

# Computer Science Capstone Topic Approval Form

**INFORM INSTRUCTOR:**

Potential use of proprietary company information: No. According to the dataset to be used on Kaggle.com, the data set is public domain.

**ANALYSIS****1. Project topic and description:**

This capstone project is a basic application of Educational Data Mining and Learning Analytics, interrelated fields of study that involve analyzing data to understand and enhance learning and educational outcomes. Employing machine learning, the project will identify key patterns and trends in relevant student data and predict achievement scores based on historical academic performance.

**Scenario**

MindShift Solution Expert (MSE) is a consulting firm specializing in educational solutions. The client, a high school, has partnered with MSE to provide solutions that will aid in addressing the school's academic initiatives.

**Client**

The client is a high school that is focused on optimizing student academic achievement. The school is determined to be proactive in adopting data-driven solutions that can preemptively identify and address educational challenges, ensuring improved academic performance in the future.

**Organizational Needs**

Recognizing that leveraging data-driven insights is an impactful approach, MSE has decided to create an application that analyzes educational data and predicts academic achievement. Thus, MSE needs to create an application that employs machine learning to process relevant data (i.e. historical grades, parental education levels, etc.), identify critical trends that impact student performance, and predict future student achievement. Such a tool aligns with the school's focus on optimizing academic achievement among all students.

**2. Project purpose and goals:**

The purpose of this project is to develop an application to process and analyze student data in a manner that empowers educators to optimize student achievement.

The goal is to employ machine learning to give insight into critical trends that impact student achievement and predict student achievement based on the data.

**3. Descriptive method:**

The application will use visualizations such as heatmaps of student performance, correlation matrices, bar charts, and scatter plots, to display, interpret, and explore the dataset. These visualizations aim to provide insights into student performance patterns and relationships between academic variables.



**ANALYSIS(Continued):****4. Predictive or prescriptive method:**

The project will implement a predictive model to forecast student achievement scores based on historical data and other relevant data points. To achieve this, a machine learning model will be developed using algorithms such as linear regression, decision tree regression, or random forest regression. Using the data set, the model will then predict student scores as numerical values.

**DESIGN and DEVELOPMENT:****1. Computer science application type:**

- Web

**2. Programming/development language(s) you will use:****Back-end Development:**

- **Python:** The core language used for its extensive data analysis and machine learning libraries.
- **Flask:** A micro web framework for serving the web application and interfacing with Python.

**Front-end Development:**

- **HTML:** Structures the web application's user interface.
- **CSS:** Styles the web interface, enhancing visual appeal and usability.
- **JavaScript:** Adds interactivity and dynamic elements to the web application.

**3. Database Management System you will use:**

Not applicable.

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

- Windows 11

**5. Estimated number of hours for the following:**

- i. Planning and design: 15 Hours
- ii. Development: 120 Hours
- iii. Documentation: 15 Hours
- iv. Total: 150 Hours

**6. Projected completion date:**

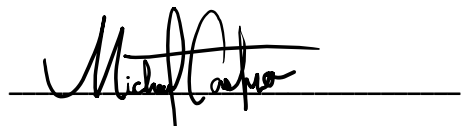
May 17, 2024



**IMPLEMENTATION and EVALUATION:**

- 1. Describe how you will approach the execution of your project.**
  - 1. Project Development Plan Creation**  
Define specific project goals, milestones, and timelines to ensure alignment with project objectives.
  - 2. Data Acquisition**  
Confirm the relevance and validity of the data set for use in this project.
  - 3. Data Cleaning and Preparation**  
Implement data preprocessing techniques for quality and suitability in modeling.
  - 4. Develop & Train Machine Learning Model**  
Select algorithm, train model, and evaluate performance.
  - 5. Develop the Front End of the Web Application**  
Develop the user interface and user experience components of the web application.
  - 6. Integrate Machine Learning Model**  
Integrate trained model into web app backend, ensuring frontend-backend communication.
  - 7. Conduct Testing & Validation**  
Conduct testing of the web app (unit testing, integration, outcome validation, etc.)
  - 8. Complete Remaining Documentation**  
Finalize all documentation.
  - 9. Deploy/Submit Application for Assessment**  
Submit the project for assessment with all requirements for successful execution.

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

**STUDENT'S SIGNATURE**

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.

**INSTRUCTOR'S SIGNATURE:**

Charles Paddock

INSTRUCTOR APPROVAL DATE: 4/15/2024



**WESTERN GOVERNORS UNIVERSITY**

