-15	658.390015	666.140015	637.880005	650.599976	650.599976	20209600	28.144774	NaN	NaN
2021-07-16	2021-07-16	654.679993	656.700012	642.200012	644.219971	644.219971	16339800	30.501153	NaN	NaN
2021-07-19	2021-07-19	629.890015	647.200012	621.289978	646.219971	646.219971	21297100	37.792766	NaN	NaN
2021-07-20	2021-07-20	651.989990	662.390015	640.500000	660.500000	660.500000	15442700	37.835715	NaN	NaN
2021-07-21	2021-07-21	659.609985	664.859985	650.289978	655.289978	655.289978	13910800	32.083300	NaN	NaN

1244 rows × 10 columns

```
[ ]  #plot the data
     plt.figure(figsize=(12.2, 4.5))
     plt.plot(new_df['Close'], label = 'Close Price', alpha = 0.5)
     plt.scatter(new_df.index, new_df['Buy'], color = 'green', label='Buy Signal', marker = '^', alpha = 1)
     plt.scatter(new_df.index, new_df['Sell'], color = 'red', label='Sell Signal', marker = 'v', alpha = 1)
     plt.title('Tesla Close Price')
     plt.xlabel('Date')
     plt.ylabel('Close Price USD($)')
     plt.legend( loc='upper left')
     plt.show()
```



```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
/usr/local/lib/python3.7/dist-packages/matplotlib/axis.py in convert_units(self, x)
   1572         try:
-> 1573             ret = self.converter.convert(x, self.units, self)
   1574         except Exception as e:

                                   22 frames
/usr/local/lib/python3.7/dist-packages/matplotlib/dates.py in convert(value, unit, axis)
   1920         """
-> 1921         return date2num(value)
   1922 

/usr/local/lib/python3.7/dist-packages/matplotlib/dates.py in date2num(d)
    436             return d
--> 437         return _to_ordinalf_np_vectorized(d)
    438 

/usr/local/lib/python3.7/dist-packages/numpy/lib/function_base.py in __call__(self, *args, **kwargs)
   2107 
-> 2108         return self._vectorize_call(func=func, args=vargs)
   2109 

/usr/local/lib/python3.7/dist-packages/numpy/lib/function_base.py in _vectorize_call(self, func, args)
   2185         else:
-> 2186             ufunc, otypes = self._get_ufunc_and_otypes(func=func, args=args)
   2187 

/usr/local/lib/python3.7/dist-packages/numpy/lib/function_base.py in _get_ufunc_and_otypes(self, func, args)
   2145             inputs = [arg.flat[0] for arg in args]
-> 2146             outputs = func(*inputs)
   2147 

/usr/local/lib/python3.7/dist-packages/matplotlib/dates.py in _to_ordinalf(dt)
    221 
--> 222     base = float(dt.toordinal())
    223 

AttributeError: 'numpy.float64' object has no attribute 'toordinal'

The above exception was the direct cause of the following exception:

ConversionError                           Traceback (most recent call last)
/usr/local/lib/python3.7/dist-packages/IPython/core/formatters.py in __call__(self, obj)
    332                 pass
    333             else:
--> 334                 return printer(obj)
    335             # Finally look for special method names
    336             method = get_real_method(obj, self.print_method)

/usr/local/lib/python3.7/dist-packages/IPython/core/pylabtools.py in <lambda>(fig)
    239 
    240     if 'png' in formats:
--> 241         png_formatter.for_type(Figure, lambda fig: print_figure(fig, 'png', **kwargs))
    242     if 'retina' in formats or 'png2x' in formats:
    243         png_formatter.for_type(Figure, lambda fig: retina_figure(fig, **kwargs))

/usr/local/lib/python3.7/dist-packages/IPython/core/pylabtools.py in print_figure(fig, fmt, bbox_inches, **kwargs)
```