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CODE-PULSE

Dr. Santhosh Kumar B
Sr. Assistant Professor, CSE
department
New Horizon College of
Engineering
Bangalore, India

Dr. B. Rajalakshmi
HOD, CSE department
New Horizon College Of
Engineering
Bangalore, India

Priyanshu Jangir D
Student, CSE department
New Horizon College Of
Engineering
Bangalore, India

Patil Gaurav Balaji
Student, CSE department
New Horizon College Of
Engineering
Bangalore, India

Pranav Srinivas Barad
Student, CSE department
New Horizon College Of
Engineering
Bangalore, India

Abstract-

The DSA Tracker web application designed to facilitate the learning and mastery of data structures and algorithms (DSA) for computer science students and programming enthusiasts. With the increasing importance of DSA in various domains such as software development, data analysis, and machine learning, there is a growing need for effective tools to enhance the learning experience and track progress in this field. The DSA Tracker offers a user-friendly interface that allows users to navigate through various DSA topics, including arrays, linked lists, stacks, queues, trees, graphs, sorting algorithms, searching algorithms, and more. Each topic is accompanied by interactive visualizations and explanatory content to aid in comprehension. Users can also test their knowledge through coding exercises and quizzes, which are integrated within the application. One of the prominent features of DSA Tracker is the progress tracking system. Users can create personalized profiles to monitor their learning journey and track their progress over time. The application provides detailed statics, performance metrics, and visual representations of progress to help users identify their strengths and areas that require improvement. The implementation of DSA Tracker is built upon modern web technologies, including HTML, CSS, JavaScript, and server-side frameworks. The application follows responsive design principles, ensuring compatibility across multiple devices and platforms. The results of the study demonstrate that neural networks approach for predicting deforestation can be utilized and its outcomes show the areas that destroyed during the research period

Keywords- E-Learning, Cognitive Learning, Visualization, Data Structure & Algorithms, Human Computer Interaction.

I. INTRODUCTION

DSA stands for "Data Structures and Algorithms," which is a core topic in computer science and programming. DSA Tracker will be a platform designed to help students, developers, and researchers track their progress in learning or applying data structures and algorithms. Overall, DSA Tracker is a valuable platform for anyone looking to improve their skills in data structures and algorithms. By providing a range of resources, exercises, progress tracking, and recognition programs, DSA Tracker can help users achieve their goals and become proficient in this field. Provide Comprehensive Learning Resources: The primary

objective of the DSA Tracker is to offer a centralized platform that provides comprehensive and structured learning resources for data structures and algorithms. The application aims to cover a wide range of DSA topics, ensuring that learners have access to well-organized educational content. Facilitate Hands-on Practice: The DSA Tracker aims to provide a diverse range of coding exercises and problem-solving challenges related to different DSA topics. By offering ample opportunities for hands-on practice, the application aims to enhance learners' problem-solving skills and reinforce their understanding of DSA concepts. Foster Engagement and Collaboration: The DSA Tracker aims to foster a sense of engagement and collaboration among learners. By providing discussion forums and community-driven platforms, the application encourages users to actively participate, share insights, seek assistance, and engage in knowledge sharing. The objective is to create a

supportive learning environment where learners can benefit from collective expertise and interactions with peers. This paper also deals with Foster Engagement and Collaboration: The DSA Tracker aims to foster a sense of engagement and collaboration among learners. By providing discussion forums and community-driven platforms, the application encourages users to actively participate, share insights, seek assistance, and engage in knowledge sharing. The objective is to create a supportive learning environment where learners can benefit from collective expertise and interactions with peers.

II. LITERATURE SURVEY

The development of web-based applications for learning content and progress tracking has gained significant attention in recent years. This literature review aims to synthesize existing research findings in this area, highlight knowledge gaps, and suggest potential future research directions.

Learning Content and Progress Tracking

McLean (2016) emphasized the importance of case-based learning in medical and healthcare fields. The review of worldwide literature highlighted the effectiveness of this approach, suggesting that a web-based application with diverse learning content could benefit from incorporating case-based learning methodologies. Furthermore, the study by Jacques et al. (2016) focused on the development of a web-based 24-hour dietary recall tool, indicating the potential for similar interactive platforms to be utilized for learning content.

