DEVELOPMENT OF STUDENT ACHIEVEMENT TRACKER SYSTEM USING PYTHON-TKINTER

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ABSTRACT

This paper presents the development of a Student Achievement Tracker System (SATS), a digital platform aimed at systematically recording, managing, and showcasing students' academic and extracurricular accomplishments. Designed with Python's Tkinter library, SATS offers a user-friendly, accessible interface that enables students to register, log in, and build personalized portfolios that highlight achievements in various domains. Through structured resume-building features, SAT allows students to organize their profiles for academic and career preparation, creating a centralized, digital repository for their accomplishments.

The system's architecture is engineered to prioritize simplicity and accessibility, enhanced with CustomTkinter for improved aesthetics and interactivity, making it suitable for users with varying levels of technical expertise. Core functionalities include secure login, efficient data management, and an intuitive, streamlined interface. This paper explores these functionalities in depth, alongside the challenges encountered in development and the strategies adopted to address them.

Beyond functionality, SATS integrates principles of software engineering and user-centred design to enhance usability and engagement, underscoring the importance of intuitive design in educational tools. The system serves not only individual students but also educators and institutions, providing a valuable resource for tracking, promoting, and celebrating student achievements. Through this project, we demonstrate SATS's potential to adapt to diverse educational needs, positioning it as an impactful tool for academic environments. This research emphasizes the practical significance of SATS, paving the way for future enhancements that align with evolving educational demands and digital learning trends.

Keywords: Python, CustomTkinter, Achievement Tracker, Development, Tkinter Library.

I. INTRODUCTION

In today's educational landscape, tracking and managing student achievements has become essential for both students and educational institutions. A well-documented portfolio of accomplishments can be a decisive factor in students' academic progression, career opportunities, and overall professional development. However, many students struggle to organize and maintain a comprehensive record of their academic and extracurricular achievements. Traditional methods, such as physical files or manual record-keeping, are often inefficient, time-consuming, and difficult to access, limiting their effectiveness as students prepare for future academic and career pursuits.

The Student Achievement Tracker System (SATS) is designed to address these challenges by providing an intuitive digital platform for students to compile, organize, and showcase their achievements. Developed using Python's Tkinter library and enhanced with CustomTkinter for improved visual appeal, SATS offers an accessible and interactive interface that simplifies the process of portfolio management. The system enables students to register, log in securely, and create personalized profiles that consolidate their academic, extracurricular, and professional accomplishments into a structured, easy-to-navigate format.

This paper examines the development of SATS, focusing on its design principles, architectural framework, and core functionalities. The research highlights the application of software engineering principles and user-centred design, which contribute to the system's functionality and usability. By leveraging SATS, students and educators gain a resource that not only enhances the documentation of achievements but also streamlines the resume-building process, helping students prepare for the demands of academic and professional settings.

Furthermore, this study aims to assess the practical applications of SATS in educational environments, discussing its potential to adapt to the evolving needs of digital learning and institutional assessment. Through SATS, we demonstrate how technology can be leveraged to create impactful educational tools that foster

student growth, making achievement tracking an accessible and organized process for users with varied technical expertise.

II. LITERATURE REVIEW

1. Automated Student Progress Monitoring Using Data Mining Techniques

Automated monitoring systems using data mining have demonstrated the ability to analyse large sets of student data to predict academic outcomes and provide real-time feedback on student progress (Kim et al., 2021). Data mining techniques, including clustering and classification, enable institutions to identify patterns in student performance, making it possible to proactively address academic challenges. However, while these systems provide robust progress monitoring, they often focus more on academic assessments and performance metrics rather than holistic achievement tracking, which includes extracurricular and professional milestones. SATS addresses this gap by offering a more personalized tracking system that allows students to document a wide range of achievements beyond academic performance.

2. Using Gamification to Enhance Student Engagement in Tracking Achievements

Studies on gamification in education, such as those by Cruz et al. (2020), have shown that incorporating gamified elements—such as badges, rewards, and progress levels—into achievement tracking systems can significantly enhance student engagement. Gamification encourages students to actively participate in documenting their accomplishments by creating a more interactive and rewarding experience. However, gamified systems can sometimes be complex and may require significant technological infrastructure, making them challenging for all students to access or use efficiently. SATS offers a simpler, straightforward approach, focusing on usability and accessibility, especially for users with limited technical skills. By using CustomTkinter for an engaging but minimalist interface, SATS emphasizes ease of use while maintaining a visually appealing design.

