EECS 491 - Assignment 1

Due Date : Midnight of Feb 14, 2018
Submit your notebook (or code and LaTeX Document) to Canvas before due time. And also make commitments in your repository regularly to show your progress.

Requirement:
Design a problem that can be solved by Bayesian Rule. We require the problem containing at least one random variable continuous or multi-value (not all binary). Your document should make a clear description of your problem and provide corresponding mathematical model in probability theory. Besides, write some code to solve the problem and show the results.

You can use following questions as a guideline for you document and program:
1. What's the data and hidden parameter (or representation) in you problem?
2. What's the generative process in your model (how the data in you model generated) and how to generate random data with program?
3. What's the prior, likelihood, and posterior in your model?
4. How to calculate the likelihood with program?
5. How to calculate the posterior with program?
6. With a given data sample, what's the posterior distribution looks like, and what's the best estimation of hidden parameter.
7. If you use repeating test and take multiple samples, how does the posterior distribution evolves in the progress?

Besides all above problems, you also can investigate other things in your problem. We highly encourage innovative exploration in our course.

Your document should organized in the way that contains all materials you'll need in the presentation of discussion session.

Sample Problem:
If you don't have your own idea you can solve coin-flipping problem:

There is a coin, when you flip it, it results in head or tail. However there is a hidden parameter controls the probability of this coin that results in head after flipping. Our problem is to estimate this hidden parameter with the result of this coin's flipping trails.

Discussion Session:

There are two discussion sessions for this assignment : Feb 5, 2018 (Monday) and Feb 12, 2018 (Monday). You will be randomly assigned to a group in each session. We'll publish the group arrangement one day before the discussion session.

In discussion session, you should clearly explain your idea and work to others as a presenter; and also be a good listener when other group member is presenting their works. You are required to give feedback to the presenter in each session. In the second discussion session, you should also take some notes for other's presentation. After that, you are required to submit a brief feedback to Canvas for each group member except yourself. We'll hand out the rubric for feedback later (before Feb 12, 2018). Basically, it contains questions like:

1. Presenter's Name and ID
2. Whether or not presenter finish the assignment's requirement (0 - 3) ?
3. Whether or not presenter explain his/her work well (0 - 3) ?
4. Whether or not presenter make a solid analysis on experiment results (0-3)?
5. Whether or not presenter explored an interesting or innovative idea (Yes or No)? If yes what's that?
6. A brief comment for the presentation

We require you submit the feedback in Canvas before midnight of the day after the second discussion session.

Absence:
If you have some reasonable reason that cannot come to discussion session, you should make a appointment with TA in advance to present your work to TA in office hour.