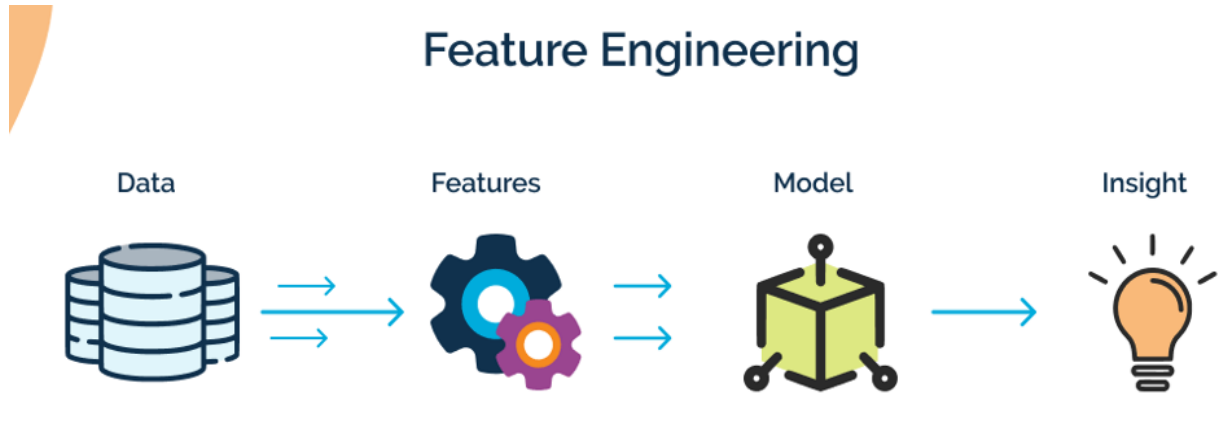


AI Task

1. Feature Engineering.

Description: learn all techniques of Feature Engineering and do examples regarding every technique.

- Feature Engineering is one of the most important steps in the data science and machine learning pipeline. It involves creating, transforming, selecting, or extracting features (variables) from basic raw data to enhance the performance of machine learning models.



➤ Feature Engineering Techniques:

1) Missing Value Imputation: It handles missing data by filling or dropping.

- **Techniques:**

- Mean/Median/Mode imputation
- Forward/Backward fill
- Predictive imputation
- Dropping missing values

2) Encoding Categorical Variables: This technique converts categorical values into numerical values.

- **Techniques:**

- Label Encoding
- Binary Encoding
- One-Hot Encoding
- Target Encoding

3) Feature Scaling (Normalization/Standardization): Brings features to the same scale.

- **Techniques:**

- Standard Scaling (Z-score)
- MinMax Scaling
- Robust Scaling

4) Feature Transformation: This technique applies mathematical transformations to reduce skewness or highlight patterns.

- **Techniques:**

- a. Log / Square Root / Box-Cox transformations
- b. Power transformation

5) Feature Creation: This technique creates new features from existing features.

6) Discretization / Binning: Convert continuous variables into discrete buckets.

- **Techniques:**

- a. Custom binning
- b. Equal-width binning
- c. Equal-frequency binning

7) Interaction Features: This technique combines features to capture relationships.

8) Polynomial Features: Add interaction and polynomial terms.

9) Datetime Features: Extract components like day, month, year from date fields.

10) Text Feature Engineering: Extract features from text data.

- **Techniques:**

- a. Bag of Words
- b. TF-IDF
- c. Word embeddings
- d. Count of words, characters, etc.

11) Feature Selection Techniques: This technique chooses only relevant features to improve model performance.

- **Techniques:**

- a. Variance Threshold
- b. Correlation matrix
- c. Lasso Regularization
- d. Recursive Feature Elimination (RFE)