Discussion 1

1.1.1

Give a formal statement of the following models identifying the probability laws of the data and the parameter space. State whether the model in question is parametric or nonparametric.

(d) The number of eggs laid by an insect follows a Poisson distribution with unknown mean λ. Once laid, each egg has an unknown chance p of hatching and the hatching of one egg is independent of the hatching of the others. An entomologist studies a set of n such insects observing the number of eggs laid and the number of eggs hatching for each nest.

1.1.2

Are the following parametrizations identifiable? (Prove or disprove)

(b) The parametrization of Problem 1(d).

(c) The parametrization of Problem 1(d) if the entomologist observes *only* the number of eggs hatching but not the number of eggs laid in each case.

1.1.3

Which of the following parametrizations are identifiable? (Prove or disprove.)

(d) X_{ij}, $i = 1, \ldots, p$; $j = 1, \ldots, b$ are independent with $X_{ij} \sim N(\mu_{ij}, \sigma^2)$ where $\mu_{ij} = \nu + \alpha_i + \lambda_j$, $\theta = (\alpha_1, \ldots, \alpha_p, \lambda_1, \ldots, \lambda_d, \nu, \sigma^2)$ and P_θ is the distribution of $X_{11}, \ldots, X_{pb}$.

(e) Same as (d) with $(\alpha_1, \ldots, \alpha_p)$ and $(\lambda_1, \ldots, \lambda_b)$ restricted to the sets where $\sum_{i=1}^p \alpha_i = 0$ and $\sum_{j=1}^b \lambda_j = 0$.

1.1.6

Which of the following models are regular? (Prove or disprove)

(b) P_θ is the distribution of X when X is uniform on $\{0, 1, 2, \cdots, \theta\}$, $\Theta = \{1, 2, \cdots\}$.

(c) Suppose $X \sim N(\mu, \sigma^2)$. Let $Y = 1$ if $X \leq 1$ and $Y = X$ if $X > 1$. $\theta = (\mu, \sigma^2)$ and P_θ is the distribution of Y.