

CSCI 350: Data Analytics
Spring 2017
HW#2: Inference with MME

Out: 2/22/2017
Due: 3/1/2017@11:59:59pm
MME for mean: 20 points
MME for variance: 20 points
Inference test: 20 points
Questions: 20 points

Total: 80 points

Goal

The purpose of this assignment is for you to gain experience with inference using Method of Moments Estimators (MME).

Assignment

In class, we discussed an example in MATLAB where we obtained samples from a simulated “sensor” whose data described the arrival of customers in a store. As such, we assumed the distribution that best described the data was the Poisson distribution. As we did not really know (or pretended not to know) the underlying parameter governing the ground truth distribution, we substituted this parameter with the sample mean \bar{X} . We then used the sample mean as the governing parameter for a Poisson distribution from which we collected samples.

In this assignment you will compute the Method of Moment Estimators for the parameters of a Normal distribution, then you will use these MME estimators to sample from a Normal distribution. Finally, you will compare the distribution of the original data to the samples that were generated using your MME estimators.

Your tasks will consist of

1. Mathematically formulate and solve for expressions for the MME estimators for parameters of the Normal distribution.
2. Create a “sensor” that, based on a Normal distribution, generates a data set. Assume your “sensor” generates temperatures with mean $\mu = 65$ and variance $\sigma^2 = 400$
3. Implement MATLAB code that computes the MME estimators for which you derived mathematical expressions.

4. Use your MATLAB MME estimators computed on the data set obtained from your “sensor” as replacements for the parameters in a Normal distribution. Sample from the Normal distribution that uses your MME estimators.
5. Compare the histogram of the sensor data with your sampled data (that used the MME). This will serve as your inference test.

Answer the following questions in written form (PDF or MS-Word).

1. How does your MME estimator impact your sampled data if there are a small number of sensor measurements?
2. How does the quality of your sampled data change as the number of sensor measurements increases?

Submission

- In a single document (MS-Word or PDF), Include your derivations of the MMEs for the Normal distribution and answers to the two questions.
- Include all of your MATLAB code
- Create a single ZIP archive file (no TAR, RAR, 7-ZIP, etc.) containing your document (MS-Word or PDF only) and all of your MATLAB code. Make sure to test your MATLAB code by unzipping the ZIP file and verifying that it runs. Code that does not run will receive a zero without review. Please name your ZIP file `FirstName_LastName.zip`.
- Submit your ZIP file via the Course Blackboard. Make sure to attach the ZIP file before you submit. If multiple submissions are made, only the latest one will be graded.

Note

Make sure you understand and are able to represent all of the mathematical steps involved in computing MME estimators. Full credit for the written work is given when you represent all mathematical steps. Make sure you include a single MS-Word or PDF document. Please do not have separate JPEG files if you include images of written work. Make sure to include the JPEG in the same single document containing your written work.

Submit your assignment via blackboard. This is a timed submission, so please ensure you have submitted on time. PDF or MS-Word documents are the only form of document that will be accepted. ZIP file is the only archive format that will be accepted. Please do not attach individual files. Your submission must be a single ZIP archive.