Load data and import python packages

Link to data definition: https://www.bls.gov/help/hlpforma.htm#AP

```
#clone GitHuB repository so all team members can work off the same data
!git clone https://github.com/severelylefty/MSDS432.git
```

```
Cloning into 'MSDS432'...
remote: Enumerating objects: 4, done.
remote: Counting objects: 100% (4/4), done.
remote: Compressing objects: 100% (4/4), done.
remote: Total 4 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (4/4), done.
```

```
!ls
```

```
MSDS432  sample_data
```

```
import numpy as np
import pandas as pd
#for visuals
import seaborn as sns
import matplotlib.pyplot as plt
import plotly.express as px
```

```
inflation = pd.read_csv('/content/MSDS432/inf_data_upload.csv')
inflation2 = pd.read_csv('/content/MSDS432/inf_data_upload_2.csv')

frames = [inflation,inflation2]

#Union dataset to create one dataframe
#Originating datasets were split into 2 due to size contraints with GitHub
union_df = pd.concat(frames)
```

Basic exploration of the dataset

```
union_df.head(10)
```

	series_id	prefix	sa_code	period	area_code	base_code	item_code	item
0	CUURS35ASA0	CU	U	R	S35A	S	A0	
1	CUUSS35ASA0	CU	U	S	S35A	S	A0	
2	CUURS35ASAA	CU	U	R	S35A	S	AA	
3	CUUSS35ASAA	CU	U	S	S35A	S	AA	
4	CUURS35ASAE	CU	U	R	S35A	S	AE	

```
union_df.tail()
```

	series_id	prefix	sa_code	period	area_code	base_code	item_code	i
222798	CUUS0120SAT	CU	U	S	120	S	AT	
222799	CUUR0120SAT1	CU	U	R	120	S	AT1	P
222800	CUUS0120SAT1	CU	U	S	120	S	AT1	P
222801	CUUR0120SETB	CU	U	R	120	S	ETB	
222802	CUUS0120SETB	CU	U	S	120	S	ETB	

```
union_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 445504 entries, 0 to 222802
Data columns (total 11 columns):
 #   Column            Non-Null Count   Dtype  
---  ------            --------------   -----  
 0   series_id         445504 non-null  object 
 1   prefix            445504 non-null  object 
 2   sa_code           445504 non-null  object 
 3   period            445504 non-null  object 
 4   area_code         445504 non-null  object 
 5   base_code         445504 non-null  object 
 6   item_code         445504 non-null  object 
 7   item_description  445504 non-null  object 
 8   area_description  445504 non-null  object 
 9   Evaluation_Date   445504 non-null  object 
 10  inf_value         445504 non-null  float64
dtypes: float64(1), object(10)
memory usage: 40.8+ MB
```

```
union_df.columns, len(union_df)
```

```
(Index(['series_id', 'prefix', 'sa_code', 'period', 'area_code', 'base_code',
        'item_code', 'item_description', 'area_description', 'Evaluation_Date',
        'inf_value'],
       dtype='object'), 445504)
```

```
len(union_df.series_id.unique())
```

```
1038
```

Clean data

```
# remove white spaces from the data entries

union_df['prefix'] = union_df['prefix'].str.strip()
union_df['sa_code'] = union_df['sa_code'].str.strip()
union_df['period'] = union_df['period'].str.strip()
union_df['area_code'] = union_df['area_code'].str.strip()
union_df['base_code'] = union_df['base_code'].str.strip()
union_df['item_code'] = union_df['item_code'].str.strip()
union_df['item_description'] = union_df['item_description'].str.strip()
union_df['area_description'] = union_df['area_description'].str.strip()
union_df['Evaluation_Date'] = union_df['Evaluation_Date'].str.strip()
```

```
# count unique values in each column
print(union_df.nunique())
```

```
series_id           1038
prefix                 1
sa_code                1
period                 2
area_code             36
base_code              1
item_code             17
item_description      17
area_description      36
Evaluation_Date      432
inf_value          42537
dtype: int64
```

```
# count each distinct values inf_value
print(union_df['inf_value'].value_counts())

#over half of the records are inf_value=0, 0 value being treated as null
```

```
0.000      258522
100.000       306
112.800       162
130.000       148
```

```
122.800       148
              ...
244.054         2
238.894         2
119.726         2
129.140         2
158.247         2
Name: inf_value, Length: 42537, dtype: int64
```

```
#removing null values, in this data set 0 is a null value
union_df = union_df[union_df.inf_value != 0]
```

