Centralized Project Management System For Enhanced Research Administration And Tracking

[1]Sai Kumar B M, [2]Murali Karthik K L, [3]Keerthana S, [4]Shashank M, [5]Battula Bhavya

Dept. of Computer Science and Engineering,
Presidency University, Karnataka, India

Abstract: Since its beginning in 1987, the Research Department has successfully completed more than 1,200 projects, leading to a substantial accrual of files and papers related to each study. Currently, these records exist in the form of an Excel sheet and Word documents and pose quite an obstacle for Research Administration to keep abreast, monitor, and track their progress as ongoing studies. The increasing volume and complexity of these projects have made it difficult to supervise research activities effectively and ensure smooth progress across multiple stages. This paper explores the challenges faced by the department due to the existing manual record-keeping system and proposes a more efficient, centralized approach to project management. By incorporating advanced technology and the most up-to-date data management, this research strives to smooth the process of monitoring while upgrading tracking abilities to ensure maximum efficiency in administering research.

Index Terms - Research Department, Project Management, Data Management, Document Storage, Excel Sheets, Word Documents, Research Administration, Project Tracking, Study Supervision, File Management, Research Monitoring, Progress Tracking, Centralized System, Technology Integration, Efficiency Improvement, Record Keeping Challenges, Research Projects, Data Organization.

Introduction

Since its inception in 1987, the Research Department has handled over 1,200 projects, which, over time, have generated an enormous archive of research files and documents. These records have been kept and accounted for using tools such as Excel sheets and Word documents. While these methods were efficient in managing smaller volumes of data, they have become inadequate as the number of projects and their complexity continue to increase. The Research Administration is currently facing challenges in managing, supervising, and tracking the progress of these many ongoing and completed studies efficiently. The increasing volume of data, coupled with the growing diversity of research topics, has made it difficult to maintain an organized, systematic approach to project management. The existing file storage methods are largely decentralized, and crucial project details are often spread across multiple documents, making it hard to retrieve and update information in real time. Consequently, Research Administration has a difficult time monitoring the studies' progress, tracking the meeting of deadlines, and keeping an overall record of research projects. The more interdisciplinary and collaborative research projects become, the greater the need for an integrated system. Researchers, project managers, and administrators need access to the status of a project, resources, and updates within a single system. If such a system does not exist, then precious time is wasted sifting through countless files, and the likelihood of missing important project milestones and critical data is substantially increased. Given these challenges, the department has looked for more sophisticated and efficient ways to enhance the management of projects. A central system, supported by modern technologies and tools, provides the opportunity to streamline research processes, enhance collaboration, and improve oversight. The introduction of a digital solution could reduce reliance on manual record-keeping, increase the accuracy and efficiency of tracking project progress, and much more. This paper proposes a technological solution for centralizing project tracking and management in response to the challenges outlined above. It shall discuss the benefits that could

accrue from utilizing modern data management tools, cloud-based systems, and automated tracking mechanisms to streamline the operations and enhance the efficiency of the Research Department. Through this change, the Research Department will enhance its capability to manage an ever-growing number of projects and effectively monitor their progress for enhanced outcomes.

