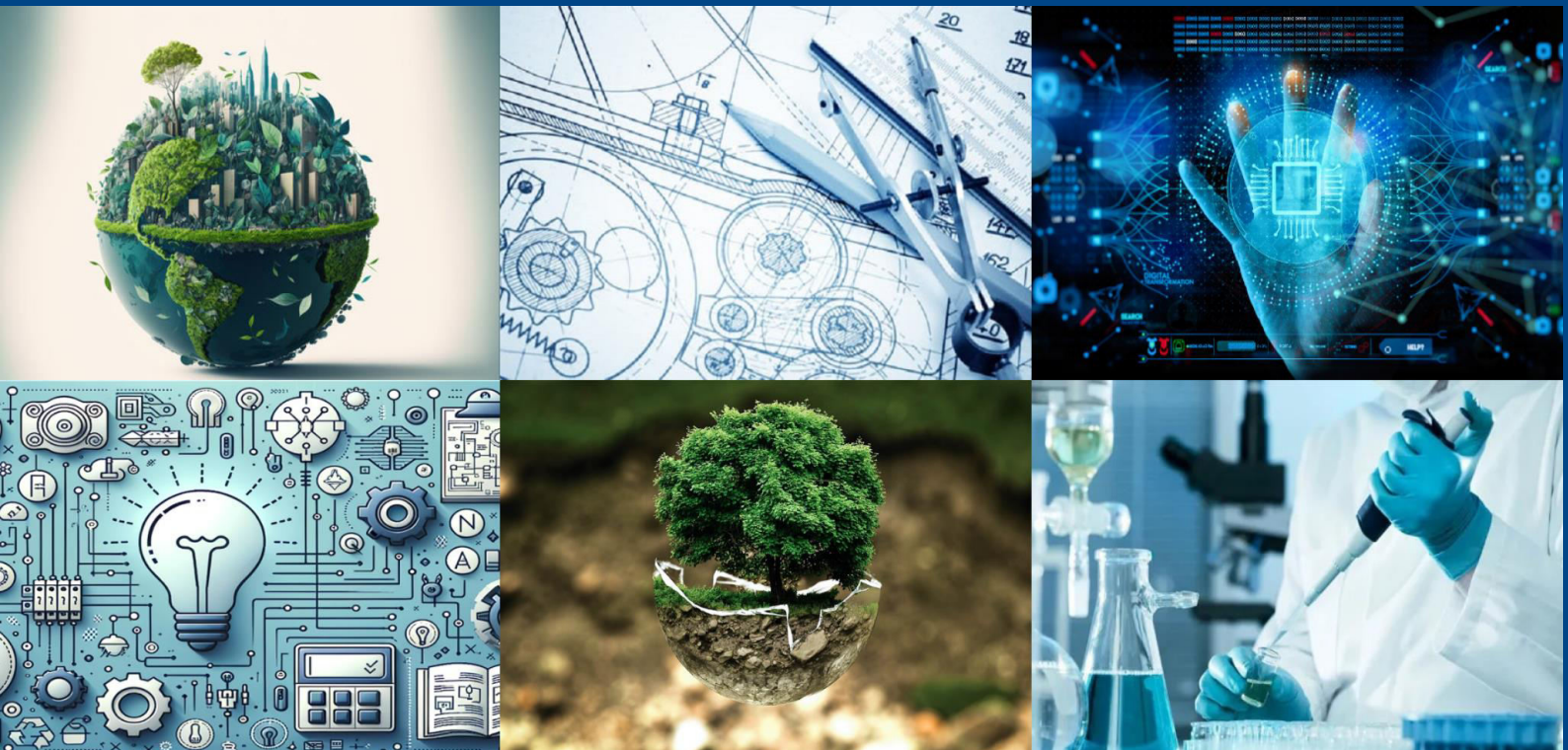# International Journal of Multidisciplinary
Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Flutter-Based Digital Classroom App for Android & iOS

Rohit Shirsat, Shubham Supekar

Dept. of Information Technology, SKNCOE, Savitribai Phule Pune University, Pune, India

ABSTRACT: This paper explores the development of a **Flutter-based Digital Classroom App** that serves as an educational platform for students and teachers on Android and iOS devices. The app leverages Flutter's capabilities to provide a seamless user experience across both platforms. It offers features like live classes, assignments, discussion boards, and notifications. The paper will cover the system architecture, user interface design, and the benefits of using Flutter for cross-platform development.