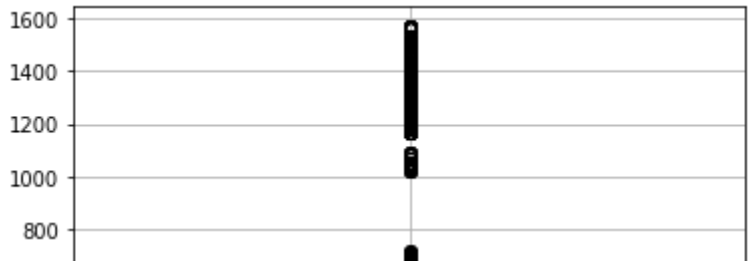
```
# check after removing nulls
print(union_df['inf_value'].describe())
print(union_df.describe())
```

```
count    186982.000000
mean        201.179038
std         110.180272
min          68.500000
25%         129.400000
50%         176.600000
75%         240.434750
max        1565.734000
Name: inf_value, dtype: float64
          inf_value
count  186982.000000
mean      201.179038
std       110.180272
min        68.500000
25%       129.400000
50%       176.600000
75%       240.434750
max      1565.734000
```

Outlier Exploration

```
#Consider some type of visual display such as a boxplot to determine any outliers. Do
union_df['inf_value'].describe(percentiles = [.25, .5, .75, .95])
union_df.boxplot(column = 'inf_value')

print('There seems to be a lot of possible outliers. Keeping them because, this could
```

```
There seems to be a lot of possible outliers. Keeping them because, this could b
```




```
#separating data based on sa_code
#S represents semi-annual inflation values whereas R represents monthly
#Splitting the dataset by period was deemed necessary for EDA

union_df_period_s = union_df[union_df.period == 'S']
union_df_period_r = union_df[union_df.period == 'R']

union_df.count()
union_df[union_df.period == 'S'].count()
union_df[union_df.period == 'R'].count()
```

```
series_id           93491
prefix              93491
sa_code             93491
period              93491
area_code           93491
base_code           93491
item_code           93491
item_description    93491
area_description    93491
Evaluation_Date     93491
inf_value           93491
dtype: int64
```

```
union_df_period_s.period.unique()
union_df_period_s.period.unique()
```

```
array(['S'], dtype=object)
```

Look more closely at the data from the last 4 years

```
from datetime import datetime

#pick data from the last 4 years

union_df['Evaluation_Date'] = pd.to_datetime(union_df['Evaluation_Date']).dt.date

mask = (union_df['Evaluation_Date'] >= pd.to_datetime('1/31/18')) & (union_df['Evaluat
last_4_years = union_df.loc[mask]
min(union_df['Evaluation_Date']), max(union_df['Evaluation_Date'])
```