I. LITERATURE SURVEY

In this section, we examine some of the existing literature associated with the challenges and solutions for managing research projects in terms of data management, tracking of projects, and the integration of modern technologies for efficient research administration. Previous studies, methodologies, and technological advancements in the management of research projects can be very useful in answering the issues identified in the Research Department. Challenges in Traditional Project Management Systems A lot of studies highlighted the shortcomings of traditional systems in project management, more so in research environments because data volumes and project complexities keep growing. (2019), an example of which is related to inefficiency in traditional systems, mainly Excel spreadsheets and MS Word, as they did not incorporate real-time co-authorship, data automatic synchronization and tracking. For this reason, errors, lateness and inefficient management of the several projects track of these research administrators frequently occur due to lack of clear control over several simultaneous projects. Centralized Project Management Systems. As a response to the above challenges, there is a growing emphasis on developing centralized project management systems. According to Jones and Lee (2021), their study focused on the adoption of centralized platforms, for example, PMS, and cloud-based systems for research project administration. It emerged that these tools improved the effectiveness of communication, streamlined data sharing, and enabled real time tracking of project milestones. The centralized approach allowed for seamless collaboration among team members and provided research administrators with better oversight, ultimately improving project efficiency. Application of Modern Technologies in Research Project Supervision Contemporary literature also discusses how Advanced Technologies, such as Artificial Intelligence (AI), Machine Learning (ML), and Internet of Things (IoT), may contribute to enhancing research project supervision. A study by Nguyen and Tran (2022) explored the use of AI-driven tools to monitor research progress, predict potential delays, and suggest corrective actions based on data analysis. These technologies not only help in tracking research outcomes but also assist in forecasting project success rates, optimizing resources, and improving overall management strategies. Integration of such technologies in project management systems can help mitigate the inefficiencies of the current manual approach and achieve more accurate and timely supervision of projects. Cloud-Based Solutions for Research Documentation This shift towards cloud-based systems for research documentation and data storage has increasingly been adapted in research institutions across the globe. According to Thomas et al. (2021), cloud solutions allow for the scalable, flexible, and secure storage of large volumes of project-related documents and data. This platform allows for easy accessibility, sharing, and collaboration, which allows researchers and administrators to work seamlessly from different locations. Cloud-based systems also provide automatic backup and data recovery features, which minimize data loss and ensure the integrity of research records.

II. METHODOLOGY

This methodology section will explain the approach and procedures that need to be taken in order to solve the problems encountered by the Research Department with regards to managing and monitoring the research projects. The section would detail the measures to develop a more efficient and centralized system for managing the project, incorporating modern technology solutions to streamline the process of handling data, improve oversight, and enhance the tracking of projects. The proposed methodology is divided into several key phases, each intended to solve specific issues identified in the current system. 1. Problem Identification and Requirement Analysis The methodology begins with a deep understanding of all the challenges and limitations for the Research Administration in handling project information. This is done in a qualitative as well as quantitative manner by using various methods: Interviews and Surveys: Interviews have been conducted with research administrators, project managers, and other key stake holders to identify pain points, inefficiencies, and specific needs concerning project management and tracking of the data. Document Review: Analyzing the past records and project files that exist in Excel sheets and in Word documents for the determination of the current system's strengths and weaknesses. Requirement Gathering: Determining a list of functional requirements that a new system would offer, for example, project milestones monitoring, central storage of all documents, easy collaboration, and real-time updates of the progress. 2. System Design and Technology Selection Based on the insights gathered from the problem identification and requirement analysis phase, a comprehensive system design is developed. It involves selecting appropriate technologies and designing an architecture that matches the needs of the department. System Architecture Design: A centralized system architecture will be designed to integrate project tracking, document management, and real-time updates in one

unified platform. The system will consist of the following key modules: Project Tracking Module: Tracks the progress of each research project by monitoring key milestones and deadlines. Automation Tools: Routine tasks such as progress reporting, data entry, and updates will be automated to reduce administrative overhead. 3. Data Collection and Integration After the system design is complete, the next step is to collect and integrate data from the current research projects into the new system. Integration with Existing Systems: The new system connects any existing platforms the department already uses, such as email systems, calendar applications, and even document sharing tools so there is no disruption caused due to data fragmentation. API Integration: When so needed, APIs connect external databases, research management platforms, or established collaboration tools already in use. 4. System Development and Customization This stage involves developing and tailoring the project management system using the chosen technologies and design specifications. The development process includes: User Interface (UI) Design: It is the designing of the user friendly interface that is intuitive both for administrators and researchers. The UI is designed so that users can easily input data, track progress, and access relevant documents without extensive training. 5. Testing and Validation The system is subjected to rigorous testing before full implementation to ensure that it meets all the functional requirements and is free from errors.

III. OBJECTIVES

1.Centralized Data Storage: Implement a central database to maintain all project files and documentation in an organized format in lieu of the Excel sheets and Word documents.

2. Real-time Project Monitoring: Provide a facility for real time monitoring of projects in execution, with details on milestone, completion percentages, and status of studies.

3. Automated Report Generation: Support the generation of reports on the status of the project, usage of resources, and key performance indicators.

