Group Project NPS2001: Prototyping a digital app

The learning objective of the project is to apply what you have learned in class and develop a strategy to solve an actual problem using computers: In groups of 4 or 5, you will design and prototype a digital app that could, if fully developed, help solve or mitigate a real world problem of your group's choice. An 'app' here refers to either a mobile app, a website, or a program. The app will be developed around a central algorithm that will carry out the main task (i.e. you are to **work only with algorithms that already exist instead of hypothetical algorithms that might be created in future**). The app could be a recommendation platform, an education game, a simulator, etc. The central algorithm would then be a specific recommendation algorithm, a shortest path algorithm (for instance), or a simulation algorithm, respectively. The **group project consists of five group milestones**. Your score for this group project will determine 35% of your total score for this module.

All electronic reports as well as the class presentation must be submitted in PDF format. No MS Word file (DOC format) will be accepted. Please refer to the separate grading rubrics to see the criteria that you will be graded on. **Be reminded that penalties will be imposed for going beyond the size limit for each report as shown in the rubrics (i.e. 5% deduction for every page over the limit).**

Group Milestones

For the first four group milestones, each group will submit **a report of maximum 2 pages**. For the fifth group milestone, the document will consist of the slides of your class presentation. You should write the names and matriculation numbers of all the group members on the first page of each submitted document. Further details on the milestone requirements are provided below. Milestones 1 to 4 determine 20% of your total score for the module (each milestone carries 5%) while Milestone 5 (i.e. group presentation) determines 12% of your total score.

You are expected to use the font Times in size 11 with single spacing and default margin for the milestone reports. Note that your score will be decreased by 5% for each additional page beyond 2 pages. We give a buffer of 2-3 lines worth of space before imposing this penalty.

Group Milestone 1: Ideation and planning Report

To complete this milestone, you are to outline in broad strokes what your project will involve. The goal of this Milestone is to get your project off to a good start.

Prior to the submission of Milestone 1, you are to get your instructor's approval regarding the feasibility of your project. This can be done by scheduling an in-person meeting between your group and the instructor or if this is not possible, over the email. Once the project is approved, you are to submit a report answering the questions below:

1. Which real world problem have you chosen to work on? Why is it an important problem?
2. What will your app do and how will it help solve or mitigate the problem?
3. What is the central algorithm or class of algorithms that will enable this app to work? What would the algorithm need to do (you can illustrate this with a flow chart) in your app? What resources (i.e. textbooks, authoritative web pages/blogs, YouTube videos, etc) have you found explaining the algorithm that you will use? (Note that you will give a detailed explanation of the algorithm later, in Milestone 4.) What are the prerequisites to understand these resources and how easily do you think you will be able to understand them? (e.g. does it require coding ability, some type of math, etc)
It is not necessary to pick a particular algorithm for your app at this stage but you do need to **be fairly sure that algorithms for performing the required task actually exist**. It is best to avoid the situation where your group discovers only at Milestone 4 that algorithms for your app have not yet been made.
4. Under what circumstances do you expect users to use your app? (e.g. will they use it in the office as part of their job, part of their leisure time, will they use it on the move, etc) What is (are) the target demographic(s) for your app? (eg. students, working professionals, young, elderly, etc) What issues, if any, might your users run into while using your app and which you have to keep in mind?

This document will be entitled ReadMe.pdf and will later be uploaded to GitHub (see next Milestone).

Group Milestone 2: Data Report

The data report will answer 2 distinct questions about data.

Question 1 - What data does your app need to function and how will your app process it?
Your app, like any other app, requires data in order to function. This data could be user data (e.g. age, location…), image data, etc. To help you answer the above question, you will first create a data flow diagram to represent the flow of your data from the input of your app to its output. Make sure to specify the type of data at each step of your data flow diagram. Insert your data flow diagram in your report.

Question 2 - What are the issues related to data privacy and security for your app and how will your app deal with them?
Whenever data is used, there will be concerns about privacy and security. In the context of your app, you will state how your app will collect, use and share users' personal data to protect their privacy. Use a few examples to illustrate your data privacy policy. Second, you will list the data security risks in a risk assessment matrix where you will specify the risk's likelihood and its severity. You will use a 3-level scale for likelihood (unlikely, likely, near certain) as well as for severity (mild, moderate, severe). Finally, you will briefly describe how you will mitigate these security risks. Keep your answers concise (2 to 3 sentences) but technically accurate.

To help you develop your app in a collaborative environment, you will create a dedicated project repository in GitHub. You will use this repository throughout the semester to upload the necessary files, work collaboratively among group members and keep track of versions' history. For the present milestone, you will create a small representative dataset (SQL or NoSQL) containing all the relevant input data required for your app to function, as explained in your report and with your data flow diagram. You will upload your dataset to your dedicated repository on GitHub and add a link to the dataset in your report. Also, remember to upload your ReadMe.pdf file (see milestone 1) to GitHub.

Note that there are two deliverables for this milestone: one deliverable is the relevant database uploaded to your project repository on GitHub (link to be included in your report), and another deliverable is the report itself addressing 2 important questions about data.

Group Milestone 3: UI/UX Report

Using Figma or other similar tools, create a prototype interface for your app using what you have learned in class.
Each group member will present the app to 3 potential users and get feedback from them. Use this feedback to improve the UI/UX design of your app. You may further iterate feedback and amendment if additional iterations are necessary to converge toward the desired interface.
Then, upload your prototype in PDF format to your project repository in GitHub.

In a report entitled Interface.pdf, you will explain the choices behind your UI/UX design using the concepts you have learned in class. You will include the feedback you received in a table and explain how you accordingly amended your interface. You may use specific use cases to illustrate your explanations.

Note that, here again, there are two deliverables for this milestone: one deliverable is your prototype uploaded to your project repository on GitHub (link to be included in your report), and another deliverable is the report itself.

+ Submit a link to the prototype in FIGMA

Group Milestone 4: Algorithm Report

Write a report on the central algorithm(s) of your app answering the following questions:

1. Explain the purpose of the algorithms in your app. Clarify whether the chosen algorithms are the only existing algorithms that can perform the intended task. List alternative algorithms and explain your choice.
2. Explain how a particular algorithm works - what are the inputs and outputs, what is the sequence of steps performed on this input and leading to the output (you can illustrate this with a flow chart)?
3. What is (are) the limitation(s) of this algorithm(s)?

4. Provide an executable code that demonstrates the work of algorithm(s) and tests which you run.

You are expected to delve into the technical details of how the algorithm works using what you have learned in class. The level of technical depth should be similar to that at which PageRank was covered in class.

Your report should take the form of a user-friendly documentation to ensure that non-group members can easily understand your project and your algorithm and promptly start collaborating with you. Your report will be entitled Documentation.pdf.

Group Milestone 5: Group presentation

Summarize the whole development process, from ideation to design, data and privacy as well as choice of algorithm, in the 4 previous milestones in a class presentation targeted at your fellow students. The goal here is to show your ability to organize and communicate technical information succinctly. Each group's presentation is to last 20 minutes, with the presentation itself lasting 10-15 minutes and another 5-10 minutes for Q&A.

In addition to summarizing the information from the first 4 milestones, your presentation is to include an outlook of your project:

1. What are the greatest strengths and weaknesses of your app?
2. What would be the biggest technological, societal and/or ethical challenges in moving forward with actually creating the app? Comment briefly on how you would manage these challenges.