

Categorical Data Analysis: HW 2

1. This exercise is similar to the one we did in class regarding the parameter π of the binomial distribution. Here, assume that y_1, \dots, y_n are i.i.d. from a Poisson distribution with mean μ .
 - (a) Find the MLE of μ and its standard error using likelihood theory.
 - (b) Find the Wald test statistic for testing $H_0 : \mu = \mu_0$ and indicate when to reject the null hypothesis.
 - (c) Find the formula for the Wald confidence interval for μ .
 - (d) Find the score test statistic for testing $H_0 : \mu = \mu_0$ and indicate when to reject the null hypothesis.
 - (e) Is there a closed formula for the score confidence interval for μ ? If yes, find it, if no, sketch a graph of how you would find it.
 - (f) Construct the likelihood ratio test for the null hypothesis $H_0 : \mu = \mu_0$ and indicate when to reject it.
 - (g) Last Thursday, I secretly monitored how often you and some of your friends logged on to Facebook over a 3 day period. The data are below. Consider this a random sample of all TU-Graz students. Based on these data,
 - i. test the hypothesis $H_0 : \mu = 10$ versus $H_0 : \mu \neq 10$.
 - ii. find the 95% Wald confidence interval for the average number of times students logged on to Facebook.

Student	Logins	Student	Logins
1	9	12	17
2	16	13	18
3	17	14	18
4	14	15	17
5	17	16	10
6	11	17	12
7	12	18	12
8	15	19	16
9	13	20	20
10	9	21	16
11	12		

2. Email me (before the class on Friday, Dec. 5th; my email is bklingen@williams.edu, use subject line: "LR interval") an R program that returns the lower and upper bound of the likelihood ratio confidence interval for the binomial proportion π . Use it to find the interval for $y = 7$ successes out of $n = 12$ trials.