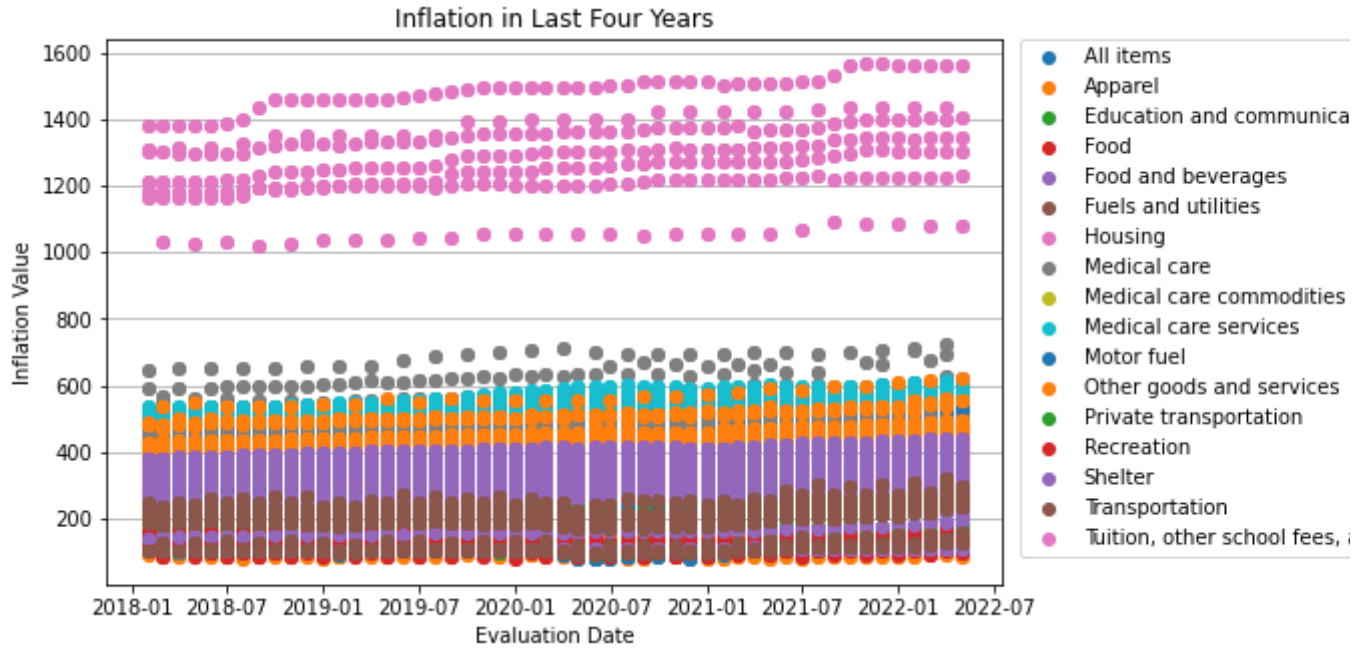
```
/usr/local/lib/python3.7/dist-packages/pandas/core/ops/array_ops.py:73: FutureWa
  result = libops.scalar_compare(x.ravel(), y, op)
(datetime.date(1987, 1, 31), datetime.date(2022, 4, 30))
```

```
last_4_years['area_description'] = last_4_years['area_description'].apply(lambda x: x.
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: SettingWithCopyW
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stab
  """Entry point for launching an IPython kernel.
```

```
import matplotlib.pyplot as plt

plt.rcParams["axes.grid.axis"] ="y"
plt.rcParams["axes.grid"] = True

fig = plt.figure(figsize=(8, 5))
groups = last_4_years.groupby("item_description")
for name, group in groups:
    plt.plot(group["Evaluation_Date"], group["inf_value"], marker="o", linestyle="", l
plt.title("Inflation in Last Four Years")
plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)
plt.xlabel("Evaluation Date")
plt.ylabel("Inflation Value")
```