User Engagement and Reflection

Choe et al. (2017) explored how individuals engage with personal data through visual data exploration. Understanding self-reflection and user engagement is crucial in the design and implementation of web-based learning applications. This indicates the necessity to integrate features that allow users to reflect on their learning progress and interact with the content in a meaningful way.

Progress Tracking and Data Visualization

Weinreb et al. (2018) utilized lineage tracing on transcriptional landscapes to link state to fate during differentiation. While the focus was on cellular differentiation, the concept of tracking and visualizing progress is relevant to the development of web-based learning applications. Incorporating data visualization techniques similar to those used in this study could enhance progress tracking within the application.

User Participation and Policy Making

Charalabidis and Loukis (2012) explored participative public policy making through the utilization of multiple social media platforms. While not directly related to learning content, the study highlights the potential for user participation in web-based applications. Future research could investigate the integration of participative elements within the learning platform to enhance user engagement and progress tracking.

Data Repository and Access

Giffen et al. (2015) focused on providing contemporary access to historical biospecimen collections. While the context differs, the study highlights the importance of data repository and access within web-based applications. Considering the potential volume of learning content and user data, future research could explore efficient data management strategies and secure access protocols.

Sustainability Assessment and Application

Peano et al. (2014) proposed a methodology for the sustainability assessment of agri-food systems. While the subject matter may differ, the study provides insights into the development and assessment of web-based applications. Future research could adapt similar methodologies to assess the sustainability and effectiveness of web-based learning applications.

Geo-Data Visualization

Resch et al. (2014) focused on web-based 4D visualization of marine geo-data using WebGL. While the study's focus is on geographic data, the visualization techniques and web-based implementation have potential applications in the development of learning content platforms. Future research could explore the integration of interactive geo-data visualization to enhance the learning experience.

Conclusion and Future Directions

In conclusion, the literature review highlights the diverse range of research findings relevant to the development of web-based applications for learning content and progress tracking. Integrating case-based learning methodologies, user engagement features, progress tracking, participative elements, data management strategies, sustainability assessment methodologies, and interactive data visualization techniques can enhance the effectiveness and user experience of such applications. Future research should focus on

integrating these insights to develop comprehensive and user-centric web-based learning platforms.

Overall, the literature review identifies the need for holistic and user-centered approaches in the design and development of web-based applications for learning content and progress tracking. By addressing the knowledge gaps and building on the existing research findings, future studies can contribute to the advancement of this important area of educational technology.

1. EXISTING SYSTEM

As we know that the idea of animation and visualization is not new. After an extensive review of the literature of cognitive learning techniques and animation technologies that have made an interaction with education, we have explored and identified many deficiencies in the world of visualization.

A recent study on animation by Barbara and Morrison in year 2013 stated that in the past decade, high quality and graphical user interfaces have become a standard, especially in the field of games [5].

We have found that there are different kinds of visualization platforms helping people in different areas of life. Especially in the field of education there are bundles of visualization platform for students about different courses of science and technology [19]. As we know currently the world is moving to E-Learning platforms and people prefer to sit at home and attend lessons online. So as for it concerns HCI (Human Computer Interaction), which is focusing to facilitate teachers and students to provide them the interactive and user friendly interface [5]. The existing new methods and approaches to study algorithms were done by Marc H Brown in his publication of algorithm animations [8]. In year 2003 Rainer Koschke has conducted a survey on "software visualization"; this survey was conducted through e-mails.

The survey papers were sent to researchers in software maintenance departments and reverse engineering [6]. These kinds of surveys have conducted and published elsewhere [7], [17]. Keller and Bassil conducted similar survey but this survey was about software cost, quality and little focused on cognitive aspects of available visualization tools [12]. In the literature study of data structure and algorithm visualization, we have found some visualized platform serving students [9], i.e. O-Matrix, Algolist, Jeliot3, TRAKLA2, David Galles (Visualization), John Morris (Visualization), NZACDITT, CATAI, TANGO etc. [9]. There is another good website of data structure visualization was developed by Duane Jarc in the institute of George Washington [13].

A very famous data structure and algorithms online platform was developed by David Galles [14]. There is a very famous learning environment tool TRAKLA2 for data structure and algorithms course [15]. Open DSA, a web platform which provides an active ebook to develop an online text book for DSA [16]. During our research study, analysis and survey, we found some short comings also of these applications as written below.

