

The goal of this discussion section is to get familiar with maximizing likelihood.

Participation in discussion section counts as 5% of the grade. Completion of the worksheets counts as 20% of the grade. **Submit your worksheet work by April 14th at 2:59pm.**

1. Suppose that X is a discrete random variable with the following probability mass function:

X	0	1	2	3
P(X)	$\theta/3$	$2\theta/3$	$2(1-\theta)/3$	$(1-\theta)/3$

with $0 \leq \theta \leq 1$ is a parameter. The following 15 observations were taken from such a distribution: (3,0,2,1,3,2,1,0,2,1,3,2,1,0,0). We want to estimate the maximum likelihood estimate of θ .

- (a) Knowing that the Likelihood function is given by $F(\theta) = \prod_{i=1}^N P(X = x_i)$, given the observations x_1, \dots, x_N , write $F(\theta)$ using the 10 observations.
- (b) Write $L(\theta) = \log F(\theta)$ and find the maximum θ^* .
2. Let X_1, \dots, X_N be independent and identically distributed sample from a Poisson distribution with parameter λ . In other words

$$P(X = x|\lambda) = \frac{\lambda^x e^{-\lambda}}{x!}.$$

Find the Maximum Likelihood Estimate of the parameter λ (Consider given observations x_1, x_2, \dots, x_N).

3. Submit your work on Catcourses under the assignment **Worksheet 11 as a .pdf**.