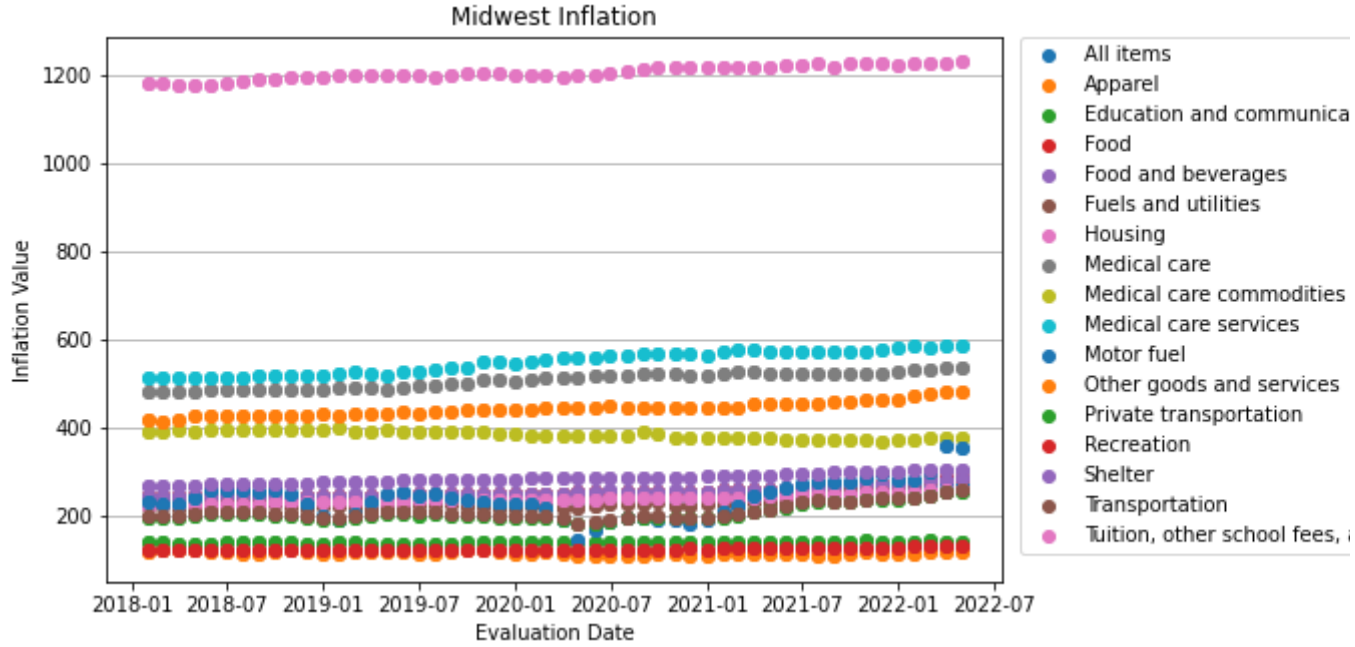
```
Text(0, 0.5, 'Inflation Value')
```



```
midwest = last_4_years[last_4_years['area_description']=='Midwest']
```

```
fig = plt.figure(figsize=(8, 5))
groups = midwest.groupby("item_description")
for name, group in groups:
    plt.plot(group["Evaluation_Date"], group["inf_value"], marker="o", linestyle="", l
plt.title("Midwest Inflation")
plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)
plt.xlabel("Evaluation Date")
plt.ylabel("Inflation Value")
```

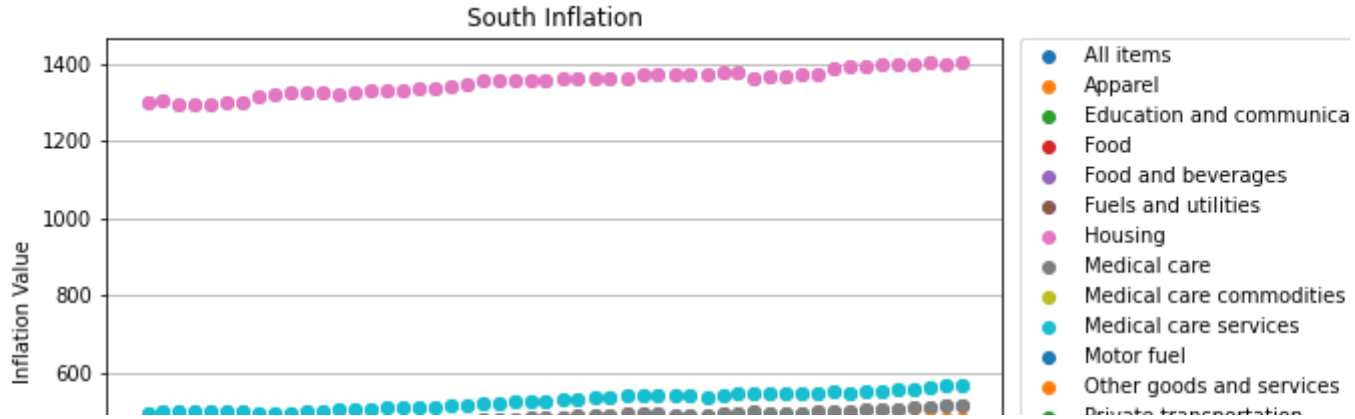
```
Text(0, 0.5, 'Inflation Value')
```




```
south = last_4_years[last_4_years['area_description']=='South']
```