- The visualization levels are very detailed, so those make a little bit difficult to understand for a beginner student.
- The majority of the instructional sites are lack of interactive multimedia and animations.
- In some web applications java applets always display message to update, even after updating.
- In some platforms an extra code is required to perform visualization, but it requires some technical skills.
- Some surveys were conducted through an email from engineers & professionals of Computer field.
- Step by step working detail was not provided, it makes difficult for learners to understand in detail.

2. PROPOSED SYSTEM

The DSA Trackers main goal is to provide a centralized platform offering well-structured and comprehensive learning resources for DSA and Algorithms. The application strives to cover an extensive range of DSA Topics, Ensuring learners can access organized educational material. The DSA Tracker aims to provide a diverse range of coding exercises and problemsolving challenges related to different DSA topics. By offering ample opportunities for hands-on practice, the application aims to enhance learners' problem-solving skills and reinforce their understanding of DSA concepts. The DSA Tracker focuses on implementing a robust progress tracking system that enables learners to monitor their progress and performance overcome. The application aims to provide detailed statistics, performance metrics, and visual representations of progress to help users identify their strengths, weaknesses, and areas requiring further improvement. The DSA Tracker aims to foster a sense of engagement and collaboration among learners. By providing discussion forums and community-driven platforms, the application encourages users to actively participate, share insights, seek assistance, and engage in knowledge sharing. The objective is to create a supportive learning environment where learners can benefit from collective expertise and interactions with peers.

• Purpose of the project :

1. The primary objective of the DSA Tracker is to offer a centralized platform that provides comprehensive and structured learning resources for data structures and algorithms. The application aims to cover a wide range of DSA topics, ensuring that learners have access to wellorganized educational content.
2. The DSA Tracker focuses on implementing a robust progress tracking system that enables learners to monitor their progress and performance over time. The application aims to provide detailed statistics, performance metrics, and visual representations of progress to help users identify their strengths, weaknesses, and areas requiring further improvement.

• Scope of the Project :

1. Provide a platform with a comprehensive set of coding challenges covering various data structures and algorithms. Provide a platform with a comprehensive set of coding challenges covering various data structures and algorithms.
2. Implement performance analytics to track and analyze user proficiency in different topics. Offer adaptive recommendations based on individual weaknesses and achievements.
3. Faster collaboration through discussion forums for users to ask questions and share insights. Introduce leaderboards to encourage friendly competition and motivation.
4. Ensure cross-device compatibility with a responsive design. Adhere to accessibility standards to make the platform inclusive for users with disabilities

1. Project Objectives :

- **Learning Facilitation:** Enable users to enhance their data structures and algorithms skills through hands-on coding practice. Provide a platform with a curated set of challenges and a real-time code editor.
- **Progress Tracking:** Allow users to monitor their learning progress and receive adaptive recommendations. Implement performance analytics, weakness analysis, and personalized feedback.
- **Engagement and Motivation** Foster user engagement and motivation through gamification elements and a collaborative community. Introduce leaderboards, badges.

- **User-Friendly Interface:** Design a responsive web application with an intuitive code editor and adherence to accessibility standards.

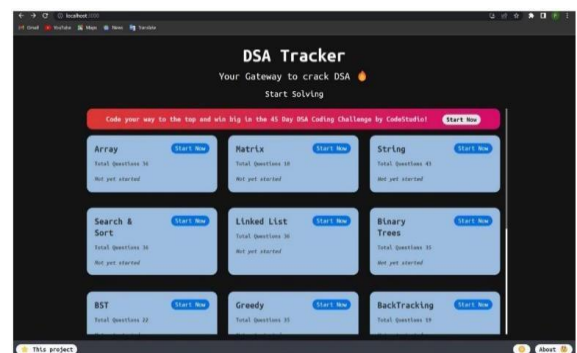
III. METHODOLOGY

The process flowchart demonstrates the step-by-step progression of creating a DSA tracker, commencing from planning and concluding with maintenance. Every box depicts significant phases or tasks while deciding nodes steer the course as per accomplishment and input received. It is imperative to understand that real development may necessitate iterations and modifications based on individual project exigencies and testing/launch feedback obtained.

