* Feature Engineering

Feature learning is the process of using domain knowledge to extract features from raw data. These features can be used to improve the performance of machine learning algorithm.

```
                    Feature
                  Engineering
        ┌─────────────┬──────────┬─────────┐
        ↓             ↓          ↓         ↓
     Feature       Feature    Feature   Feature
  Transformation   Construcⁿ  Selectⁿ   Extractⁿ
```

→ Missing Value
Imputation

→ Handling Categorical   [One - Hot code]
Features

→ Outlier Detection

→ Feature Scaling.   col1   col2   ⌒ new colᵐ

→ Feature Construction like [length, Breadth] [Area]

What is Feature Scaling?
Feature scaling is a technique to standar-dize the independent features presents in the data in a fixed range.

Why do we need feature scaling?

Let x be the salary & y be age

Ex: x_1 & y_1 are in row 2, x_2 & y_2 are in row 9

$(x_2 - x_1)^2 = (83000 - 48000)^2 = 1225\,000000$

$(y_2 - y_1)^2 = (50 - 27)^2 = 529$

KNN will give poor performances.

Types of feature scaling?

1] Standardization
(Also called as Z-score Normalizat^n)

2] Normalization

Standardization involves transforming data so that it has a mean (average) of 0 and a standard deviation of 1.

$$\text{Standardized (Z)}\ \text{Value} = \frac{(X - Mean)}{Standard\ Deviation}$$

where,

x is original data point $[\mu = 0,\ \sigma = 1]$

Necessary Standardizat^n for Algorithms

1. K-Means
2. K-Nearest-Neighbours
3. Principal Component Analysis (PCA)
4. Artificial Neural Network
5. Gradient Descent