I. INTRODUCTION

In the rapidly evolving world of education, the demand for digital platforms that facilitate remote learning has surged. **Digital classroom apps** are at the forefront of this evolution, helping students and teachers interact and collaborate effectively outside the traditional classroom setting. This paper discusses the development of a **Flutter-based Digital Classroom App**, targeting both Android and iOS platforms, that can host live classes, share educational resources, manage assignments, and facilitate communication.

1.1 Problem Statement
Traditional educational methods are often limited by geographical and physical constraints. With the shift toward online learning, it is crucial to have efficient, user-friendly, and cross-platform apps that can support various educational activities. Developing such an app using Flutter allows for reduced development time and cost, ensuring that the app reaches both Android and iOS users seamlessly.

1.2 Objectives
- To develop an app that supports live classes, assignments, quizzes, and peer interaction.
- To create an app with a unified interface for Android and iOS users.
- To evaluate the advantages of Flutter in building cross-platform educational apps.

II. SYSTEM ARCHITECTURE

The architecture of the app is designed to support scalability, flexibility, and ease of use. The app consists of several components that interact with each other, as shown in the diagram below.

2.1 Components
- **Frontend (Mobile App)**: Developed using Flutter, it serves as the user interface for both Android and iOS.
- **Backend Server**: Handles user authentication, storage of educational materials, assignment submission, etc.
- **Database**: Stores data such as user profiles, assignments, grades, and course content.
- **Third-Party Services**: Includes video conferencing APIs (like Zoom or Jitsi) for live classes and Firebase for notifications.
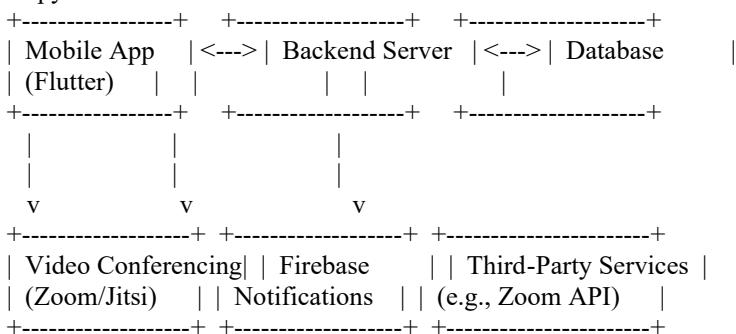
2.2 System Diagram

plaintext
Copy

```
+----------------+   +------------------+   +------------------+
| Mobile App     |<--->| Backend Server |<--->| Database         |
| (Flutter)      |   |                  |   |                  |
+----------------+   +------------------+   +------------------+
       |                    |                      |
       |                    |                      |
       v                    v                      v
+------------------+   +------------------+   +---------------------+
| Video Conferencing| | Firebase        | | Third-Party Services |
| (Zoom/Jitsi)     | | Notifications    | | (e.g., Zoom API)     |
+------------------+   +------------------+   +---------------------+
```

III. FEATURES AND FUNCTIONALITIES

The app provides several core features that aim to enhance the learning experience.

3.1 User Authentication

The app supports secure login and registration through email, Google, or Facebook authentication, with role differentiation (students, teachers, and admins).

3.2 Live Classes

Teachers can host live sessions using integrated video conferencing APIs like Zoom or Jitsi. Students can join using a class code or a direct link provided by the teacher.

3.3 Assignments and Quizzes

Teachers can upload assignments, quizzes, and exams. Students can submit their work within the app. The backend evaluates the quizzes automatically, and grades are updated in real-time.

3.4 Discussion Board

Students and teachers can engage in discussions and share resources on a subject-specific forum, promoting peer-to-peer learning.

3.5 Notifications

The app uses Firebase Cloud Messaging to send real-time notifications about upcoming classes, deadlines, and new resources.

IV. UI/UX DESIGN

4.1 User Interface Design

The app's user interface is simple, intuitive, and consistent across both platforms. Below is a table comparing the main screens for both Android and iOS versions of the app.

Screen	Function	Android Design	iOS Design
Login Screen	User authentication	Material Design	Cupertino Design
Home Screen	Dashboard with upcoming classes, assignments	Drawer Navigation	Tab Navigation
Classroom Screen	Live class interface with chat and video	Full-screen video with chat bubbles	Full-screen video with integrated chat
Assignments Screen	List of assignments with submission options	Card-style list	List-style view with swipe actions
Discussion Board	Community interactions	Nested comment threads	Flat comment threads

4.2 Design Flow

The design flow follows a **Material Design** approach for Android, ensuring a native feel, while **Cupertino Design** is used for iOS to match its design language.