4. Access Control: Ensure secure access to project files with role-based access control that relates to the department's roles.

5. Efficient Search and Retrieval: Incorporate a search facility where users can easily locate information on project details through project ID, study title, or principal investigator.

6. Notifications & Alerts: Add automated alerts on critical deadlines, progress updates, and tasks of high priority, so nothing is missed. 7. Audit Trail: Log every change to the project files and documentation so accountability and tracking are possible.

8. Collaboration Features: Develop a site that will enable multi-stakeholders collaboration in the project with real time edits documented.
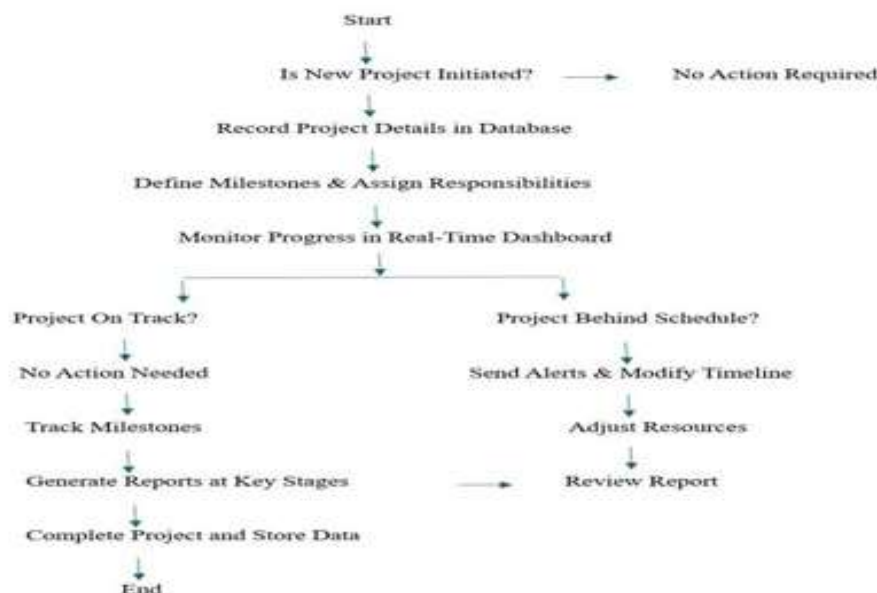
IV. RESEARCH GAPS OF EXISTING METHODS

Introduction

Despite the advancement of technologies and the introduction of various project management systems, many research gaps remain in the existing methods used for managing and tracking research projects in organizations, particularly in the context of research departments. Even the most traditional systems, as well as some of the more modern solutions, continue to possess limitations that obstruct efficient tracking of projects, data management, and consequently, project success. This section identifies the research gaps in current methods and highlights areas that need more exploration and improvement.

5.1 Inability to Integrate Real-time Data and Monitor

This is one of the features that many traditional project management systems and even some of the contemporary solutions lack the ability to provide real-time updates and data integration. Where project timelines and milestones keep changing in research environments, having an up-to date overview is very important. Existing methods have used periodic updates or manual entry of progress reports, which causes delay in the flow of information. The gap is very evident about the integration of systems with real-time data monitoring tools that can provide live updates about the progress of the project, resource allocation, and possible risks.

5.2 Poor Collaboration and Communication Features

Present methods in handling project management, which frequently encounter poor communication and teamwork among workers of projects, especially for complex projects involving research studies with participants of various stakeholders and locations. Tools like Excel and Word are static, and a collaborative work can't take place in real-time through this tool. With more superior project management software, their integration with some communication tool like a chat system or email platform results in developing communication silos. There is a research gap in developing project management systems that provide integrated collaboration features, allowing for real-time discussions, file sharing, and task assignments without needing to switch between different platforms.

5.3 Fragmented Data Management Systems

Many research departments have a disintegrated management of data. Information can be spread out across various platforms, spreadsheets, and documents, thus creating a disjointed user experience in accessing a complete, centralized view of the data at a glance. Moreover, data integrity is often compromised since project details have to be manually updated on different platforms. While some of the solution software integrates data management, very few do so in a manner that also incorporates project tracking, documentation, and resource management into one comprehensive system. There exists a large gap in developing a system that would allow integration of all the functionalities related to project management—file storage, tracking, and allocation of resources—within a single access platform.

