SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade (Cycle-III)
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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECT303-ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

III YEAR/ V SEMESTER

UNIT 2 – SUPERVISED LEARNING

TOPIC – LINEAR REGRESSION

Linear Regression

- **Machine Learning** is a branch of Artificial intelligence that focuses on the development of algorithms and statistical models that can learn from and make predictions on data.
- **Linear regression** is also a type of machine-learning algorithm more specifically a **supervised machine-learning algorithm** that learns from the labelled datasets and maps the data points to the most optimized linear functions. which can be used for prediction on new datasets.

Linear Regression

- First of we should know what supervised machine learning algorithms is. It is a type of machine learning where the algorithm learns from labelled data.
- Labeled data means the dataset whose respective target value is already known. Supervised learning has two types:
    - **Classification**
    - **Regression**

Linear Regression

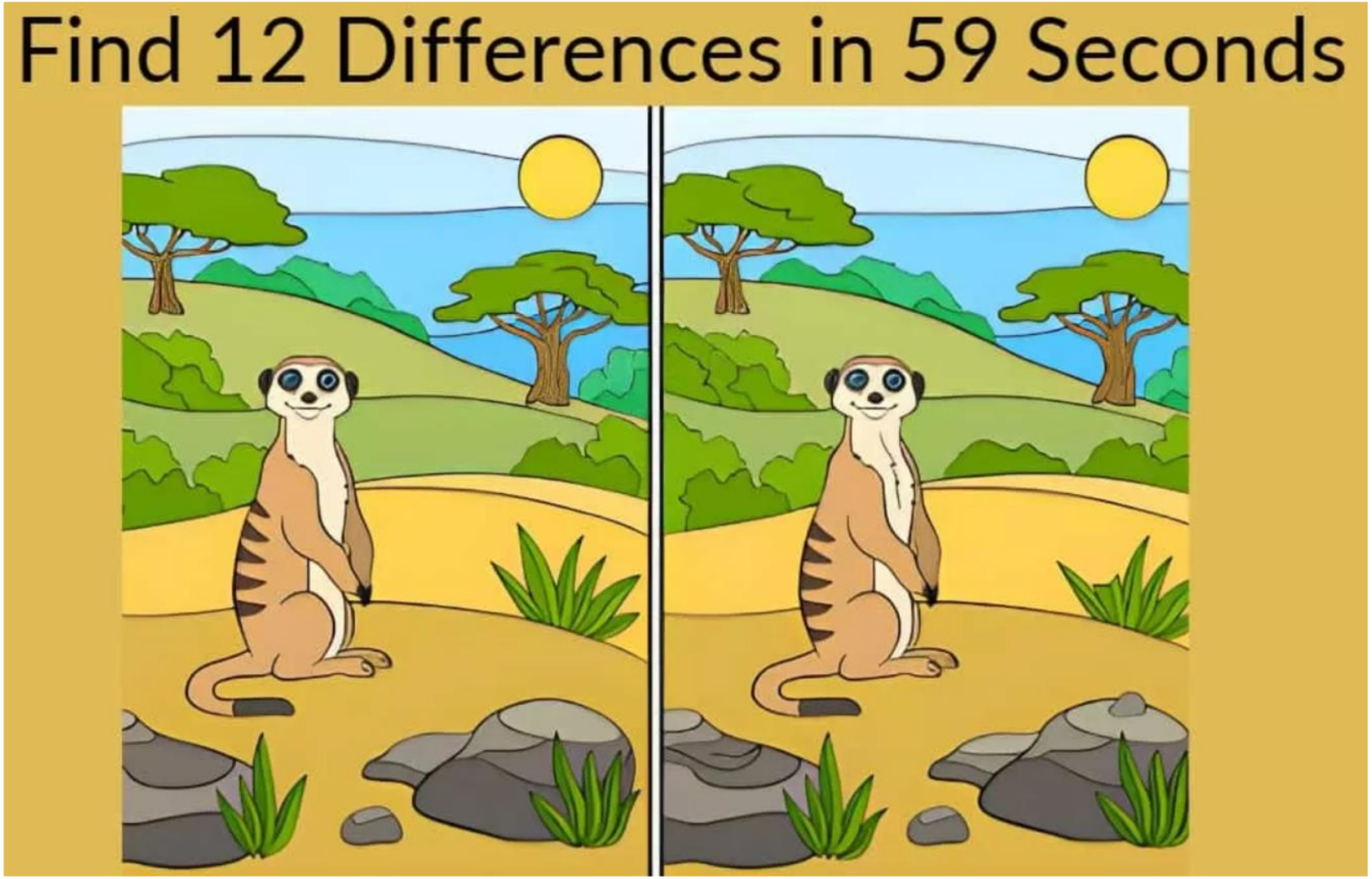
Classification:

