MTH 372: Assignment I

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Instructions

- Use statistical software R for your codes and only basic in built functions are allowed.

- Due date is February 9, 2020 (6 p.m.). No late assignments will be accepted.

- Submit all of your work which include the report, codes, results and graphs.

- Follow the labelling method for your files.

1. (10 points) Generate a random sample of size 1000 from standard normal distribution.

   (a) Calculate the estimate of the unknown parameters using method of moments in R.

   (b) Find the maximum likelihood estimate of the unknown parameters in R.

   (c) Taking variance constant and equal to 1, plot the log likelihood for various values of mean.

   (d) Plot log likelihood functions for various values of mean and variance.

2. (5 points) The following data are the smiling times of a baby (in seconds). Assume that the smiling times follow Uniform $(0, \theta)$.
   10.4, 19.6, 18.8, 13.9, 17.8, 16.8, 21.6, 17.9,12.5, 11.1, 4.9, 12.8, 14.8, 22.8, 20.0, 15.9,16.3, 13.4,17.1,14.5, 19.0, 22.8, 1.3, 0.7, 8.9, 11.9, 10.9, 7.3, 5.9, 3.7, 17.9, 19.2, 9.8, 5.8, 6.9, 2.6, 5.8, 21.7, 11.8, 3.4, 2.1, 4.5, 6.3, 10.7, 8.9, 9.4, 9.4, 7.6, 10.0, 3.3, 6.7, 7.8, 11.6, 13.8, 18.6

   (a) Based on the data, what will be the maximum likelihood estimate.

   (b) Show graphically that the likelihood function attains maxima at the above estimate.

3. (5 points) Generate a random sample of size 1000 from Geometric $(p = 0.6)$.

   (a) Find the maximum likelihood estimate of the unknown parameter in R. Also mention the log likelihood of the corresponding estimate.

   (b) Show graphically your results in the above part. For that, plot log likelihood functions for various values of p.