5.4 Scalability and Adaptability Issues

Many of the project management tools used today are effective for smaller research projects but cannot scale to accommodate larger, multidisciplinary research efforts involving multiple teams, data types, and complex workflows. These tools are generally rigid and not very accommodating for the needs of departments, teams, or research topics. As research projects become increasingly large and complex, they can also become too slow or inefficient to use effectively. Scalable solutions that will grow with the needs of the department and can adapt to changing research project natures are required.

5.5 Limited Support for Decisions

Traditional systems often do not allow for the deep insight that would otherwise be needed in order to make a decision on research administration. Decisions are typically made based on subjective judgment or incomplete data. While some project management tools provide basic reporting features, few integrate data analytics and machine learning to offer predictive insights or assist in decision-making. There is a gap in research into decision support systems that can analyze past project data, identify trends, and provide recommendations for future projects, such as resource allocation or risk management strategies.

5.6 Security and Data Privacy Concerns

Since most research projects involve sensitive and confidential information, project information security and confidentiality are the most important features. But most of the existing systems for managing research projects are not equipped with adequate security protocols, which make them prone to vulnerabilities at the stages of data storage, sharing, and access. On the other hand, even though some of the cloud-based systems support security features, they still do not comply with particular data protection regulations relevant to research institutions. There is a need for more research into secure, compliant data management systems tailored to research environments that can guarantee data integrity while supporting collaboration and sharing.

5.7 User Experience and Accessibility Issues

Existing research project management systems can be complex and difficult for non-technical users to navigate, especially when they involve intricate workflows or specialized tools. In most cases, these systems require a great deal of training, which may make users reluctant or inefficient when using the platform. There is, therefore, a need for systems with user-friendly interfaces and minimal learning curves to allow accessibility to both research administrators and team members with varying technical expertise. Mobile accessibility also becomes an important consideration as research teams may need to access project data remotely. Research gaps still exist in the development of systems that consider ease of use, intuitive design, and mobile compatibility.

V. PROPOSED METHODOLOGY

This study will suggest a structured methodology in designing and implementing a centralized project management system that could address the challenges of managing and monitoring research projects. The approach will consist of six key phases aimed at dealing with the current inefficiencies in the system, making it streamlined to track and administer the project. The first phase is problem identification and requirement gathering, which involves gathering thorough data from stakeholders, especially research administrators and project managers. This phase puts into the limelight any existing pain points such as the lack of real-time tracking, decentralized storage, and inefficiencies in collaborating. Findings are applied to develop a functional list of requirements that will form the basis of the system design. Suitable technologies to be used in the system design and architecture phase to address the needs of the department are identified. Scalability, accessibility, and efficiency are ensured through the use of cloud-based solutions, project management software, and automation tools. The system architecture is modular with dedicated components for project tracking, document management, communication, and automation. The data collection and integration phase is an amalgamation of existing records, cleaning and standardization of data, and migrating to the new system. It integrates with platforms like email and calendar tools, allowing for a continuous workflow. APIs are used to bridge the new system with external tools, integrating into a unified ecosystem that manages research. As soon as the design is concluded, the development and adaptation phase of the system occurs, comprising department requirement adaptation of project management tool, automation features for reminding and reporting, and finally, an easy-to-understand interface that works fine. The system is fully tested at this stage and all possible errors are traced, discussed, and thus are not produced into live conditions. Finally, in the implementation and training phase, the system is deployed with minimum disturbance to the ongoing projects. Training sessions are conducted to familiarize the users with the system features so that it could be adopted smoothly. This structured methodology not only addresses the current challenges but also provides a scalable and efficient framework to manage future research projects effectively.

VI. SOFTWARE REQUIREMENTS SPECIFICATIONS

A. Functional Requirements

Project Tracking: Track milestones, deadlines, and progress; generate visual reports; send notifications for deadlines.

Document Management: Centralized file storage with version control, support for various file types, and secure access controls. Collaboration Tools: Supports up to 100 users; perform functions in under 3 seconds.

Scalability: Handle growth, integration, and increase data size over time.