It predicts the class of the dataset based on the independent input variable. Class is the categorical or discrete values. like the image of an animal is a cat or dog?

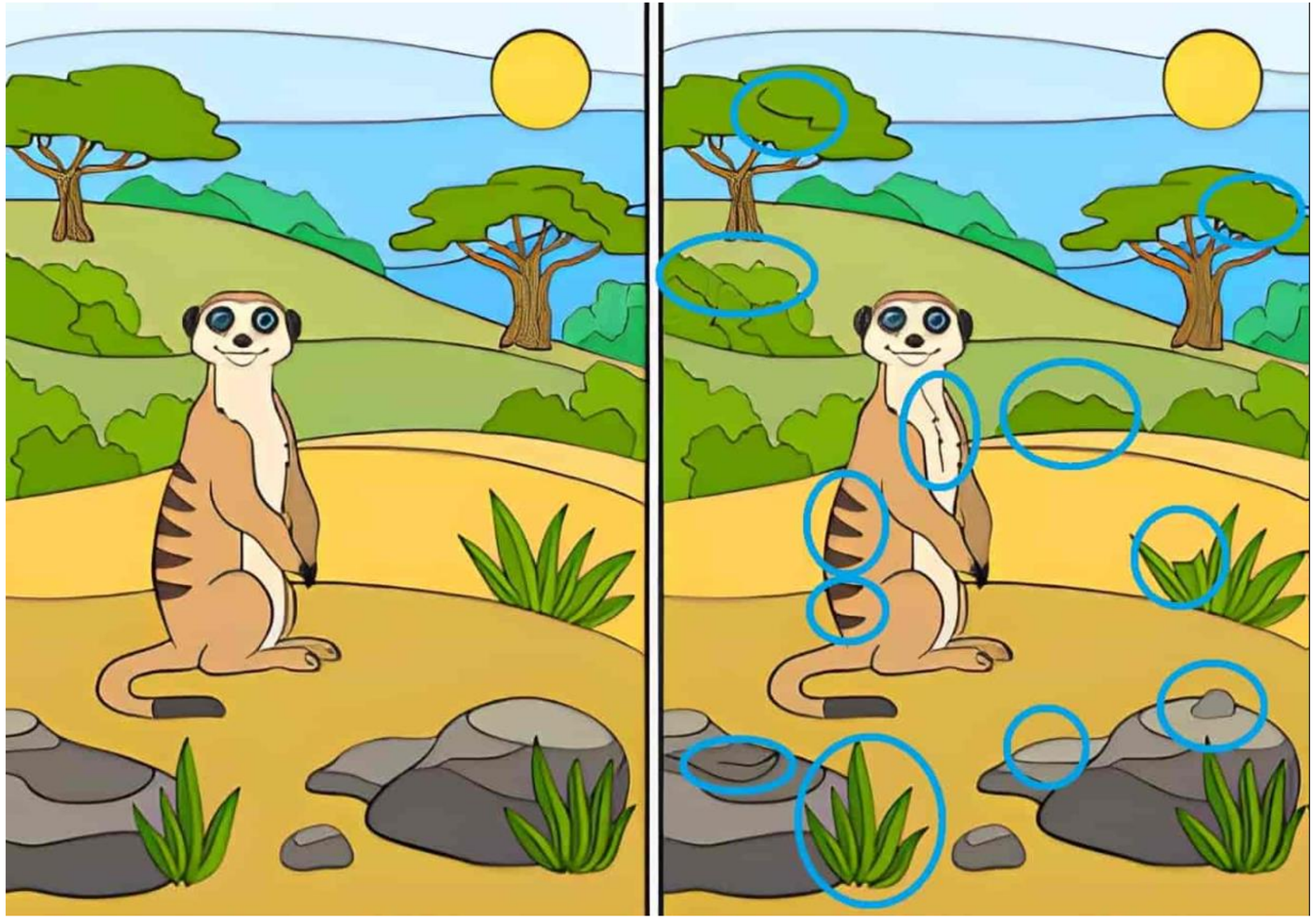
Regression:

