MSA 2025 Phase 2 - Part 1

1 MSA 2025 Phase 2 - Part 1

[214]:
```
import os
import sklearn
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

1.1 1. Find all variables and understand them

[229]:
```
# Get the folder path containing the datasets
folder_path = 'datasets/W store sales'

# Loop through every file in the folder
for file in os.listdir(folder_path):
    file_path = os.path.join(folder_path, file)

    # Load dataset into a dataframe
    df = pd.read_csv(file_path)

    # First 10 instances of the dataset
    print(f"First 10 instances from the dataset: {file}")
    display(df.head(10))

    # Select numeric columns for statistical measures
    print(f"Mean and Standard Deviation from the dataset: {file}")
    numeric_df = df.select_dtypes(include = 'number')
    display(numeric_df.agg(['mean', 'std']))


    # Plot histograms and bar plots depending on column type
    print(f"Distributions for numerical and categorical columns: {file}")

    # Identify column types
    numeric_cols = df.select_dtypes(include='number').columns
    categorical_cols = [
```

```
    col for col in df.columns
    if (
        df[col].dtype == 'object'
        or isinstance(df[col].dtype, pd.CategoricalDtype)
    )
    and not col.lower().startswith('date')
]

    # Combine both sets of columns for plotting
    plot_cols = list(numeric_cols) + categorical_cols
    n_cols = 3
    n_rows = (len(plot_cols) + n_cols - 1) // n_cols

    # Subplot grid for our graphs
    fig, axes = plt.subplots(n_rows, n_cols, figsize = (20, 10 * n_rows))
    axes = axes.flatten()

    # Loop through columns and choose appropriate plot
    for i, col in enumerate(plot_cols):
        ax = axes[i]
        if col in numeric_cols: # Plot numerical columns as histograms
            sns.histplot(df[col], bins=20, ax=ax)
            ax.set_title(f'Histogram of {col}')
        else:
            counts = df[col].value_counts()
            sns.barplot(x=counts.index, y=counts.values, ax=ax) # Plot␣
↪categorical columns as bar plots
            ax.set_title(f'Bar Plot of {col}')
            ax.set_xlabel(col)
            ax.set_ylabel('Count')
            ax.tick_params(axis='x', rotation=45)

    # Delete unused subplots
    for j in range(i + 1, len(axes)):
        fig.delaxes(axes[j])

    # Show plots
    plt.tight_layout()
    plt.show()

    # Transform the df dataframe fully numeri
    df_numeric = df.copy()
    # Find categorical columns again, including 'store'
    categorical_cols = [
        col for col in df_numeric.columns
        if (
            df_numeric[col].dtype == 'object'
```