Reliability: Achieve 99.9% uptime with robust backup strategies

Security Data encryption; Role-based permissions; Audit frequency

Usability Elegant interface, support multi-language, accessible by design.

Accessibility Compliance on WCAG 2.1; support for both web and mobile. Accessibility

VII. SYSTEM DESIGN

A. Architectural Overview

System Design The system adopts client-server architecture with cloud based storage for ensuring that access by the users is remote, secure, and has direct real-time updating and easy data management capabilities while encouraging teamwork. This architecture consists of the following layers: User Interface Layer: This is a friendly, user-accessible layer that offers access to both researchers, administrators, and project managers. This interface will be accessible using web browsers and mobile applications. Application Layer: Implements the business logic for project tracking, document management, and automation. Manages workflows like progress monitoring, notifications, and reporting. Data Layer: Stores all project-related data in a centralized, cloud-based repository. Guarantees data integrity through encryption and role based access controls. Integration Layer: Tracks project milestones, deadlines, and progress using Gantt charts and dashboards. Seamless communication between members and administrators. Automation Tools: Automates routine activities, such as progress reporting, reminders, and document organization. Reduces administrative overhead and minimizes human error. User Management Module: The module has role-based access control for secure and customized user experience. User activity is monitored and audited.

B. Data Flow Diagram (DFD)

The system employs a linear data flow Users enter project information or updates through the UI layer. The application layer processes it and updates the database in the data layer. Automation tools provide notifications or reports based on pre-defined triggers. External integrations like email systems give the user notification of an update or deadline. Data or reports are retrieved by users from the database through the UI layer.

C. Security Features

Data Encryption: Data is encrypted in both transit and storage to ensure it is secure. Role-Based Access Control: It denies access to sensitive information based on user roles. Audit Logs: User activities are monitored and recorded for compliance.

VIII. CONCLUSION

With increasing complexity and volume, research projects require an efficient and centralized approach to managing projects. This paper discusses the shortcomings of traditional tools such as Excel and Word documents in not meeting the challenges of real-time tracking, collaboration, and data organization. A robust and scalable system design incorporating modern technologies, such as cloud-based platforms, automation tools, and centralized data management, has been proposed to overcome these inefficiencies. The proposed solution provides many benefits, such as simplified project tracking, improved document management, and better collaboration among the stakeholders. By automating routine tasks and integrating real-time communication tools, the system minimizes administrative overhead and reduces the risk of errors. Moreover, the secure and user-friendly interface allows researchers and administrators to access and update the project data with ease. It will highly help the Research Department to be able to track its studies in progress, adhere to deadlines, and reach new heights of efficiency and accuracy in all aspects. Also, being modular and scalable in architecture will make the system more capable of adjusting itself to future needs while being supportive of department growth and evolving research needs. In conclusion, adopting a centralized project management system is a transformative move for the Research Department, allowing it to continue to maintain the high standards of productivity and innovation while effectively managing the increasing portfolio of research projects.
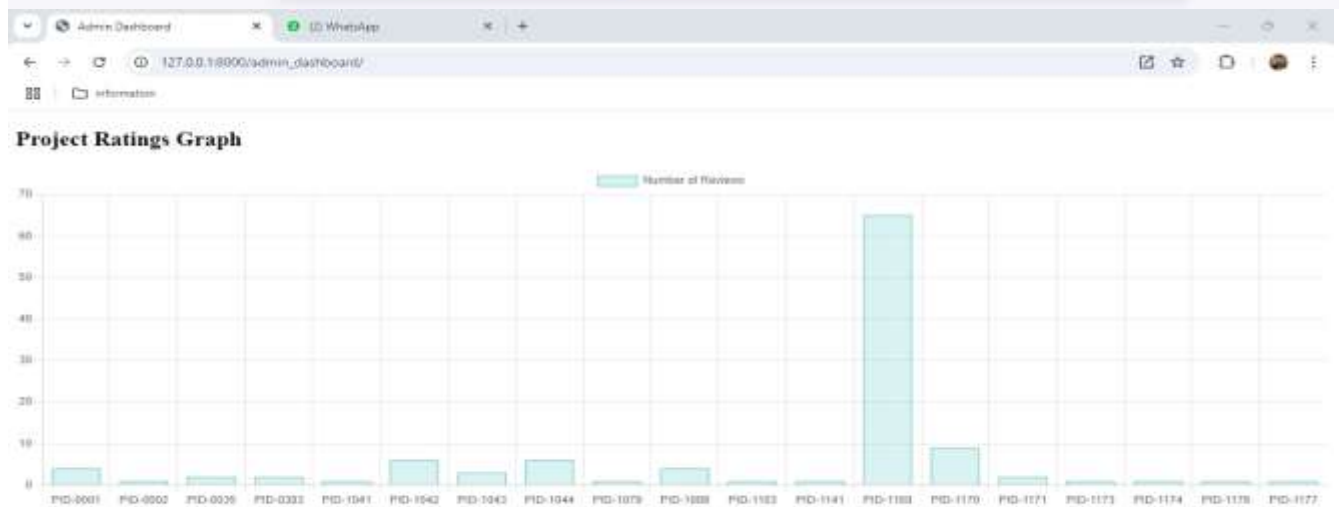
IX. OUTPUT

