**[Que – 25] - Discuss the 4 differences between correlation and regression.**

Correlation and regression are both statistical techniques used to analyze relationships between variables, but they serve different purposes and have distinct characteristics. Here are four key differences between correlation and regression:

1. **Purpose and Nature**:
   * **Correlation**: Measures the strength and direction of the linear relationship between two variables. It determines whether and how strongly two variables are related, but it does not imply causation.
   * **Regression**: Predicts the value of one variable (dependent variable) based on the value of another variable or variables (independent variables). Regression analysis aims to understand how the dependent variable changes as the independent variables change.
2. **Output**:
   * **Correlation**: Results in a single value known as the correlation coefficient (e.g., Pearson's r, Spearman's ρ, Kendall's τ). This coefficient ranges from -1 to +1, indicating the strength and direction of the relationship between variables.
   * **Regression**: Produces an equation of the form Y=a+bX+ϵ, where Y is the dependent variable, X is the independent variable, a is the intercept, b is the slope coefficient (indicating the effect of X on Y), and ϵ is the error term. Regression provides estimates of the coefficients a and b that best fit the data.
3. **Application**:
   * **Correlation**: Used to summarize and describe the relationship between variables. It helps in understanding associations in data and can guide further investigation.
   * **Regression**: Used for prediction and forecasting. It allows us to predict the outcome of one variable based on the input of another variable or variables. Regression analysis is widely used in fields such as economics, finance, and social sciences for modeling and prediction purposes.
4. **Directionality**:
   * **Correlation**: Symmetrical in nature; the correlation coefficient between X and Y is the same as that between Y and X.
   * **Regression**: Asymmetrical; there is a distinction between the dependent variable (outcome) and the independent variables (predictors). Regression analysis focuses on how changes in the independent variables affect changes in the dependent variable.