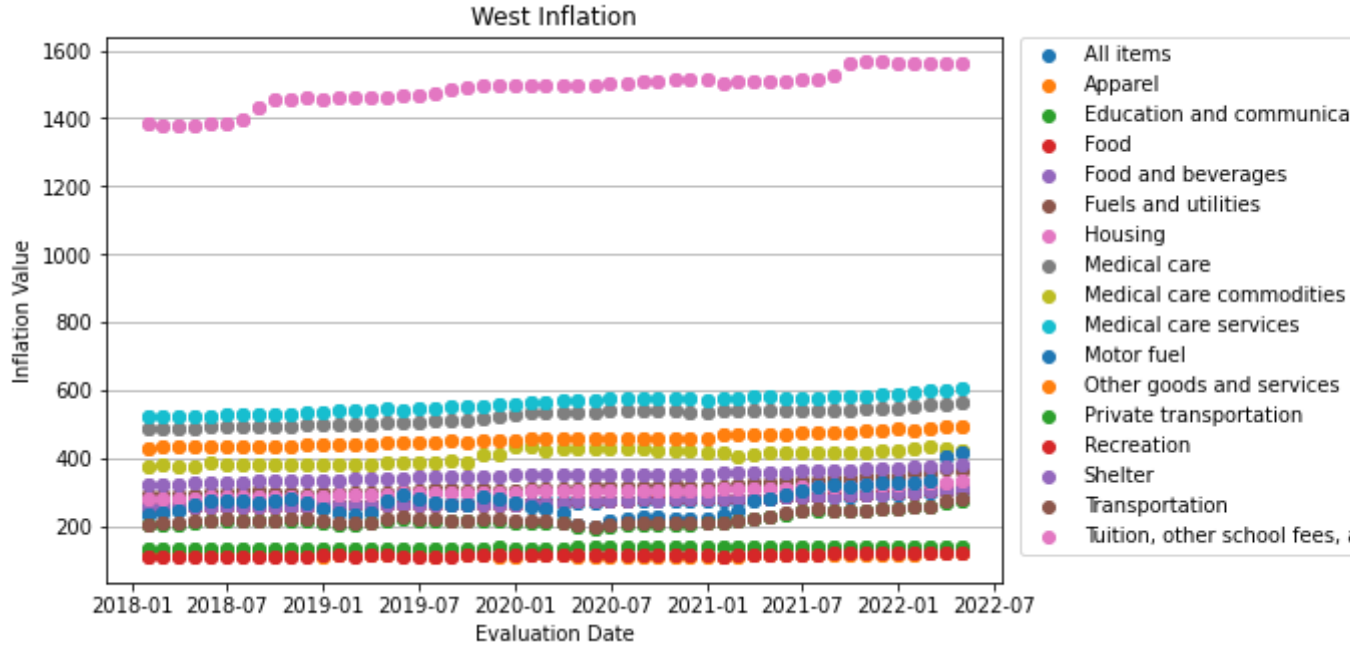
```
fig = plt.figure(figsize=(8, 5))
groups = south.groupby("item_description")
for name, group in groups:
    plt.plot(group["Evaluation_Date"], group["inf_value"], marker="o", linestyle="", l
plt.title("South Inflation")
plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)
plt.xlabel("Evaluation Date")
plt.ylabel("Inflation Value")
```

```
Text(0, 0.5, 'Inflation Value')
```




```
west = last_4_years[last_4_years['area_description']=='West']

fig = plt.figure(figsize=(8, 5))
groups = west.groupby("item_description")
for name, group in groups:
    plt.plot(group["Evaluation_Date"], group["inf_value"], marker="o", linestyle="", l
plt.title("West Inflation")
plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)
plt.xlabel("Evaluation Date")
plt.ylabel("Inflation Value")
```