It predicts the continuous output variables based on the independent input variable. like the prediction of house prices based on different parameters like house age, distance from the main road, location, area, etc.

Classroom Activity



Classroom Activity



Classroom Activity

Classroom Activity

What is Linear Regression?

- Linear regression is a type of supervised machine learning algorithm that computes the linear relationship between the dependent variable and one or more independent features by fitting a linear equation to observed data.
- When there is only one independent feature, it is known as Simple Linear Regression, and when there are more than one feature, it is known as Multiple Linear Regression.
- Similarly, when there is only one dependent variable, it is considered Univariate Linear Regression, while when there are more than one dependent variables, it is known as Multivariate Regression.

Why Linear Regression is important?

- The interpretability of linear regression is a notable strength. The model's equation provides clear coefficients that elucidate the impact of each independent variable on the dependent variable, facilitating a deeper understanding of the underlying dynamics.
- Its simplicity is a virtue, as linear regression is transparent, easy to implement, and serves as a foundational concept for more complex algorithms.

Why Linear Regression is important?

- Linear regression is not merely a predictive tool; it forms the basis for various advanced models. Techniques like regularization and support vector machines draw inspiration from linear regression, expanding its utility.
- Additionally, linear regression is a cornerstone in assumption testing, enabling researchers to validate key assumptions about the data.

Types of Linear Regression

There are two main types of linear regression:

Simple Linear Regression

This is the simplest form of linear regression, and it involves only one independent variable and one dependent variable. The equation for simple linear regression is:

$y=\beta0+\beta1X$ $y=\beta0+\beta1X$

where:

- Y is the dependent variable
- X is the independent variable
- β0 is the intercept
- β1 is the slope

Types of Linear Regression

Multiple Linear Regression

This involves more than one independent variable and one dependent variable.

The equation for multiple linear regression is:

$y=\beta0+\beta1X1+\beta2X2+\ldots\ldots\beta nXny=\beta0+\beta1X1+\beta2X2+\ldots\ldots\beta nXn$

where:

- Y is the dependent variable
- X1, X2, …, Xn are the independent variables
- β0 is the intercept
- β1, β2, …, βn are the slopes

