

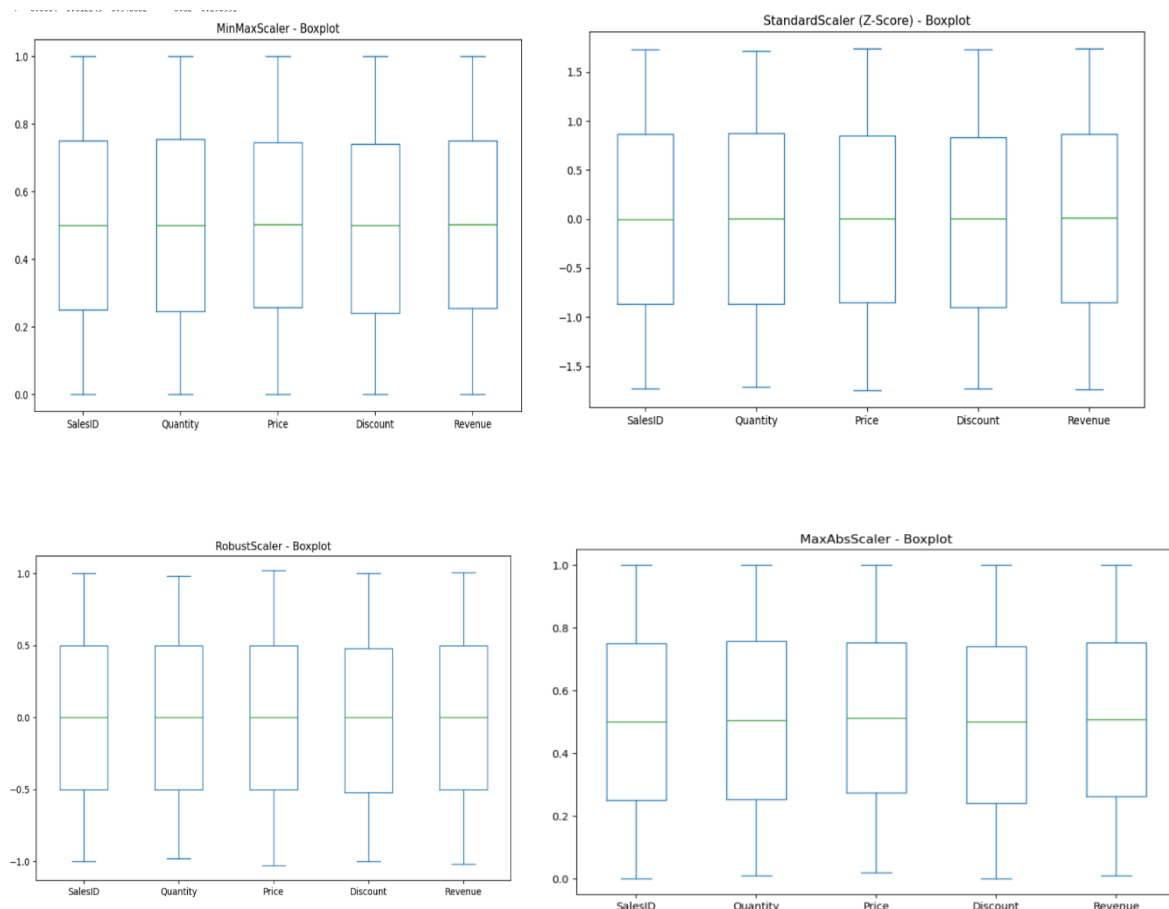
# Task 01 - Data Normalization & Z-Score

- This report demonstrates data normalization techniques applied to a synthetic Sales dataset containing 10,000 rows.

## # Techniques Applied:

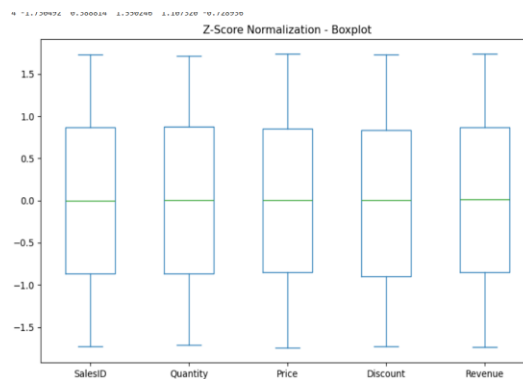
- 1 **Min-Max Normalization:** Scales values to a fixed range [0, 1].  
Formula:  $(x - \min) / (\max - \min)$
- 2 **Z-Score Normalization (Standardization):** Transforms data to have mean = 0 and standard deviation = 1.  
Formula:  $(x - \mu) / \sigma$
- 3 **Robust Normalization:** Uses median and interquartile range to reduce the effect of outliers.
- 4 **MaxAbs Normalization:** Scales values by dividing by the maximum absolute value.

## # Boxplot For Techniques



## # Mean Centering with Z-Score:

- Performed using sklearn's StandardScaler with mean centering enabled. This ensures each feature has a mean of 0, which improves model performance in machine learning algorithms sensitive to scale.



## # Observations:

- 1 After Min-Max scaling, all values are between 0 and 1.
- 2 Z-Score normalization ensures each feature is centered and standardized.
- 3 Robust scaling reduces the effect of outliers compared to Min-Max scaling.
- 4 MaxAbs scaling works well for sparse datasets by scaling between -1 and 1.