3. A Blockchain-Based Framework for Student Academic Records

Blockchain technology has recently been proposed for securing and decentralizing academic records, providing students with greater control over their data and enhancing data integrity (Li & Nguyen, 2021). Blockchain frameworks offer a tamper-resistant way of storing records, which is beneficial for ensuring data authenticity. However, blockchain implementations often require considerable computational resources, technical expertise, and costs, making them less accessible for smaller educational institutions or independent student use. SATS focuses on more accessible, lightweight data management features that are achievable within a Python-Tkinter framework. By incorporating fundamental security protocols like password encryption and secure login, SATS aims to provide secure, user-friendly data handling without the complexity and overhead of blockchain systems.

4. Visualizing Student Achievement Data with Educational Dashboards

Educational dashboards have become an essential tool in student achievement visualization, allowing educators and students to see performance metrics and trends in an intuitive, graphical format. Dashboards facilitate quick insights into students' strengths and areas for improvement (Garcia & Molina, 2021). While dashboards are effective for visualizing performance at an aggregate level, they may not allow for detailed, personalized achievement tracking across various categories. SATS offers a more individualized approach, enabling students to document and update specific achievements such as academic awards, extracurricular involvement, and professional experience. Although not as graphically sophisticated as dashboards, SATS provides a personalized portfolio system through Tkinter's interface, balancing data visualization with comprehensive achievement tracking.

5. Development of an E-Portfolio System for University Students

E-portfolio systems are widely used for documenting student work and accomplishments across academic and professional domains, providing students with a digital space to showcase their achievements (Huang & Chen, 2020). E-portfolios offer flexibility in structuring content and are valuable for career preparation. However, many e-portfolio systems can be complex, requiring extensive customization and ongoing maintenance. SATS builds on the e-portfolio concept by offering a simplified, centralized platform designed specifically for achievement tracking. By using Python's Tkinter and CustomTkinter libraries, SATS prioritizes ease of use and accessibility, providing essential features such as secure registration, personalized portfolios, and structured

resume-building tools that allow students to compile, organize, and showcase their accomplishments without the complexity of a full-scale e-portfolio system.

III. METHODOLOGY

The methodology for developing the Student Achievement Tracker System (SATS) is structured around a user-centred design approach, emphasizing ease of use, data security, and functionality. The development process involves several stages: requirements gathering, system design, technology selection, implementation, and testing. Below is a detailed breakdown of each phase:

1. Requirements Gathering

- Objective: Identify the functional and non-functional requirements that the system should fulfil.
- Stakeholders: Students, educators, and academic institutions.
- Data Collection Methods: Surveys, interviews, and feedback from students and educators to understand their needs for tracking academic, extracurricular, and professional achievements.
- Requirements Identified: Key features such as user registration, secure login, achievement portfolio management, resume building, and ease of accessibility. Additional non-functional requirements include usability, data privacy, and responsive design.

2. System Design

- Architecture Design: SATS is structured using a modular design, where each component handles a specific function—such as user authentication, portfolio management, and resume generation.
- User Interface (UI) Design: A simple, intuitive UI was developed using Tkinter with the CustomTkinter extension for enhanced visual appeal. The design prioritizes accessibility and ease of navigation.
- Database Design: A lightweight, local SQLite database is used to store user information securely. The database structure includes tables for user credentials, achievements, resume data, and portfolio content, ensuring efficient data organization and retrieval.

3. Technology Selection

- Programming Language: Python is chosen for its simplicity and robust libraries for GUI development, allowing rapid prototyping and ease of implementation.
- GUI Framework: Tkinter and CustomTkinter are used for front-end development, providing an interactive and visually appealing interface without high system demands.
- Database: SQLite is selected for its reliability, ease of integration with Python, and suitability for local storage requirements, making it ideal for small-scale, personal applications.
- Security Measures: Basic encryption methods are implemented to protect sensitive user data, such as login credentials.

4. Implementation

- Development Process: The system is built following an iterative, modular approach, where each feature is developed and tested independently before integration.
- User Registration and Authentication Module: This module includes registration, login, and password protection features. Users provide basic credentials, which are encrypted and stored in the database for security.
- Achievement Management Module: Allows users to enter, edit, and delete their achievements, categorized into academic, extracurricular, and professional accomplishments. Users can add descriptions, dates, and other relevant details.
- Resume Builder Module: A simplified resume generator based on the user's achievements, allowing students to create a structured CV directly within the system.
- Portfolio Interface: A visually organized display of all user achievements, providing a consolidated view of their accomplishments.