Types of Linear Regression

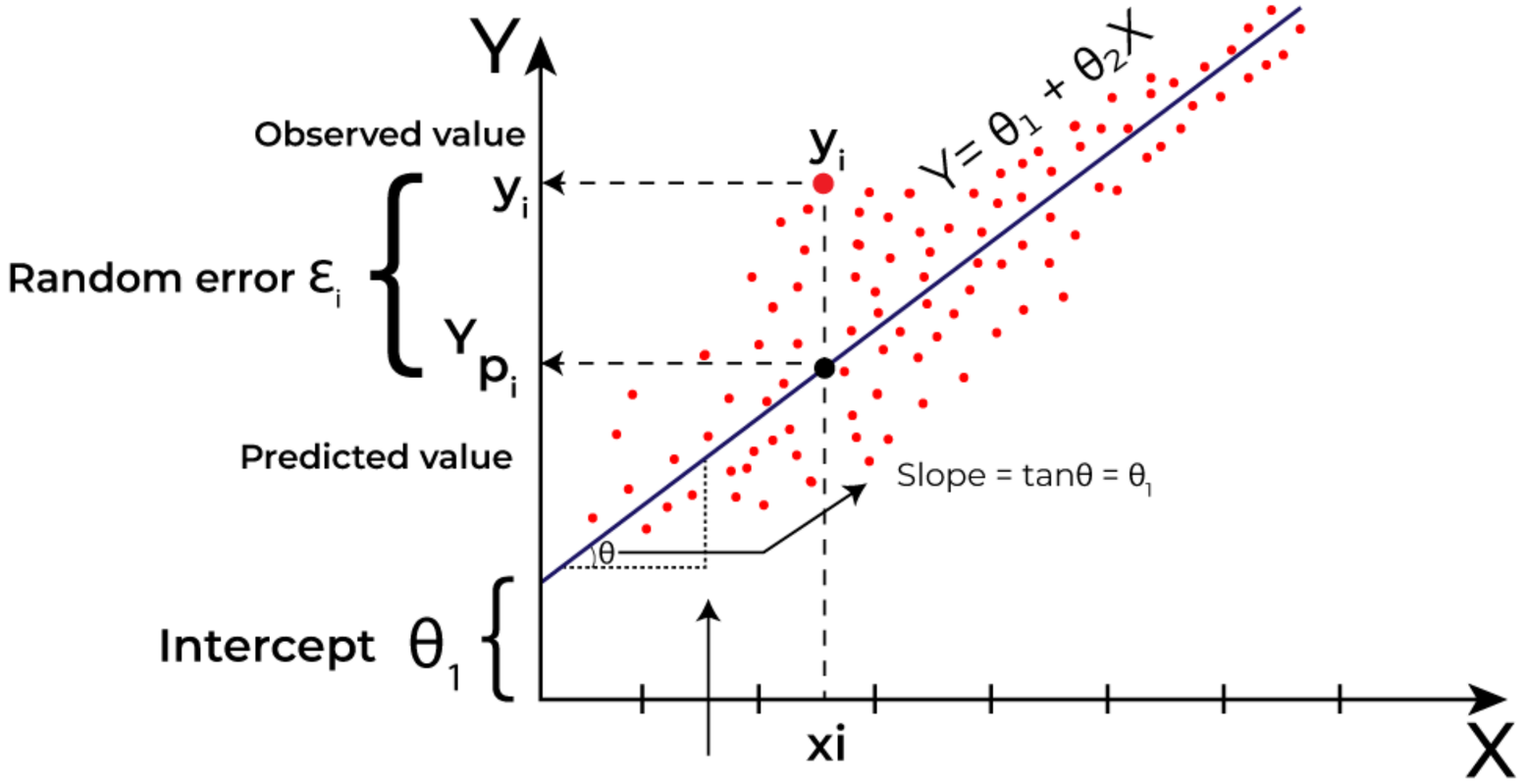
The goal of the algorithm is to find the best Fit Line equation that can predict the values based on the independent variables.

- In regression set of records are present with X and Y values and these values are used to learn a function so if you want to predict Y from an unknown X this learned function can be used.
- In regression we have to find the value of Y, So, a function is required that predicts continuous Y in the case of regression given X as independent features.

What is the Best Fit Line?

- Our primary objective while using linear regression is to locate the best-fit line, which implies that the error between the predicted and actual values should be kept to a minimum. There will be the least error in the best-fit line.
- The best Fit Line equation provides a straight line that represents the relationship between the dependent and independent variables. The slope of the line indicates how much the dependent variable changes for a unit change in the independent variable(s).

What is the Best Fit Line?



What is the Best Fit Line?

- Here Y is called a dependent or target variable and X is called an independent variable also known as the predictor of Y.
- There are many types of functions or modules that can be used for regression. A linear function is the simplest type of function.
- Here, X may be a single feature or multiple features representing the problem.
- Linear regression performs the task to predict a dependent variable value (y) based on a given independent variable (x). Hence, the name is Linear Regression. In the figure above, X (input) is the work experience and Y (output) is the salary of a person. The regression line is the best-fit line for our model.

Assessment

Evaluate the any Regression model in Machine learning by suitable metrics.

THANK YOU