To apply smoothing techniques to our dataset, lets focus on two common methods: the Moving Average and Exponential Smoothing. These methods are useful for reducing noise, especially in time-series data, but can be applied to various types of sequential data or to smooth individual features in dataset.

Ensure pandas is installed in your environment

In [ ]:
```
pip install pandas
```

```
Requirement already satisfied: pandas in c:\programdata\anaconda3\envs\steel_strengt
h\lib\site-packages (2.2.1)
Requirement already satisfied: numpy<2,>=1.26.0 in c:\programdata\anaconda3\envs\ste
el_strength\lib\site-packages (from pandas) (1.26.4)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\elena\appdata\roam
ing\python\python312\site-packages (from pandas) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in c:\programdata\anaconda3\envs\steel_s
trength\lib\site-packages (from pandas) (2024.1)
Requirement already satisfied: tzdata>=2022.7 in c:\programdata\anaconda3\envs\steel
_strength\lib\site-packages (from pandas) (2024.1)
Requirement already satisfied: six>=1.5 in c:\users\elena\appdata\roaming\python\pyt
hon312\site-packages (from python-dateutil>=2.8.2->pandas) (1.16.0)
Note: you may need to restart the kernel to use updated packages.
```

Smoothing Techniques Implementation Moving Average Smoothing This technique smoothens the data by replacing each data point with the average of the adjacent data points defined within a window size.

In [ ]:
```
print(data.columns)
```

```
Index(['c', 'mn', 'si', 'cr', 'ni', 'mo', 'v', 'n', 'nb', 'co', 'w', 'al',
       'ti', 'c_smoothed_ma'],
      dtype='object')
```

In [ ]:
```
import pandas as pd

# Load the dataset
data = pd.read_csv('C:\\Users\\Elena\\Documents\\GitHub\\steel_strength\\metals_dat

# Choose a column to smooth, let's say 'x1' is your target column
# Adjust the window size according to your needs
window_size = 3
data['c_smoothed_ma'] = data['c'].rolling(window=window_size).mean()

# Display the original and smoothed data
print(data[['c', 'c_smoothed_ma']].head())
```

```
      c  c_smoothed_ma
0  0.02            NaN
1  0.18            NaN
2  0.00       0.066667
3  0.01       0.063333
4  0.01       0.006667
```