

Discriminative v.s Generative Models :

$$\begin{aligned} P(x; y) &= P(x, y) \\ P(y|x) &= P(x, y) \end{aligned}$$

⇒ Discriminative Models are used in ML & mostly for classification and regression tasks whereas generative Models are used to generate new data by observing real system data.

→ Discriminative models :-

In Discriminative models, we use Conditional prob. to calculate the prob. of dependent variable given independent variable.

eg: In logistic regression, let dependent variable y is class label that we want to predict i.e. ($y=0$ or $y=1$), given independent variable x . So, here we calculate $P(y/x)$.

→ Generative model :

In generative model, we use joint prob. distribution function of dependent variable y and independent x i.e. we calculate $P(x, y)$ occurring together by considering their joint probability. In generative model we observed data, we model system based on assumptions of stochastic phenomena. We understand the observed data & estimate the distribution parameter by studying distribution of observed data. Then this estimated parameters are used to build generative model & generate new data which will look like real or observed data.

eg: let we have observed data in pair (x, y)
 $(1, 0), (1, 0), (2, 0), (2, 1)$ & we want to calculate prob. of $x=1$ and $y=0$.