

Slides Week 38

Hierarchical Models and Mixture Distributions

$$X|Y \sim B(Y, p)$$

$$Y|\Lambda \sim \text{Po}(\Lambda)$$

$$\Lambda \sim \exp(\beta)$$

$$E[X] = E[E[X|Y]]$$

$$\text{Var}[X] = E[\text{Var}[X|Y]] + \text{Var}[E[X|Y]]$$

Holders Inequality

$$|E[XY]| \leq E|XY| \leq \left(E|X|^p\right)^{\frac{1}{p}} \left(E|X|^q\right)^{\frac{1}{q}}, \quad \frac{1}{p} + \frac{1}{q} = 1$$

Cauchy- Schwartz Inequality

$$|E(X - \mu_x)(Y - \mu_Y)| \leq \left[E(X - \mu_x)^2\right]^{1/2} \left[E(Y - \mu_Y)^2\right]^{1/2}$$