Guideline for report writing, Lab4 Bootstrap

August 30, 2017

For each assignment below, remember to

- State the task you are going to solve, using your own words.
- Include your full code in the appendix, make sure that it is well structured and that you have made comments.

Introduction, 1p

Write an introduction to the report. When we read the text, we will especially look for your description of *the aim of doing bootstrap and the general idea on how to reach this aim.* Make sure to use your own words so that we can follow your understanding. Also, point out the part of the bootstrap method/procedure that differs between non-parametric and parametric bootstrap.

Assignment 1, 0.5p

Theory and implementation

- State how the theoretical mean and variance for the gamma distribution are found, and also how the theoretical mean and variance for the statistic sample mean relates to the mean and variance for the distribution that the data is drawn from. Include also which (exact) distribution the sample mean should have in this case.
- Show your code for generating the data.

Results

- Show the results (histogram for a samples, the theoretical mean and variance for the used gamma distribution and the theoretical mean and variance for the estimator sample mean when using a sample size of 100 observations).

Assignment 2.1, 1.25p

Theory and implementation

- Describe how the distribution of the data is approximated in the case of non-parametric bootstrap. Also, outline the algorithm you will implement and carefully explain the resampling procedure.

· Describe how you implemented your solution.

Results

· Show the results and compare them to the theoretical results you stated in Assignment 1.1.

Assignment 2.2, 0.75p

Theory and implementation

· Describe how you implemented your solution. Remember to explain which arguments that are given to **boot** and how the **statistic**-function is used/built-up.

Results

· Show the results. Are they similar to the ones you got with your own function? Do you expect them be exactly the same?

Assignment 2.3, 0.5p

Theory and implementation

· Describe how you implemented your solution.

Results

· State the results from both your own implementation and using **boot.ci**.

Assignment 2.4, 2p

Theory and implementation

· Describe how you implemented your solution.

Results

· Show the resulting plot. Discuss how the method performs for different n compared to what it claims to do. How large n is needed in this case to be able to rely on the confidence level?

Assignment 3.1, 1p

Theory and implementation

· Describe the general idea of maximum likelihood estimation and show how the expressions you are using in the implementation are derived.

· Describe how you implemented your solution.

Results

- State the result.

Assignment 3.2, 1p

Theory and implementation

- Describe how the distribution of the data is approximated in the case of parametric bootstrap and what assumption that is made. Also, outline the algorithm you will implement and point out where you are going to use maximum likelihood estimation.

- Describe how you implemented your solution.

Results

- Show the results and comment on if they are similar to the ones you got with non-parametric bootstrap.

Assignment 3.3, 1p

Theory and implementation

- Describe how you implemented your solution. Remember to explain which arguments that are given to **boot** and how the **statistic**- and **rangen**-functions are used/built-up.

Results

- Show the results.

Assignment 3.4, 1p

Theory and implementation

- Describe how you changed your implementation in Assignment 1.5 to now use parametric bootstrap instead of non-parametric. Remember to point out in which part there is a need for re-estimating the parameters with MLE.

Results

- Show the resulting plot and comment on if it is similar to the one you got with non-parametric bootstrap.

Assignment 4

Theory and implementation

- For the first part of the assignment, describe how you changed your implementation in Assignment 2.4 to now use the variance instead of the mean (0.5p).
- Explain how studentized confidence intervals are constructed, what things you have to approximate and how this should be done. Describe your implementation (2p).

Results

- Show the resulting plots and discuss them according to the lab instructions (0.5p).

Appendix - R code