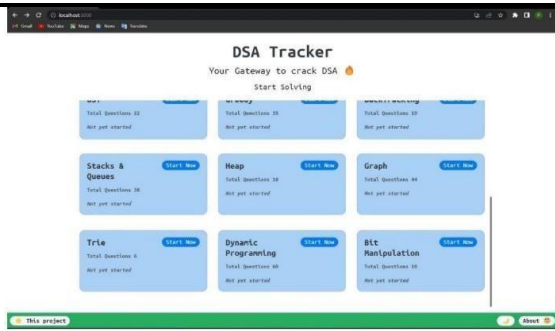


1. **Requirement Gathering:** To start, comprehend the specific necessities and objectives of the DSA Tracker web application. This necessitates recognizing its intended audience, desired attributes, and functionalities required to bolster learning, progress tracking as well community involvement.
2. **Design and Architecture:** Construct a comprehensive design structure for DSATracker involving defining user interface elements such as data models or database plans that cater to scalability in order to ensure an efficient design which is pleasing on visual front while being intuitive at UI level.
3. **Technology Selection :** Select appropriate technologies frameworks programming languages keeping variables like security ,performance compatibility with feature set into considerations
4. **Development & Implementation:** Develop core features inclusive of Registration process authentication detailed management and interactive quizzes coding exercises progression gauges along with other function sets by best practices suited towards maintaine in future.
5. **UI Development:** Implement visually appealing components designed particularly for this tracker App making it device friendly whilst exhibiting easy navigations coupled responsiveness during transition.
6. **Testing:** The app thoroughly tested includes unit testing integration testing acceptance trials ensuring expected results delivered through seamless User experience

IV. RESULTS AND ANALYSIS



The consistent monitoring, analysis, and adjustment of the DSA tracker are essential to its ongoing enhancement. The objective is to develop an adaptable and receptive platform that satisfies users' educational requirements effectively.



Developing a DSA (Data Structures and Algorithms) tracker using web development typically involves using a combination of frontend and backend programming languages, along with other technologies for the database, version control, and more. Here's an example using specific technical programming languages for each layer:

Frontend:

Programming Language:

JavaScript (ES6+): Widely used for frontend dev.

TypeScript: Adds static typing to JavaScript, improving code maintainability.

React.js: A popular JavaScript library for building UI.

User Interface Styling: CSS (with Preprocessors like Sass or Less): Style sheets for designing the user interface.

Monaco Editor: An open-source code editor that powers Visual Studio Code



Backend:

Programming Language: Node.js (JavaScript on the server side): Efficient for handling asynchronous operations.

Express.js: A minimal and flexible Node.js web application framework.

Authentication: JSON Web Tokens (JWT): For secure user authentication.

Database: MongoDB (NoSQL Database): A scalable and flexible database for storing user data, progress, and challenges



Development Tools and Practices:

Git: For tracking changes in the codebase and collaborative development. API Documentation

Swagger/OpenAPI: For documenting and testing APIs.

Testing Frameworks:

Jest (for JavaScript/TypeScript): A popular testing framework for JavaScript applications. Continuous Integration/Continuous Deployment (CI/CD):

Jenkins, Travis CI, GitHub Actions: Tools for automating the testing and deployment processes.

V. CONCLUSION

In conclusion, the DSA Tracker web application serves as a comprehensive and interactive platform for learning and mastering data structures and algorithms (DSA). By providing a centralized hub of educational resources, hands-on coding exercises, progress tracking features, and a community-driven environment, the DSA Tracker aims to address the challenges faced by learners in DSA. Through the application, users can explore a wide range of DSA topics, aided by interactive visualizations and explanatory content. They can practice their problem-solving skills through coding exercises and quizzes aligned with specific DSA concepts. The progress tracking system allows users to monitor their growth, identify areas for improvement, and track their overall performance. Additionally, the DSA Tracker fosters engagement and collaboration by providing discussion forums and knowledge-sharing platforms, enabling users to interact with peers, seek guidance, and exchange insights.

This community-driven approach creates a supportive learning environment that enhances the overall learning experience. With a responsive design and compatibility across multiple devices, the DSA Tracker ensures accessibility and convenience for users to learn and practice DSA on their preferred devices. Ultimately, the DSA Tracker web application aims to empower users in their DSA learning journey, equipping them with the necessary skills and knowledge to excel in computer science and programming. By providing a comprehensive learning experience, practical exercises, progress tracking, and community engagement, the DSA Tracker seeks to enhance DSA mastery and contribute to the development of strong problem-solving capabilities in users.

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