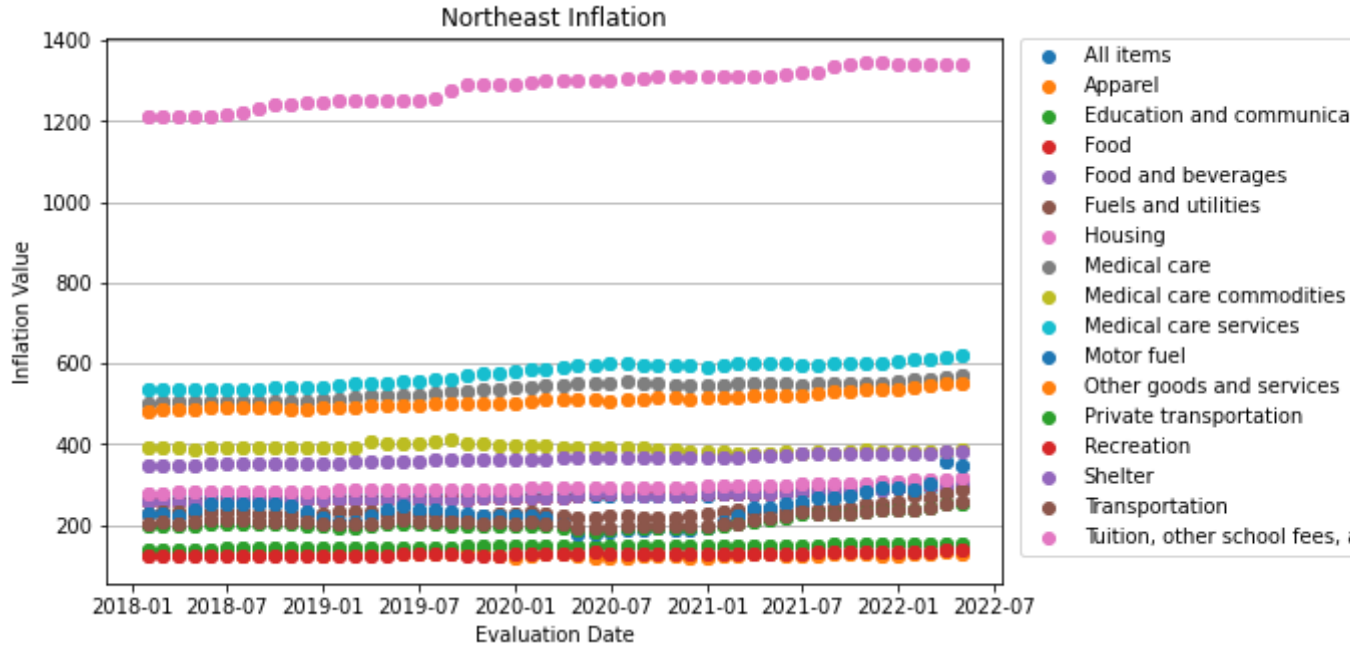
```
Text(0, 0.5, 'Inflation Value')
```




```
Northeast = last_4_years[last_4_years['area_description']=='Northeast']

fig = plt.figure(figsize=(8, 5))
groups = Northeast.groupby("item_description")
for name, group in groups:
    plt.plot(group["Evaluation_Date"], group["inf_value"], marker="o", linestyle="", l
plt.title("Northeast Inflation")
```

```
plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)
plt.xlabel("Evaluation Date")
plt.ylabel("Inflation Value")
```

```
Text(0, 0.5, 'Inflation Value')
```




```
# I actually live here
sandiego = last_4_years[last_4_years['area_description']=='San Diego-Carlsbad, CA']
```

