

Assignment 3 and Final Report Instructions

May 29, 2023

You can use printing and handwriting together to finish your assignment. Please ensure that your name and student ID have been written on every page of your assignment file. You should hand in your *assignment 3* on **June 5th**, 2023 during the morning class and submit your *final report* on **June 12th**, 2023 through email 991103951@qq.com with your name and student ID as your email subject and your filename. Late submission should be unacceptable.

Please use the data you have downloaded from your assignment 2 to finish your assignment 3 and your final report.

Assignment 3

1. Please construct a linear regression model based on your data set. Explain why you want to construct the linear regression.
2. Please write down the corresponding likelihood of the linear regression.
3. Please use non-informative prior distribution of regression parameters to find the posterior distribution of coefficients condition on variance and your data. You can use sampling method to show the histograms of the coefficients' marginal distributions.
4. Suppose the variance is known and the prior distribution of the coefficients is a multivariate normal distribution with mean 0, covariance matrix $\sigma_0^2 \mathbf{I}$, please deduct the posterior distribution of the coefficients.
5. According to the posterior distributions of the coefficients in question 3 and 4, please deduct the posterior expectation of your response variable respectively.

Final Report (You can input any part of your previous works from your assignments, but please ensure the part has been done by yourself.)

1. Express whether your question is mainly related to statistical analysis or statistical prediction, and justify whether the information from your data set is enough to answer your research question.
2. Try to use Bayesian methods to answer your research question. You can constructing probability models, hierarchical probability models, conditional probability models, and/or any other Bayesian methods to fit your data and extract important information from your data with corresponding parameters.
3. Continue your report with appropriate explanations, statements, and data visualization methods for your model results.
4. Then, conclude your findings based on your research. And conclude what you have learned from the course of *Bayesian Statistics*.