EMP214 Probability Theory Project

1st Semester 2021-2022

General Rules:

- The project is to be done in groups of 4-6 members.
- Copied projects will not receive any marks.
- Pick one of the following topics and prepare a report or presentation explaining the general idea and how it relates to the topics you studied. You should also prepare a 6-minute video of your report/presentation. ALL team members should speak during the presentation. The duration of the video should not exceed 10 minutes under any circumstances. The topics include:
    - Bayesian inference in machine learning (learning an unknown probability distribution by observing outcomes and updating the distribution accordingly)
    - Entropy Encoding (e.g. the Huffman code)
    - Probabilistic models related to the COVID-19 pandemic (e.g. number of cases, virus incubation period)
    - Applications of Markov Chains (e.g. weather prediction, market trend prediction)
- You are required to submit two files:
    1- A video narrating your presentation. You can use a screen recording software to do this. Do NOT present yourself before you speak, since this will needlessly lengthen the video. Instead, the name of the team member speaking can be placed at the top (or bottom) corner of the slides that he/she will narrate. You can upload your video to Youtube (as an unlisted video) or use Google drive to share the file (mp4 or mkv formats).
    2- The presentation/report file (pdf or ppt format). It should match the one in your video. The names and IDs of all the team members should be on the cover (1st page or 1st slide).
- ***Submission form:*** https://docs.google.com/forms/d/e/1FAIpQLSfYZPSlaS72r3gPxYGgvJzRO3IjOhjJZmI3H8cInQv6A0ic_A/viewform
- **You should use Google Drive to upload your files and put the links in the form as indicated.**
- **Please submit the names of your team members by Sunday, 2nd of January 2022 through this form (team members should be sorted according to their ID, names should be in ARABIC, and the file should be either an excel or a word file with a table):** https://docs.google.com/forms/d/e/1FAIpQLScKj0YKLATt_BapNL1_5TPYcbKOX0kRp78HDIZc1qE3k8HzYA/viewform
- **The form will be closed at 11:59 PM on Monday, 10th of January 2022**
- Bonus marks will be awarded to teams that include a simple MATLAB implementation of the chosen application. You can also use Octave or Python instead of MATLAB. Please make sure you include the simulation results in your presentation and add a link to your code in the form where indicated.
- Some helpful references:

    - Kay, S. M. (2006). Intuitive Probability and Random Processes using MATLAB, Springer.
    - Myers, D. S., Wallin, L., & Wikström, P. (2017). An introduction to Markov chains and their applications within finance. MVE220 Financial Risk: Reading Project.
    - Vytla, V., Ramakuri, S. K., Peddi, A., Srinivas, K. K., & Ragav, N. N. (2021, February). Mathematical models for predicting COVID-19 pandemic: a review. In *Journal of Physics: Conference Series* (Vol. 1797, No. 1, p. 012009). IOP Publishing.
    - Paul, S., & Lorin, E. (2021). Distribution of incubation periods of COVID-19 in the Canadian context. *Scientific Reports*, *11*(1), 1-9.