# 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 - μ) / σ

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.

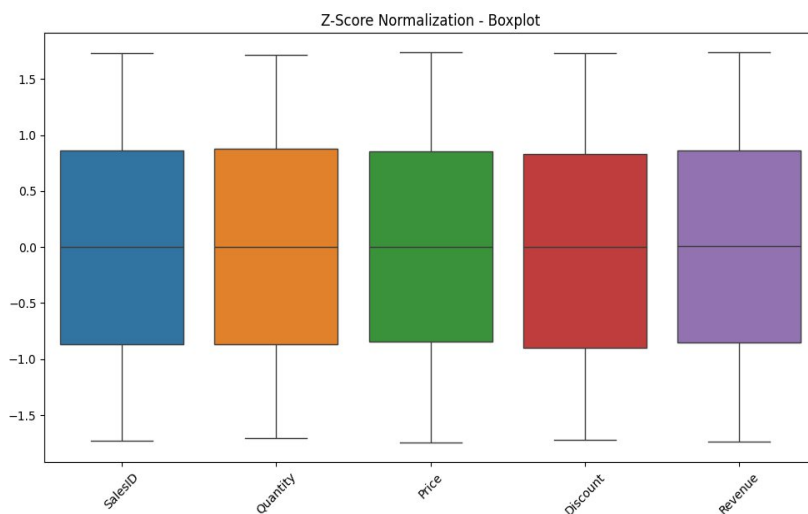## Boxplot For Normalization Techniques :
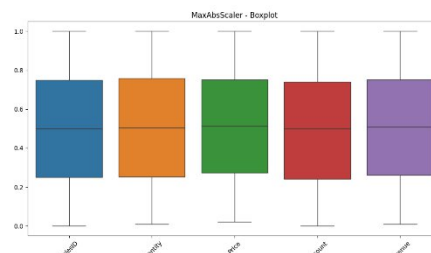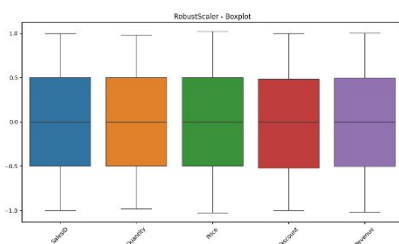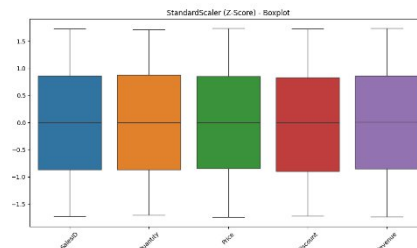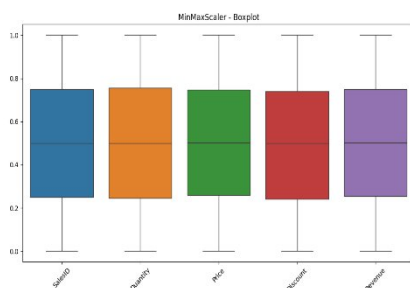
kdeplot For All Normalization Techniues:
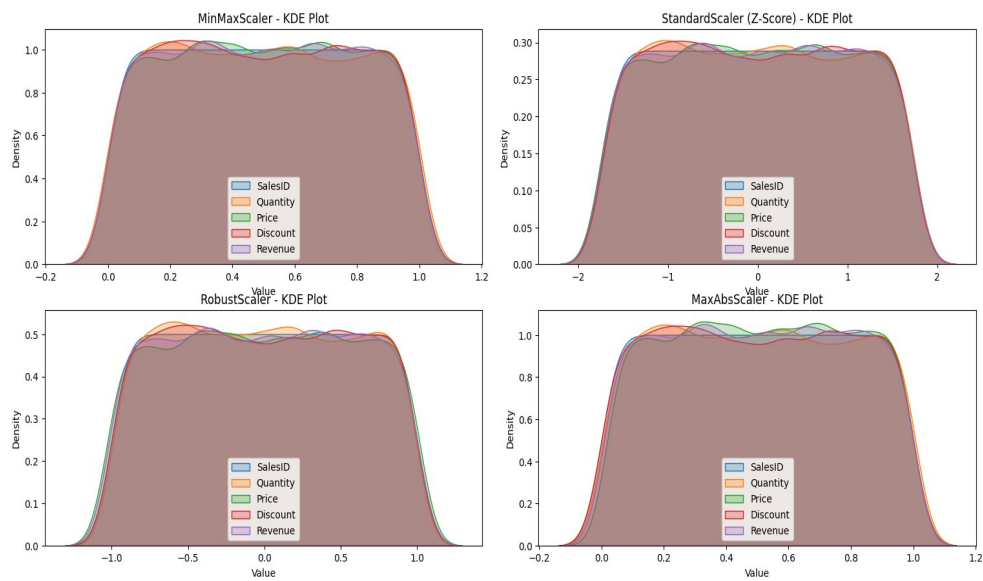
Mean Centering with Z-Score:

