Computer Science Capstone Topic Approval Form

The purpose of this document is to help you clearly explain your capstone topic, project scope, and timeline. Identify each of these areas so that you will have a complete and realistic overview of your project. Your instructor cannot sign off on your project topic without this information.

Note: You must fill out and submit this form. Space beneath each number will expand as needed.

Note: Any costs associated with developing the application will be the responsibility of the student.

INFORM INSTRUCTOR:

Potential use of proprietary company information: (Y/N) **N**

ANALYSIS:

1. **Project topic and description:**

   Exploring the Correlation between ADHD and Mood Disorders

   This project will use the CCO-licensed *Hyperaktiv* dataset to explore demographic, diagnostic, and physical data of the patients observed within. Specifically, the comorbidity of mood disorders, anxiety, and substance abuse disorders in individuals diagnosed with Attention Deficit/Hyperactivity Disorder (ADHD). Machine learning will be trained on this dataset to recognize patterns across a diverse range of neurodivergent individuals, gaining insights into potential risk factors or correlated features within the population.

2. **Project purpose and goals:**

   This data product will be developed to explore the relationship between individuals with ADHD and the comorbidity of mood disorders, for the purpose of identifying individuals who are at risk of the development of comorbid mood disorders within the neurodivergent population. The identification of these individuals, including the specific type of comorbid mood disorder, could aid in the curation of a treatment plan while mitigating risk of potential issues for such individuals.

   Specifically, this product will attempt to derive insight on
   - Individuals who may be at a higher risk of having or developing a mood disorder based on certain demographic data or physical characteristics.
   - Individuals who may be at a higher risk of having or developing a substance abuse disorder based on certain demographic data or physical characteristics.

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- Demographic qualities of individuals diagnosed with ADHD such as the prevalence of ADHD subtypes across gender and age populations, which can subsequently be used to inform treatment strategies in a more holistic manner.

3. Descriptive method:

Machine learning will be applied using a non-descriptive method. Demographic data will be cleaned, in memory, and provided to the model directly. The model will be put together using supervised learning and algorithms will be applied to draw correlations between data points and make inferences about the data.

4. Predictive or prescriptive method:

A predictive model will be applied to develop the product. As mental health treatment plans are highly subjective and specific to the individual; the solution would produce information which informs the user of risk factors rather than recommending a specific treatment plan. Once curated, the data can be used to predict the occurrence of a potential comorbid mood disorder.

DESIGN and DEVELOPMENT:

1. Computer science application type (select one):
    - Mobile (indicate Apple or Android)
    - Web
    - **Stand-alone**

2. Programming/development language(s) you will use:

    Rust

3. Operating system(s) or platform(s) you will use:

    Windows

4. Database Management System you will use:

    N/A; Data is accessible via CSVs

5. Estimated number of hours for the following:
    i. Planning and design: **5 hours**
    ii. Development: **40-60 hours**
    iii. Documentation: **10-15 hours**
    iv. Total: **55-80 hours**

6. Projected completion date: **11/05/2024**

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IMPLEMENTATION and EVALUATION:

1. Describe how you will approach the execution of your project.

I chose to use Rust for my project. While, not the mainstream choice, I prefer Rust for a multitude of reasons, including its strong, static typing, memory safety, and low-level performance. I also felt Rust would be a bit more engaging in this case and keep me more deeply interested in the project. Prior to making a commitment to this decision, I did need to perform some due diligence activities and ensure that parity could be attained between a Python and a Rust solution.

In preparation, I conducted research to establish that I would be able to use a compatible tool set in Rust to fulfill the requirements of the project. Rust's **linfa** crate will be used in place of Python's **scikit-learn**; it provides many of the most common ML algorithms out of the box and can be used to train machine learning models. To stand in for Python's **pandas** and **matplotlib**, the **polars** and **plotlars** crates, respectively, have been used instead. Rust has the capability of using **Jupyter** notebooks directly using the **excvr-jupyter** crate, that will serve as the UI element of the project.

To assess the range of functionality for the chosen toolsets, I initially completed a significant portion of the planning and design components of Task 2. This helped me get familiar with the toolset I chose and helped me explore the viability of my topic, beforehand. Doing things this way, I was able to establish a general framework that could be used for my project regardless of the topic choice.

Over the next several weeks, I will be continuing to develop different data frames using the Polars crate to train my ML model(s) on while beginning to work on my Task 2 write up, in parallel. Once I'm comfortable with the state of my data and model, I will begin creating visualizations of the data using the plotlars crate and a Jupyter notebook. I expect this piece to take up the lion's share of the development effort on my part. Working at a steady pace, I believe I can complete most of the development in just a couple of short weeks. In the remaining time, I should be able to focus on fine-tuning the details remaining in the Task 2 write up.

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This project does not involve human subjects research and is exempt from WGU IRB review.

TRUE

COURSE INSTRUCTOR'S NAME:

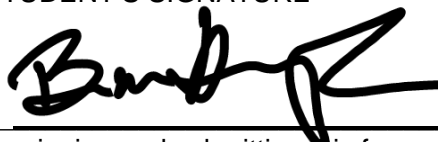*[signature: James R Ashe]*

Jim Ashe, Ph.D. Mathematics

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COURSE INSTRUCTOR APPROVAL DATE:

Tuesday, October 8, 2024

STUDENT'S SIGNATURE

[signature]   Brian M Alltop

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By signing and submitting this form, you acknowledge that any costs associated with the development and execution of the application will be your (the student's) responsibility.

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