REFERENCES

[1] Ali1.Alam, A., & Muqeem, M. (2024). An optimal heart disease prediction using chaos game optimization-based recurrent neural model. International Journal of Information Technology, 16(5), 3359-3366.

[2] Alam, A., & Muqeem, M. (2022, March). Integrated k-means clustering with nature inspired optimization algorithm for the prediction of disease on high dimensional data. In 2022 international conference on electronics and renewable systems (ICEARS) (pp. 1556-1561). IEEE.

[3] Alam, A., Ahamad, M. K., Mohammed Aarif, K. O., & Anwar, T. (2024). Detection of rheumatoid arthritis using CNN by transfer learning. In Artificial Intelligence and Autoimmune Diseases: Applications in the Diagnosis, Prognosis, and Therapeutics (pp. 99 112). Singapore: Springer Nature Singapore.

[4] Alam, A., & Ahamad, M. K. (2023). K-Means Hybridization with Enhanced Firefly Algorithm for High-Dimension Automatic Clustering. Journal of Advanced Research in Applied Sciences and Engineering Technology, 33(3), 137-153.

[5] A. Shahid, K. Wilkinson, S. Marcu, and C. M. Shapiro, "Karolinska Sleepiness Scale (KSS)," in STOP, THAT and One Hundred Other Sleep Scales, A. Shahid, K. Wilkinson, S. Marcu, and C. M. Shapiro, Eds. New York, NY: Springer, 2012, pp. 209–210. doi: 10.1007/978-1-4419-9893- 4_47.

[6] C. Berka et al., "EEG Correlates of Task Engagement and Mental Workload in Vigilance, Learning, and Memory Tasks," Aviat. Space Environ. Med., vol. 78, no. 5, pp. B231–B244, May 2007.

[7] H.-S. Shin, S.-J. Jung, J.-J. Kim, and W.-Y. Chung, "Real time car driver's condition monitoring system," in 2010 IEEE SENSORS, Nov. 2010, pp. 951–954. doi: 10.1109/ICSENS.2010.5690904.

[8] M. Gillberg, G. Kecklund, and T. Åkerstedt, "Sleepiness and performance of professional drivers in a truck simulator—comparisons between day and night driving," J. Sleep Res., vol. 5, no. 1, pp. 12–15, 1996, doi: 10.1046/j.1365-2869.1996.00013.x.

[9] C. Cajochen, D. P. Brunner, K. Kräuchi, P. Graw, and A. Wirz-Justice, "EEG and subjective sleepiness during extended wakefulness in seasonal affective disorder: circadian and homeostatic influences," Biol. Psychiatry, vol. 47, no. 7, pp. 610–617, Apr. 2000, doi: 10.1016/S0006- 3223(99)00242-5.

[10] S. Otmani, T. Pebayle, J. Roge, and A. Muzet, "Effect of driving duration and partial sleep deprivation on subsequent alertness and performance of car drivers," Physiol. Behav., vol. 84, no. 5, pp. 715–724, Apr. 2005, doi: 10.1016/j.physbeh.2005.02.021.