- 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.

BoxPlot For Z-Score Normalization:

kdeplot For All Normalization Techniues:

Z-Score Normalization - KDE Plot
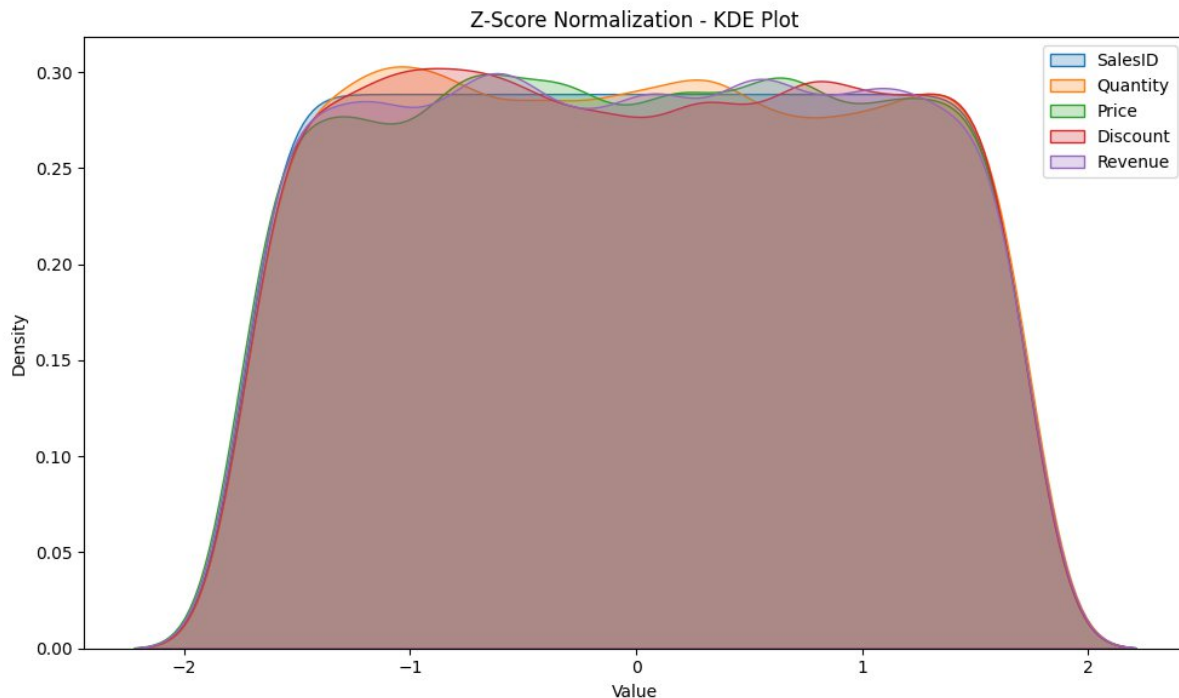
Observations:

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.