```
            or isinstance(df_numeric[col].dtype, pd.CategoricalDtype)
            or col.lower() == 'store'
        )
        and not col.lower().startswith('date')
    ]
    df_numeric = pd.get_dummies(df_numeric, columns=categorical_cols,␣
↪drop_first=True) # One-hot encode categorical columns
    for col in df_numeric.columns:
        df_numeric[col] = pd.to_numeric(df_numeric[col], errors='coerce')
```

First 10 instances from the dataset: features.csv

	Store	Date	Temperature	Fuel_Price	MarkDown1	MarkDown2	\
0	1	2010-02-05	42.31	2.572	NaN	NaN	
1	1	2010-02-12	38.51	2.548	NaN	NaN	
2	1	2010-02-19	39.93	2.514	NaN	NaN	
3	1	2010-02-26	46.63	2.561	NaN	NaN	
4	1	2010-03-05	46.50	2.625	NaN	NaN	
5	1	2010-03-12	57.79	2.667	NaN	NaN	
6	1	2010-03-19	54.58	2.720	NaN	NaN	
7	1	2010-03-26	51.45	2.732	NaN	NaN	
8	1	2010-04-02	62.27	2.719	NaN	NaN	
9	1	2010-04-09	65.86	2.770	NaN	NaN	

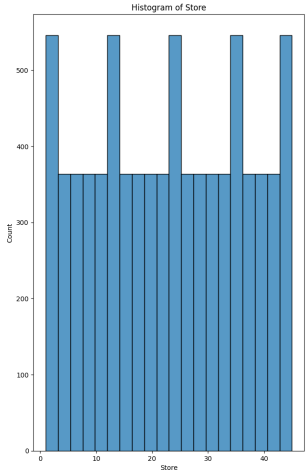
	MarkDown3	MarkDown4	MarkDown5	CPI	Unemployment	IsHoliday
0	NaN	NaN	NaN	211.096358	8.106	False
1	NaN	NaN	NaN	211.242170	8.106	True
2	NaN	NaN	NaN	211.289143	8.106	False
3	NaN	NaN	NaN	211.319643	8.106	False
4	NaN	NaN	NaN	211.350143	8.106	False
5	NaN	NaN	NaN	211.380643	8.106	False
6	NaN	NaN	NaN	211.215635	8.106	False
7	NaN	NaN	NaN	211.018042	8.106	False
8	NaN	NaN	NaN	210.820450	7.808	False
9	NaN	NaN	NaN	210.622857	7.808	False