V. TECHNOLOGY STACK

5.1 Flutter

Flutter, a UI toolkit by Google, is used for building natively compiled applications for mobile from a single codebase. It provides the following advantages:

- Fast development with **Hot Reload**.
- High performance due to direct compilation to native code.
- Native-like look and feel with rich widgets.

5.2 Backend

The backend is built using **Node.js** and **Express**, handling APIs for user authentication, assignments, and live class management. The backend communicates with the **MongoDB** database.

5.3 Firebase

Firebase is used for real-time notifications and user authentication. Firebase Authentication ensures that user data is securely managed, and Firebase Cloud Messaging delivers real-time notifications.

VI. PERFORMANCE AND SCALABILITY

Flutter provides excellent performance due to its native code compilation. The app's architecture ensures scalability:

- **Modular Backend**: The backend can handle increasing numbers of users and educational content efficiently.
- **Video Conferencing**: Integration with scalable APIs like Zoom ensures that live classes can support hundreds of students.

VII. ADVANTAGES OF FLUTTER FOR CROSS-PLATFORM DEVELOPMENT

7.1 Code Reusability

Flutter allows developers to write a single codebase for both Android and iOS platforms, significantly reducing development time and cost.

7.2 Performance

Flutter provides near-native performance, ensuring a smooth user experience across both platforms without compromising on speed or responsiveness.

7.3 Community Support

With an active community, Flutter offers a rich set of pre-built widgets and libraries, accelerating development.

VIII. CONCLUSION

The Flutter-based Digital Classroom App provides an efficient and scalable solution for modern educational needs. By using Flutter for cross-platform development, we reduce development time while maintaining high performance and a native feel across Android and iOS platforms. The app supports key features like live classes, assignments, quizzes, and notifications, aiming to enhance both teaching and learning experiences.

Future developments can include adding support for more advanced analytics, virtual classrooms, and integrations with additional educational tools.

REFERENCES

1. Flutter Documentation (2025). "Flutter: Build Natively Compiled Applications for Mobile." https://flutter.dev/docs
2. Firebase Documentation (2025). "Firebase: The Backend Solution for Mobile." https://firebase.google.com/docs
3. A.M., Arul Raj, A. M., R., Sugumar, Rajendran, Annie Grace Vimala, G. S., Enhanced convolutional neural network enabled optimized diagnostic model for COVID-19 detection, Bulletin of Electrical Engineering and Informatics, Volume 13, Issue 3, 2024, pp.1935-1942, https://doi.org/10.11591/eei.v13i3.6393.

4. A.M., Arul Raj, A. M., R., Sugumar, Rajendran, S., Padmakala, Sadagopan, N., Ahmad, Naim, A.S., Badawy, Ahmed Said, Detection of Covid-19 based on convolutional neural networks using pre-processed chest X-ray images, AIP Advances, Volume 14, Issue 3, March 2024, 035150, https://doi.org/10.1063/5.0200397.

5. Arulraj AM, Sugumar, R., Estimating social distance in public places for COVID-19 protocol using region CNN, Indonesian Journal of Electrical Engineering and Computer Science, 30(1), pp.414-424, April 2023.

6. K Vivek Balaji, R Sugumar, Harnessing the Power of Machine Learning for Diabetes Risk Assessment: A Promising Approach, International Conference on Data Science, Agents & Artificial Intelligence (ICDSAAI) 2023, pp.1-6

7. Arul Raj AM, R Sugumar, A Deep Learning-Based Preventive Measures of COVID-19 in a crowd using Reinforcement Model over GAN for Enhanced efficiency, 2023 Third International Conference on Advances in Electrical, Computing, Communication and Sustainable Technologies (ICAECT), pp.1-5, January 2023.

8. Arul Raj .A.M and Sugumar R., "Estimation of Social Distance for COVID19 Prevention using K-Nearest Neighbor Algorithm through deep learning," 2022 IEEE 2nd Mysore Sub Section International Conference (MysuruCon), Mysuru, India, 2022, pp. 1-6. March 2023, , ISBN:978-166549790-9. DOI:10.1109/MysuruCon55714.2022.9972422

9. Arul Raj .A.M and Sugumar R.," Monitoring of the social Distance between Passengers in Real-time through video Analytics and Deep learning in Railway stations for Developing highest Efficiency" , March 2023 International Conference on Data Science, Agents and Artificial Intelligence, ICDSAAI 2022, ISBN 979-835033384-8, March 2023, Chennai , India ., DOI 10.1109/ICDSAAI55433.2022.10028930.

