ECE 3610
Engineering Probability & Statistics

Instructions for the Final Project

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Spring 2020

Rubric

❑ Following rubric will be used to grade the final project report. Note that the grading will be based on the quality of the content.

- Proper title and abstract– 10%
- Section I: Introduction section that clearly outlines the motivation and literature review if applicable– 15%
- Section II: Problem formulation, or problem statement: What question you plan to answer? what analysis you plan to do? – 20%
- Section III: Simulation Results which can be based on MATLAB or Python simulations. Represent your results using figures or tables. Explain what each figure/table represents, what we understand from the results – 30%
- Section IV: Conclusions, one or two paragraphs summarizing your project – 15%
- References: list of all the cited papers, articles, websites, or datasets you used– 10%

Formatting and submission guidelines

❑ Additional notes:

- Report must be submitted as a PDF file, NOT a zip or MS word file.
- Page number must be minimum 3 pages and maximum 7 pages.
- Use the same formatting based on IEEE conference template, two column, single spaced.
- Include a screenshot of your codes in the report (as a part of Section III) or in an appendix after section IV, whichever you choose is fine. In codes are not included, the report will be considered incomplete and 20 points will be deducted.
- Deadline to submit your report is by 11:59 PM, May 10, 2020.

There are two research directions to select for your final project. These two directions are described next.

Sample Projects#1:

Direction 1: You may choose a dataset that is publicly available, and based on the context, select one or more random variables that can represent the dataset.

-    Use MATLAB or Python to calculate the mean, variance, or full distribution of each random variable.

How to plot PDF, CDF and histograms in MATLAB? see links below:
https://www.mathworks.com/help/stats/prob.normaldistribution.pdf.html

https://www.mathworks.com/help/matlab/ref/matlab.graphics.chart.primitive.histogram.html

How to compare histogram with standard PDFs? use MATLAB curve fitting tools:
https://www.mathworks.com/help/curvefit/curve-fitting.html

-    Study concepts that we discussed in class such as independence between the random variables.

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Sample Projects#2:

- There are many datasets you may choose to analyze. Examples:

COVID-19 spread analysis. The data set is available here:
https://www.tableau.com/about/blog/2020/3/coronavirus-data-hub-faq

Examples of data visualizations:

https://www.tableau.com/covid-19-coronavirus-data-resources

- Data.gov includes numerous datasets in .cvs format:
https://catalog.data.gov/dataset?res_format=CSV

https://web.stanford.edu/class/cs102/datasets.htm

- How to read CVS files in Matlab? read the instructions below:
https://www.mathworks.com/help/matlab/ref/importdata.html

- How to plot figures in MATLAB?
https://www.mathworks.com/help/matlab/ref/figure.html
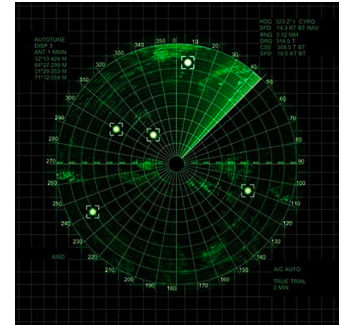
Sample Projects#3:

Direction 2: Another direction is to choose one of the applications in data science, read and understand the analysis, and perform simulations.

Examples:

1. Hypothesis testing (with applications in signal detection or radars)

Matlab tutorial:

https://www.mathworks.com/help/stats/hypothesis-testing.html

2. Linear regression for predictions (e.g., predict number of accidents, snow fall, stock market rates, etc.):

Matlab tutorial:

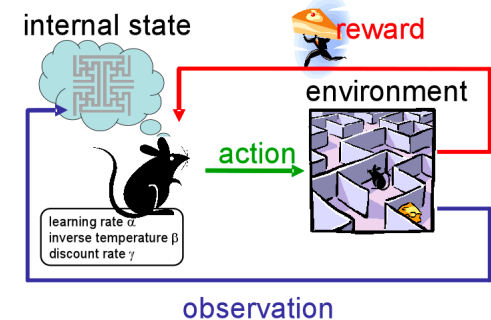https://www.mathworks.com/help/matlab/data_analysis/linear-regression.html

Sample Projects#4:

3. Reinforcement learning for robotic applications:

https://en.wikipedia.org/wiki/Reinforcement_learning
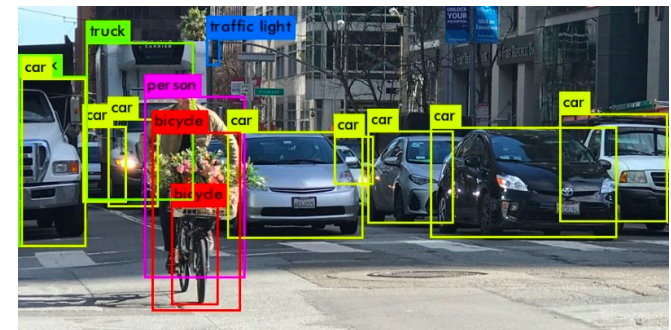
Matlab toolbox:

https://www.mathworks.com/products/reinforcement-learning.html

4. Object detection

Matlab tutorial:

https://www.mathworks.com/discovery/object-detection.html

5. Deep learning applications

Matlab toturial:

https://www.mathworks.com/solutions/deep-learning.html