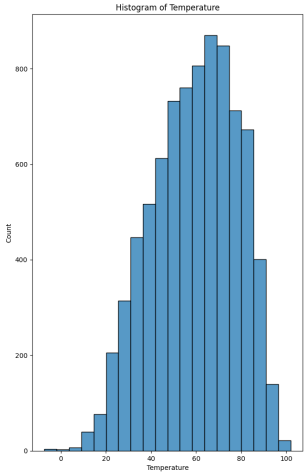
Mean and Standard Deviation from the dataset: features.csv

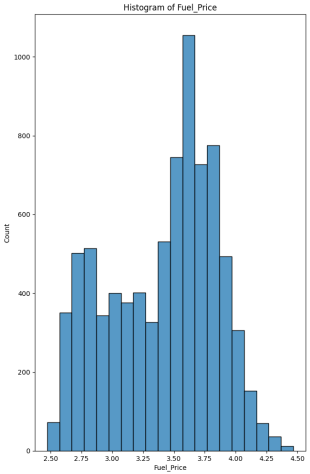
	Store	Temperature	Fuel_Price	MarkDown1	MarkDown2	\
mean	23.000000	59.356198	3.405992	7032.371786	3384.176594	
std	12.987966	18.678607	0.431337	9262.747448	8793.583016	

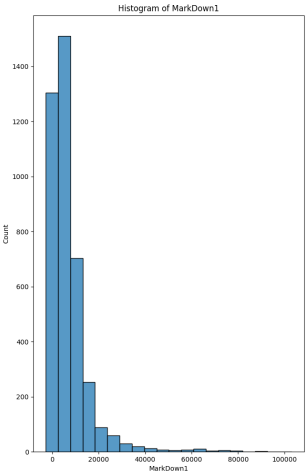
	MarkDown3	MarkDown4	MarkDown5	CPI	Unemployment
mean	1760.100180	3292.935886	4132.216422	172.460809	7.826821
std	11276.462208	6792.329861	13086.690278	39.738346	1.877259

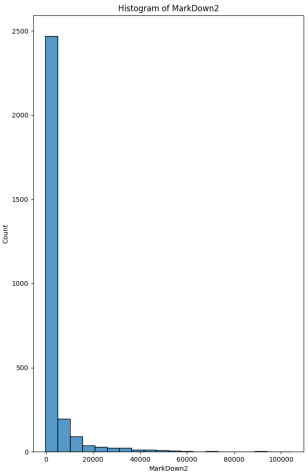
Distributions for numerical and categorical columns: features.csv

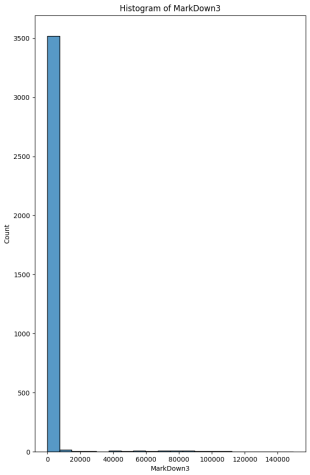

Histogram of Store
Count
Store

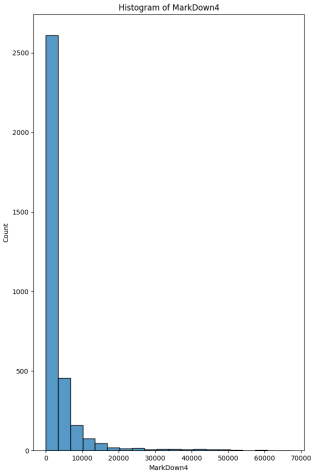

Histogram of Temperature
Count
Temperature

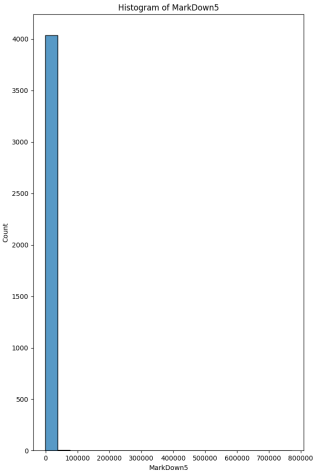

Histogram of Fuel_Price
Count
Fuel_Price

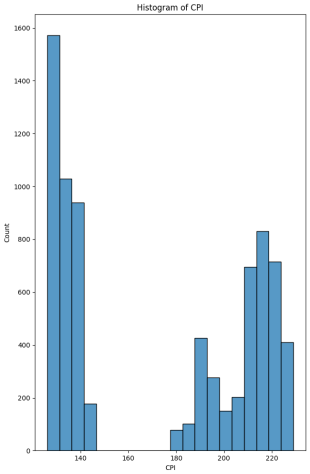

Histogram of MarkDown1
Count
MarkDown1

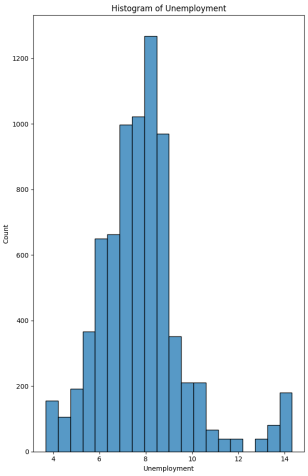

Histogram of MarkDown2
Count
MarkDown2


Histogram of MarkDown3
Count
MarkDown3


Histogram of MarkDown4
Count
MarkDown4


Histogram of MarkDown5
Count
MarkDown5


Histogram of CPI
Count
CPI


Histogram of Unemployment
Count
Unemployment

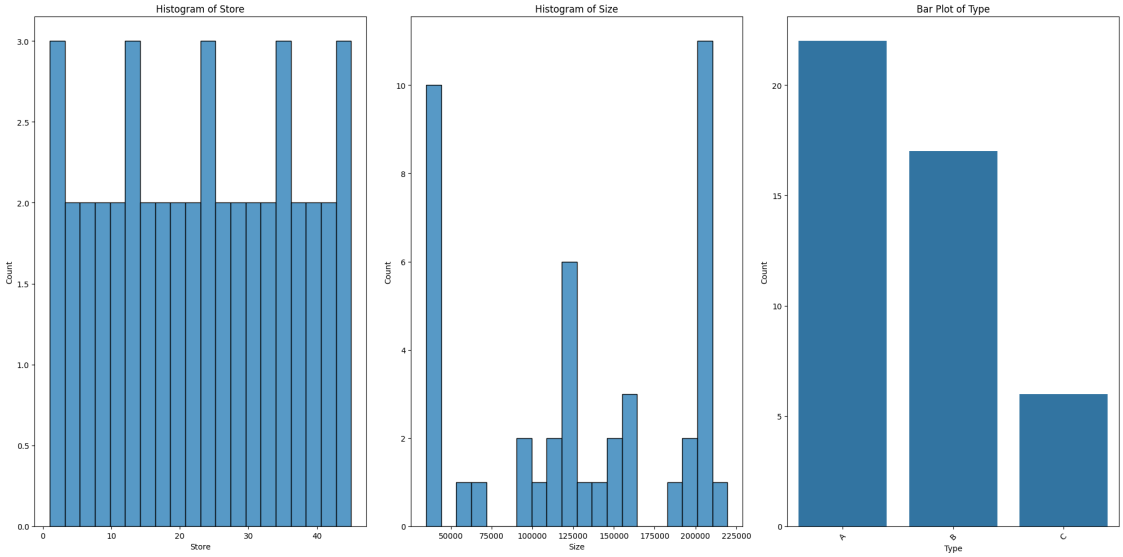
First 10 instances from the dataset: stores.csv

	Store	Type	Size
