**UNIT-I**

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| **Unit-Multivariate Normal Distribution:**  **Content:** Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters. |
| The above result is given for two variables X1 and X2 where each variable follows multivariate normal distribution.  **Bivariate Case:**  **Conditional Density of a Bivariate Normal Distribution:**  The conditional density of X1, given that X2 = x2 for any bivariate distribution is defined by    Where  is marginal distribution of X2. |
| **Result:** Ifis the bivariatenormal density, then    **Therefore the conditional distribution of two variables, each following bivariate normal distribution is given as follows:** |
| **Relation of conditional distribution to Regression model:**  If the joint distribution of  is a normal distribution, then    Which means that the conditional mean of y given x is a linear function of x. In other words, the mean of conditional distribution represents a linear regression equation. The terms α and β are expressed in terms of expectations .  **This is explained as given below:**  Consider the bivariate distribution with PDF as    Where,    The function Q can also be written as    Also,    Hence, we can write    Where    **With**    The above equation is the linear regression equation which specifies the value of  in terms of x and the variance of y about its conditional expectation is given by .  Note: |
| Example :1 Conditional Distribution of weight given height for college men.    Find the mean and variance of the conditional distribution.  Sol: |
| Ex.2 |
| Sol: 2(a)    2(b)    Therefore, by using          2(c) |
| **Estimation of parameters:**    **MLE of mean vector:**    **MLE of Covariance matrix:** |