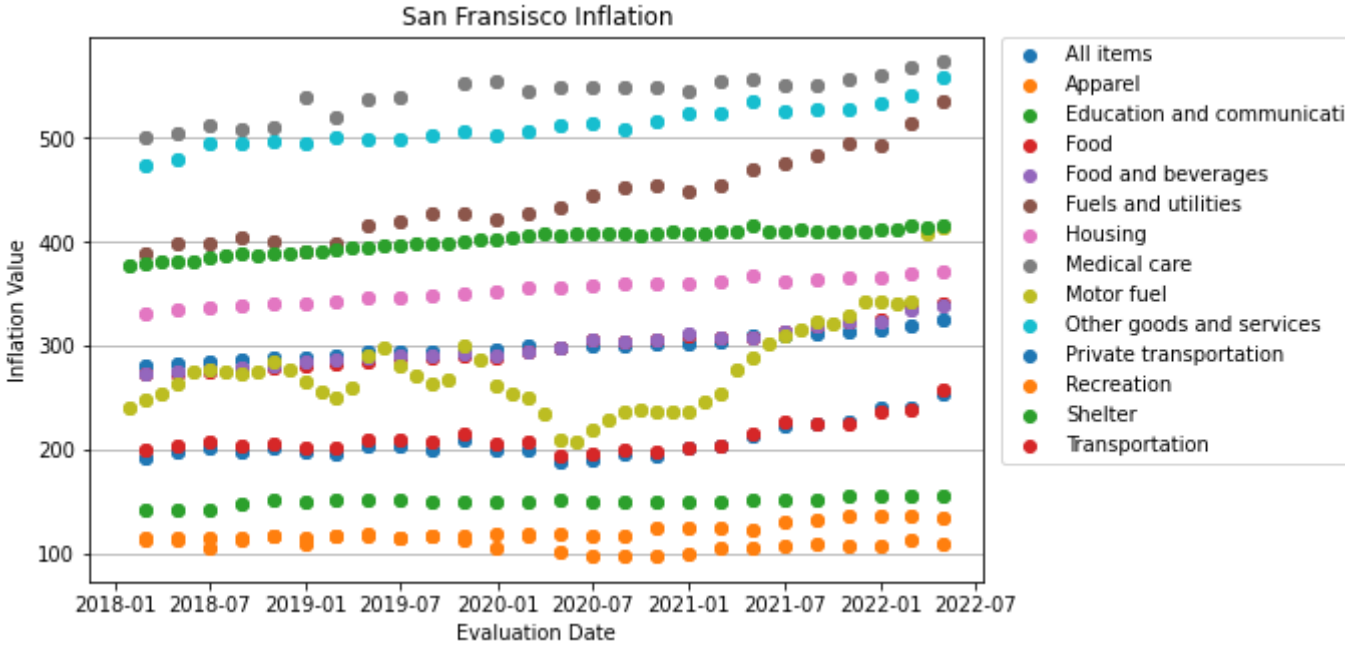
```
fig = plt.figure(figsize=(8, 5))
groups = sandiego.groupby("item_description")
for name, group in groups:
    plt.plot(group["Evaluation_Date"], group["inf_value"], marker="o", linestyle="", l
plt.title("San Diego Inflation")
plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)
plt.xlabel("Evaluation Date")
plt.ylabel("Inflation Value")
```

```
Text(0, 0.5, 'Inflation Value')
```


```
sanfransisco = last_4_years[last_4_years['area_description']=='San Francisco-Oakland-H
```

```
fig = plt.figure(figsize=(8, 5))
groups = sanfransisco.groupby("item_description")
for name, group in groups:
    plt.plot(group["Evaluation_Date"], group["inf_value"], marker="o", linestyle="", l
plt.title("San Fransisco Inflation")
plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)
plt.xlabel("Evaluation Date")
plt.ylabel("Inflation Value")
```

```
Text(0, 0.5, 'Inflation Value')
```



Additional EDA

```
sns.set(rc={'figure.figsize':(11.7,8.27)})
g = sns.boxplot(x='item_description', y='inf_value', data=union_df )
g.set_xticklabels(g.get_xticklabels(),rotation=90)
g.set(title="Inflation value by Item description")
```

```
[Text(0.5, 1.0, 'Inflation value by Item description')]
```