0	1	A	151315
1	2	A	202307
2	3	B	37392
3	4	A	205863
4	5	B	34875
5	6	A	202505
6	7	B	70713
7	8	A	155078
8	9	B	125833
9	10	B	126512

Mean and Standard Deviation from the dataset: stores.csv

	Store	Size
mean	23.000000	130287.600000
std	13.133926	63825.271991

Distributions for numerical and categorical columns: stores.csv



First 10 instances from the dataset: sales.csv

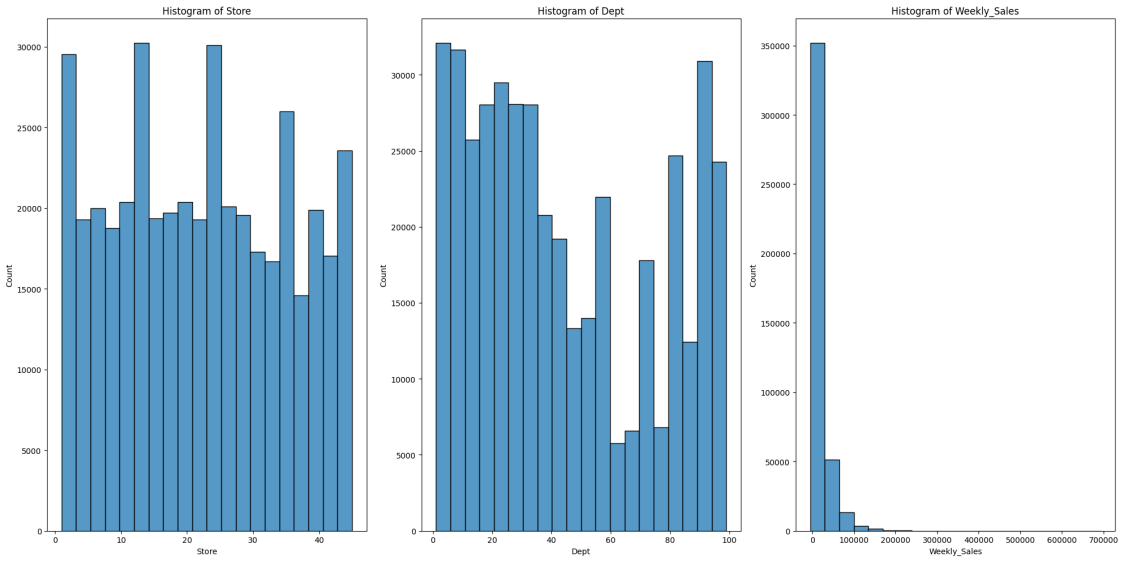
	Store	Dept	Date	Weekly_Sales	IsHoliday
0	1	1	2010-02-05	24924.50	False
1	1	1	2010-02-12	46039.49	True
2	1	1	2010-02-19	41595.55	False
3	1	1	2010-02-26	19403.54	False

```
4       1     1  2010-03-05       21827.90      False
5       1     1  2010-03-12       21043.39      False
6       1     1  2010-03-19       22136.64      False
7       1     1  2010-03-26       26229.21      False
8       1     1  2010-04-02       57258.43      False
9       1     1  2010-04-09       42960.91      False
```

```
Mean and Standard Deviation from the dataset: sales.csv
```

```
             Store       Dept  Weekly_Sales
mean    22.200546  44.260317  15981.258123
std     12.785297  30.492054  22711.183519
```

```
Distributions for numerical and categorical columns: sales.csv
```



1.2 2. Visualize Data

[ ]:
```
#
```

1.3 3. Clean Data

[231]:
```
#
```

1.4 4. Identify correlated variables

[232]:
```
#
```

1.5 5. Summary