[11] C. Papadelis et al., "Indicators of Sleepiness in an ambulatory EEG study of night driving," in 2006 International Conference of the IEEE Engineering in Medicine and Biology Society, Aug. 2006, pp. 6201–6204. doi: 10.1109/IEMBS.2006.259614.

[12] R.-S. Huang, T.-P. Jung, and S. Makeig, "Tonic Changes in EEG Power Spectra during Simulated Driving," in Foundations of Augmented Cognition. Neuroergonomics and Operational Neuroscience, Berlin, Heidelberg, 2009, pp. 394–403. doi: 10.1007/978-3-642- 02812-0_47.

[13] L.-C. Shi and B.-LLu, "Dynamic clustering for vigilance analysis based on EEG," in 2008 30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Aug. 2008, pp. 54–57. doi: 10.1109/IEMBS.2008.4649089.

[14] R. N. Khushaba, S. Kodagoda, S. Lal, and G. Dissanayake, "Driver Drowsiness Classification Using Fuzzy Wavelet-Packet-Based Feature Extraction Algorithm," IEEE Trans. Biomed. Eng., vol. 58, no. 1, pp. 121-131, Jan. 2011, doi: 10.1109/TBME.2010.2077291.

[15] S. Hu and G. Zheng, "Driver drowsiness detection with eyelid related parameters by Support Vector Machine," Expert Syst. Appl., vol. 36, no. 4, pp. 7651–7658, May 2009, doi: 10.1016/j.eswa.2008.09.030.

[16] M. B. Kurt, N. Sezgin, M. Akin, G. Kirbas, and M. Bayram, "The ANN based computing of drowsy level," Expert Syst. Appl., vol. 36, no. 2, Part 1, pp. 2534–2542, Mar. 2009, doi: 10.1016/j.eswa.2008.01.085.

[17] S. K. L. Lal and A. Craig, "A critical review of the psychophysiology of driver fatigue," Biol. Psychol., vol. 55, no. 3, pp. 173–194, Feb. 2001, doi: 10.1016/S0301-0511(00)00085-5.

[18] M. Akin, M. B. Kurt, N. Sezgin, and M. Bayram, "Estimating vigilance level by using EEG and EMG signals," Neural Comput. Appl., vol. 17, no. 3, pp. 227–236, Jun. 2008, doi: 10.1007/s00521-007-0117-7.

[19] L. Chen, Y. Zhao, J. Zhang, and J. Zou, "Automatic detection of alertness/drowsiness from physiological signals using wavelet-based nonlinear features and machine learning," Expert Syst. Appl., vol. 42, no. 21, pp. 7344–7355, Nov. 2015, doi: 10.1016/j.eswa.2015.05.028.

[20] T. Ouyang and H.-T. Lu, "Vigilance Analysis Based on Continuous Wavelet Transform of EEG Signals," in 2010 International Conference on Biomedical Engineering and Computer Science, Apr. 2010, pp. 1–4. doi: 10.1109/ICBECS.2010.5462289.

[21] M. Khan, "Efficient Car Alarming System for Fatigue Detection during Driving," Int. J. Innov. Manag. Technol., vol. 3, no. 4, 2012, doi: 10.7763/IJIMT.2012.V3.280.

[22] S. Mohanty, S. V. Hegde, S. Prasad, and J. Manikandan, "Design of Real-time Drowsiness Detection System using Dlib," in 2019 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE), Nov. 2019, 10.1109/WIECONECE48653.2019.9019910. pp. 1–4. doi:

[23] L. M. Bergasa, J. Nuevo, M. A. Sotelo, R. Barea, and M. E. Lopez, "Real time system for monitoring driver vigilance," IEEE Trans. Intell. Transp. Syst., vol. 7, no. 1, pp. 63–77, Mar. 2006, doi: 10.1109/TITS.2006.869598.

[24] B. F. Momin, "Current Status and Future Research Directions in Monitoring Vigilance of Individual or Mass Audience in Monotonous Working Environment," Int. J. Soft Comput., vol. 3, no. 2, pp. 45–53, May 2012, doi: 10.5121/ijsc.2012.3204.