10. Arul Raj .A.M and Sugumar R., "A Deep Learning-Based Preventive Measures of COVID-19 in a crowd using Reinforcement Model over GAN for Enhanced efficiency", 2023 3rd International Conference on Advances in Electrical, Computing, Communication and Sustainable Technologies, ICAECT 2023 Bhilai., India., DOI 10.1109/ICAECT57570.2023.10118327.

11. Arul Raj .A.M and Sugumar R., "Multi-Modal Fusion of Deep Learning with CNN based COVID-19 Detection and Classification Combining Chest X-ray Images," 7th International Conference on Intelligent Computing and Control Systems, Madurai., India., ICICCS 2023, Code 189354, Pages 569 – 5752023, 17 May 2023 through 19 May 2023,ISBN:979-835039725-3, DOI : 10.1109/ICICCS56967.2023.10142910.

12. Arul Raj .A.M and Sugumar R., " Enhancing COVID-19 Diagnosis with Automated Reporting using Preprocessed Chest X-Ray Image Analysis based on CNN," 2nd International Conference on Applied Artificial Intelligence and Computing, ICAAIC 2023, Salem.,India., Code 189334, Pages 35 - 402023 , 4 May 2023 through 6 May 2023, ISBN:978-166545630-2, DOI: 10.1109/ICAAIC56838.2023.10141515

13. Arul Raj .A.M and Sugumar R., "A Deep Learning Framework for COVID-19 Detection in X-Ray Images with Global Thresholding ," 2nd IEEE International Conference on Vision Towards Emerging Trends in Communication and Networking Technologies, Institute of Electrical and Electronics Engineers Inc, ViTECoN 2023, Vellore.,India., Code-190031, Aug 2023, ISBN-979-835034798-2, DOI-10.1109/ViTECoN58111.2023.10157404.

14. Arul Raj .A.M and Sugumar R., "Early Detection of COVID-19 with Impact on Cardiovascular Complications using CNN Utilising Pre-Processed Chest X-Ray Images", (ICAISC-2023), August 2023, ISBN:979-8-3503-2380-1, https://doi.org/10.1109/ICAISC58445.2023.10199456, 1st IEEE International Conference on Applied Intelligence and Sustainable Computing, ICAISC 2023 Hybrid, Dharwad., India.

15. B Yamini, K Sudha, M Nalini, G Kavitha, R Siva Subramanian, R Sugumar, Predictive Modelling for Lung Cancer Detection using Machine Learning Techniques, 2023 8th International Conference on Communication and Electronics Systems (ICCES), pp.1220-1226.

16. Vivek Balaji, K., Sugumar, R., Harnessing the Power of Machine Learning for Diabetes Risk Assessment: A Promising Approach, 2023 International Conference on Data Science, Agents and Artificial Intelligence, ICDSAAI 2023, 2023

17. R.Udayakumar, Suvarna Yogesh, Yogesh Manohar, V.R.Vimal, R.Sugumar, User Activity Analysis Via Network Traffic Using DNN and Optimized Federated Learning based Privacy Preserving Method in Mobile Wireless Networks, Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, 14(2), pp. 66–81, June 2023.

18. Dong Wang, Lihua Dai, Xiaojun Zhang, Shabnam Sayyad, R. Sugumar, Khushmeet Kumar, Evans Asenso, Vibration signal diagnosis and conditional health monitoring of motor used in Biomedical Application Using Internet of Things Environment, The IET Journal of Engineering , October 2022.

19. Govindaraj Vasanthi, "Modernizing Workflows with Convolutional Neural Networks: Revolutionizing AI Applications." World Journal of Advanced Research and Reviews, vol. 23, no. 03, 2024, pp. 3127–3136. https://doi.org/10.30574/wjarr.2023.20.2.1956.

20. Govindaraj Vasanthi, "Cloud Migration Strategies for Mainframe Modernization: A Comparative Study of AWS, Azure, and GCP." International Journal of Computer Trends and Technology, vol. 72, no. 10, 2024, pp. 57–65. https://doi.org/10.14445/22312803/IJCTT-V72I10P110.

21. Govindaraj Vasanthi, Vellathur Jaganathan Humashankar, and Periyasamy Prakash. "Explainable Transformers in Financial Forecasting." World Journal of Advanced Research and Reviews, vol. 20, no. 02, 2023, pp. 1434–1441.

INTERNATIONAL JOURNAL OF

MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com