

CS425

Grade Tracking Application

Project Document

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1. Introduction

The Grade Tracking Application is a user-friendly system designed for managing courses, assignments, and grades. It serves as a helpful tool for students, instructors, and academic institutions in a college setting, simplifying the organization and tracking of academic information.

This document explores the inception, design, and practical implementation of the Grade Tracking Application. It sheds light on the intricate details of its multifunctional features, aiming to illuminate its profound impact within the academic sphere. By offering a closer look at the application's design elements, interactive tools, and robust capabilities, this report underscores the contribution of this technology to the broader academic realm.

2. Project Overview

The Grade Tracking Application is a user-friendly system designed specifically for a college environment. Its primary goal is to streamline the management of academic data for students and instructors. It offers a centralized platform for handling various academic tasks, such as organizing courses, submitting assignments, conducting grading, and monitoring performance.

For students, the application simplifies the process of accessing course information, submitting assignments, and tracking their academic progress. Instructors benefit by efficiently managing course details, evaluating assignments, and monitoring student performance.

The application's user interfaces are straightforward and easy to navigate, ensuring a hassle-free experience for users. Its main focus lies in simplifying and optimizing academic procedures within a college setting, making it an invaluable tool for enhancing the learning experience and administrative tasks within the institution.

3. Entity-Relationship (ER) Model

3.1. Core

At the core of the database design are 6 Entities:

- Courses
- ScaleMarks
- Weights
- Assignments
- Enrollments
- Evaluations

3.1.1. Courses

Each course is the root of the rest of the core tables relationships. It is uniquely identified by an opaque `id`.

Aside from its primary key, a course holds two fields: `name`, and `credits`. These values are not used for any logic, and their purpose is only for presentation to users.

3.1.2. ScaleMarks

Each ScaleMark is associated with a course; the ScaleMarks of a course forms the grading scale of the courses.

A ScaleMark holds:

- `score`: the points needed to receive this mark.
- `mark`: the symbol or name of the mark (e.g. A, B, C+, C-, E, Fail, AA)
- `grade_point`: the value of this mark for gpa calculations. Only used for presentation to the user.

3.1.3. Weight

Each Weight is associated with a course and; the Weights of a course forms the grading system of the course. A Weight is uniquely identified by an opaque `id`.

- `name`: the name of the weight/category. Only used for presentation to the user.
- `weight`: the weight of the Weight it's course.
- `expected_max_score`: the expected sum of the `max_score`'s of the Assignments that will be below it at the end of the course.
- `drop_n`: the amount of assignments below it that will be dropped in the final grade of the course.

3.1.4. Assignment

Each Assignment is associated with a weight. An Assignment is uniquely identified by an opaque `id`.

Aside from it's primary key, an Assignment holds:

- `name`: the name of the assignments. Only used for presentation to the user.
- `max_score`: the highest score that a student can receive on the assignment (except for extra credit)

3.1.5. Enrollment

Each Enrollment is associated with a course; the Enrollments of a course forms the roster of the course. Each Enrollment **may** be associated with a user (the Student User). An Enrollment is uniquely identified by an opaque `id`.

Aside from it's primary key, an Enrollment holds:

- `name`: the name of the enrollee as determined by the instructor. This name is used only for presentation to the instructor of the course and student of the enrollment.
- `email`: the email of the enrollee as determined by the instructor. May be used for linking the Enrollment to Student Users.
- `metadata`: additional data determined by the instructor. This data is only used for presentation to the instructor.

3.1.6. Evaluations

Each Evaluation is associated with an assignment and enrollment (the enrollee). An Evaluation is uniquely identified by these associations.

An Evaluation holds:

- ``score``: the score that the enrollee received on the assignment. This may be above the ``max_score`` of the assignment in cases that extra credit was provided.
- ``evaluated``: the amount of the assignment that was evaluated for the enrollee. (e.g. when `max_score=90`, `score=20`, and `evaluated=30`, the final score of the student when `evaluated=90` will be greater than or equal to 20 and less than or equal to 80, excluding cases of extra credit)

3.2. Data Control

To support users interacting with the core data in a controlled environment two more Entities are needed.

- Users
- OIDCSubject

3.2.1. Users

Each User may be associated with an enrollment (as a Student User), or a Course (as an Instructor User). A User is uniquely identified by an opaque ``id``.

Aside from it's primary key, a User holds:

- ``name``: the name of the user. Only used for presentation to the user.