5. Testing and Validation

- Unit Testing: Individual modules (e.g., login, portfolio management) are tested independently to ensure they function correctly and meet specified requirements.
- Integration Testing: Modules are integrated to verify smooth interactions between the user interface, database, and achievement management functionalities.
- User Testing: Feedback is collected from potential users (students) to assess usability, interface clarity, and overall satisfaction. Adjustments are made based on user input.
- Performance Testing: Basic performance tests are conducted to confirm the system's responsiveness and data retrieval efficiency, ensuring the system can handle multiple user entries without lag.

6. Deployment and Future Development

- Deployment Environment: The application is developed as a standalone system, deployable on individual devices without requiring a complex server infrastructure.
- Future Enhancements: Based on testing feedback, potential future enhancements include online database integration for cloud storage, advanced resume customization options, and additional visualization features to further improve user engagement.

IV.   RESULTS

The Student Achievement Tracker System, developed using Python-Tkinter, was designed to provide a user-friendly interface for students to manage and showcase their academic and extracurricular achievements. The system includes functionalities for user registration, login, and portfolio management, which allows users to input details such as resumes, project descriptions, and achievements.

1. **User Interface**: The graphical user interface (GUI) was constructed using Tkinter, which facilitated the creation of a visually appealing and interactive platform. User feedback indicated that the interface was intuitive and easy to navigate, significantly enhancing the user experience.

2. **Functionality Testing**: Comprehensive testing was conducted to ensure the system's functionalities operated as intended. The system successfully handled user registrations, allowing multiple users to create and manage their profiles. The achievement submission process was streamlined, enabling users to add, edit, and delete achievements without technical difficulties.

3. **Performance**: The system demonstrated efficient performance, with average response times for data processing remaining under two seconds. This performance metric is crucial for ensuring that users can access and modify their information without delays.

4. **User Feedback**: After beta testing with a group of students, qualitative data was collected through surveys. Approximately 85% of users reported satisfaction with the system, highlighting its usefulness in organizing and tracking their accomplishments. Suggestions for improvement mainly centred on enhancing reporting features to generate summaries of achievements.

V.   DISCUSSION

The development of the Student Achievement Tracker System aligns with the increasing need for personalized and accessible tools for students to manage their academic and extracurricular journeys. This project not only addresses the challenges students face in tracking their accomplishments but also emphasizes the importance of self-presentation in today's competitive environment.

1. **Impact on Student Engagement**: By providing a platform where students can easily record and showcase their achievements, the system fosters greater engagement with their educational experience. Users expressed that having a dedicated space to compile their achievements motivated them to pursue more extracurricular activities, reflecting positively on their personal development.

2. **Comparison with Existing Solutions**: Unlike traditional methods of achievement tracking, such as physical portfolios or spreadsheets, the developed system offers a centralized and digital approach that enhances accessibility and organization. The integration of user-friendly design principles makes it more appealing to the target demographic of students, who often prefer digital solutions.

3. **Limitations**: Despite the positive feedback, the project encountered limitations, including the lack of advanced reporting features and integration with educational institutions' databases. Future iterations could benefit from incorporating these functionalities to broaden the system's applicability and effectiveness.

4. **Future Work**: Based on user feedback, future enhancements could include implementing a feature for automatic achievement summaries, which could generate reports tailored to specific audiences, such as universities or employers. Additionally, expanding the system to support mobile devices would increase accessibility and user engagement.

VI.   CONCLUSION

The Student Achievement Tracker System (SATS), developed with Python's Tkinter and CustomTkinter libraries, provides an accessible solution for students to systematically track and showcase their academic, extracurricular, and professional milestones. Unlike existing systems that focus on specific aspects of academic progress, SATS offers a comprehensive, user-centred platform designed to be intuitive and adaptable, catering to a range of technical abilities and achievement types.

Through the use of a simple and secure interface, SATS allows students to document their achievements in a structured way, supporting both their academic growth and career readiness. This system's design emphasizes ease of use, data privacy, and flexibility, making it suitable for individual students and educational institutions alike, without the need for complex technical resources.

In conclusion, SATS addresses a gap in educational technology by providing a straightforward, user-friendly tool that enhances student engagement in tracking personal growth and accomplishments. The system's development highlights the importance of combining simplicity with functionality, offering an innovative approach to achievement tracking that can evolve with the changing needs of modern education. SATS demonstrates the potential of accessible digital tools in empowering students to take ownership of their progress and prepare effectively for future opportunities.

VII.   REFERENCES

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