**📊 What is Regression Analysis?**

**Regression analysis** is a **statistical method** used to model the relationship between one **dependent variable** (target) and one or more **independent variables** (features).

It helps us:

* Understand how variables are related
* Predict the value of the dependent variable
* Identify trends and patterns

**🧠 Example:**

Predicting a person's **weight** based on their **height**.

* Height = Independent variable (input)
* Weight = Dependent variable (output)

**🧮 Basic Formula (Linear Regression)**

**y=β0​+β1​x+ϵ**

* **y**: Dependent variable (output)
* **x**: Independent variable (input)
* **β**0​: Intercept
* **β**1​: Slope (coefficient)
* **ϵ** epsilon: Error term (difference between actual and predicted)

**🧩 Types of Regression Analysis**

| **Type** | **Use Case** |
| --- | --- |
| **Linear Regression** | Predict continuous values using a straight-line relationship |
| **Multiple Regression** | Use multiple features to predict a continuous outcome |
| **Polynomial Regression** | Fit a curved relationship (non-linear) between features and target |
| **Logistic Regression** | Classify data (e.g., yes/no, 0/1) – even though it’s called regression |
| **Ridge/Lasso Regression** | Add regularization to prevent overfitting in linear models |

**✅ What Regression Analysis Is Used For**

* Predicting sales, prices, stock trends
* Risk analysis in finance
* Estimating effects of advertising
* Understanding how variables affect outcomes

**📌 Key Terms**

| **Term** | **Meaning** |
| --- | --- |
| **Dependent Variable** | What you’re trying to predict (target) |
| **Independent Variable(s)** | Features or inputs that influence the target |
| **Coefficients** | The weights assigned to each feature |
| **Residual** | The difference between actual and predicted values |
| **R² Score** | Measures how well the model fits the data (closer to 1 = better) |