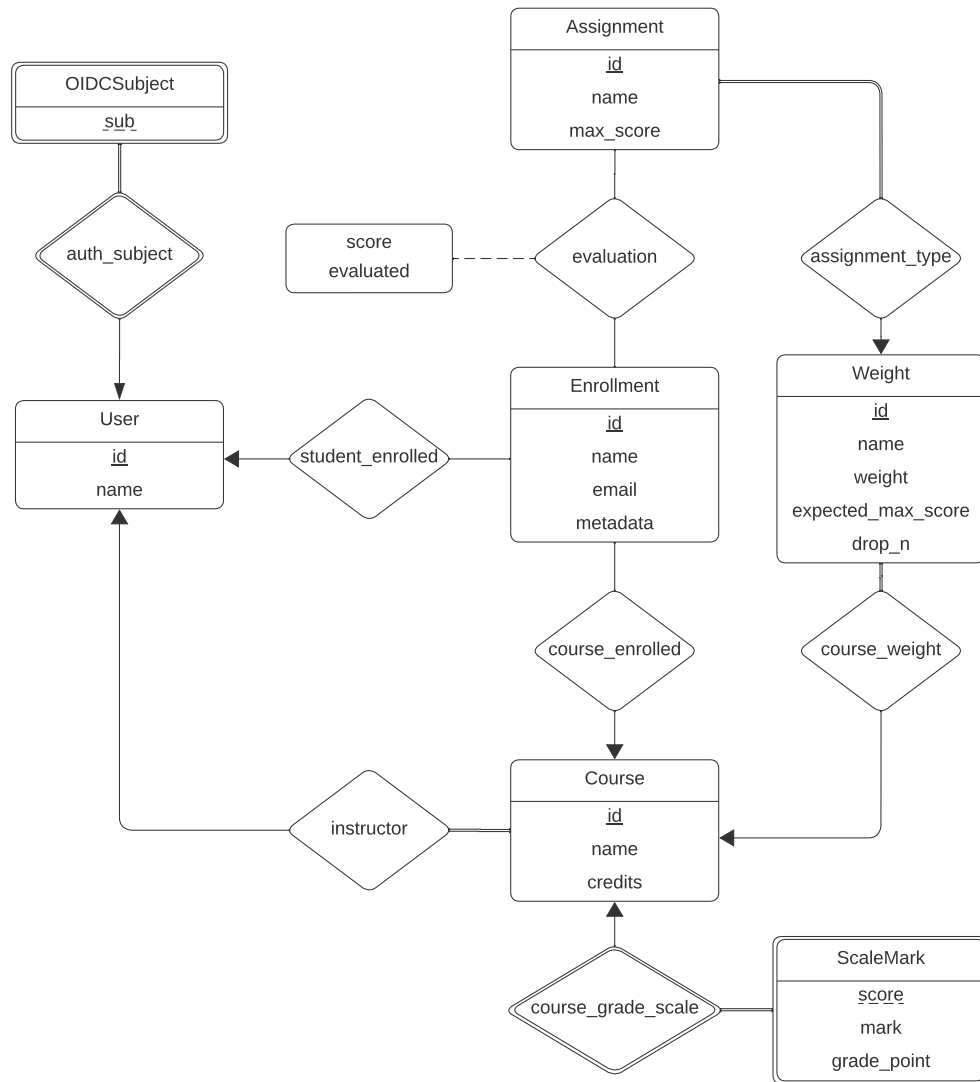
3.2.2. OIDCSubject

Each OIDCSubject is associated with a user. The OIDCSubject provides a means for the application to link an authorization token from an authentication service to a user.

An OIDCSubject holds:

- ``sub``: the subject of the tokens provided by an authorization service for a user.

3.3 ER Diagram



4. Project Features

The Grade Tracking Application encompasses a wide array of robust features that facilitate an enriched educational experience:

User Authentication and Role-Based Access

- Ensures a secure login process with distinct user roles, safeguarding sensitive information.

Course Enrollment and Management

- Provides students with an intuitive platform to explore, select, and enroll in courses.
- Empowers instructors to manage course details, including assignments and grades.

Assignment Submission and Grading

- Allows students to electronically submit assignments effortlessly.
- Equips instructors with efficient tools to evaluate and grade submissions.

Grade Calculation Based on Weighted Grading Systems

- Utilizes various grading systems to compute grades with the consideration of weighted parameters.

Data Visualization of User Performance Over Time

- Utilizes Plotly to create interactive charts that visually represent a user's academic performance.

5. Data Visualization

The Grade Tracking Application utilizes Plotly, a dynamic data visualization library, to create interactive charts that display a user's academic performance over time.

Using Plotly for Interactive Charts

Plotly, integrated into the application, offers diverse chart types, enabling the representation of academic data comprehensively. Line charts, bar graphs, and scatter plots vividly showcase user performance across courses and assignments.

Advantages of Interactive Charts

- Real-Time Tracking: Charts update instantly, showing the latest scores and progress.
- Comparative Analysis: Allows users to compare performance across different courses and assignments.
- User-Friendly Experience: Interactive features ensure a seamless and easy-to-use platform for users.
- Granular Insights: Users can delve into specific data points or time frames for detailed performance analysis.

Application in Decision Making

These visualizations assist users in identifying areas for improvement, setting goals, and tracking growth. Instructors can also use this data for comprehensive class performance analysis.

6. Security Measures

To ensure data integrity and confidentiality, the Grade Tracking Application employs stringent security measures:

- Implements user authentication protocols for a secure login process.
- Utilizes data encryption techniques to safeguard sensitive information.
- Enforces measures to prevent common web vulnerabilities like SQL injection and cross-site scripting, ensuring a robust and secure environment.

7. Conclusion

In conclusion, the Grade Tracking Application provides a dynamic and user-oriented system that enhances course management, assignment submission, grading procedures, and overall academic performance tracking. Its comprehensive feature set, integrated database design, robust data visualization, and stringent security measures collectively make it a significant asset to students, instructors, and educational institutions in their pursuit of academic excellence.

8. GitHub

The project's corresponding GitHub repository can be accessed via the following link: <https://github.com/wecreate1/CS425-Project/blob/main/db/db.ddl.sql>. This repository hosts the necessary database schema definition language (DDL) SQL file.