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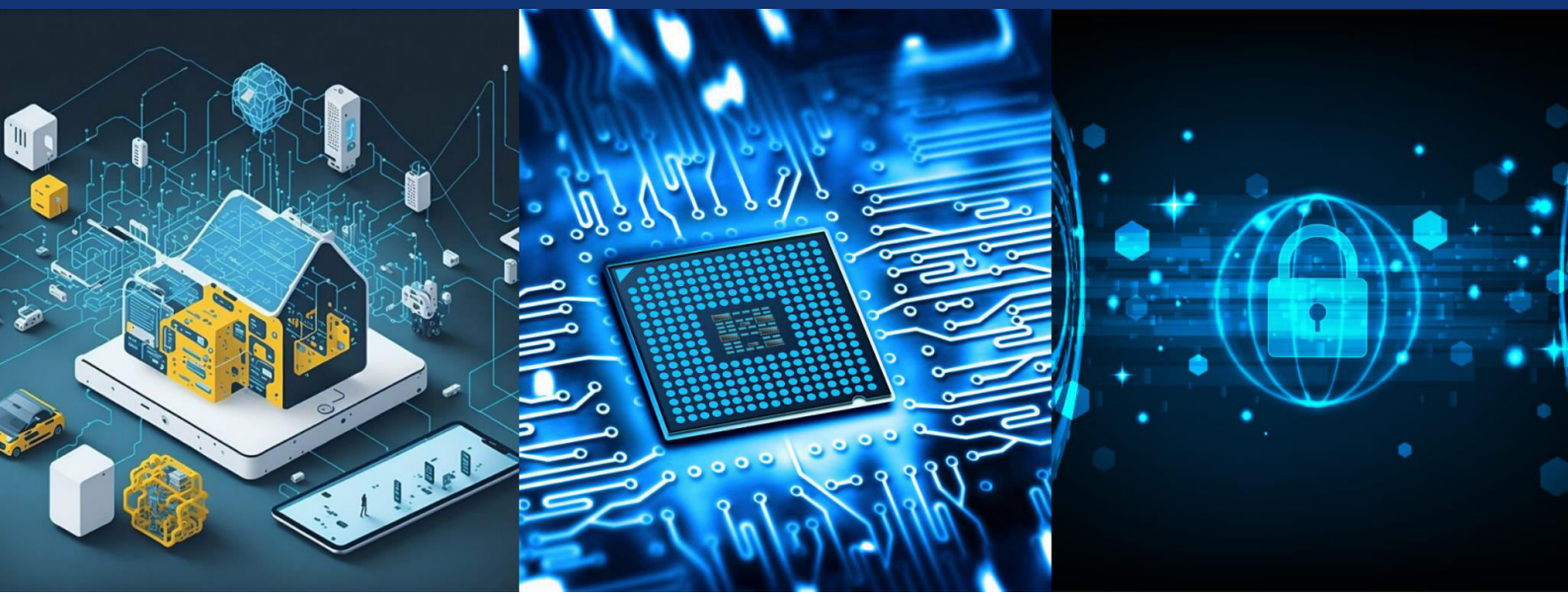

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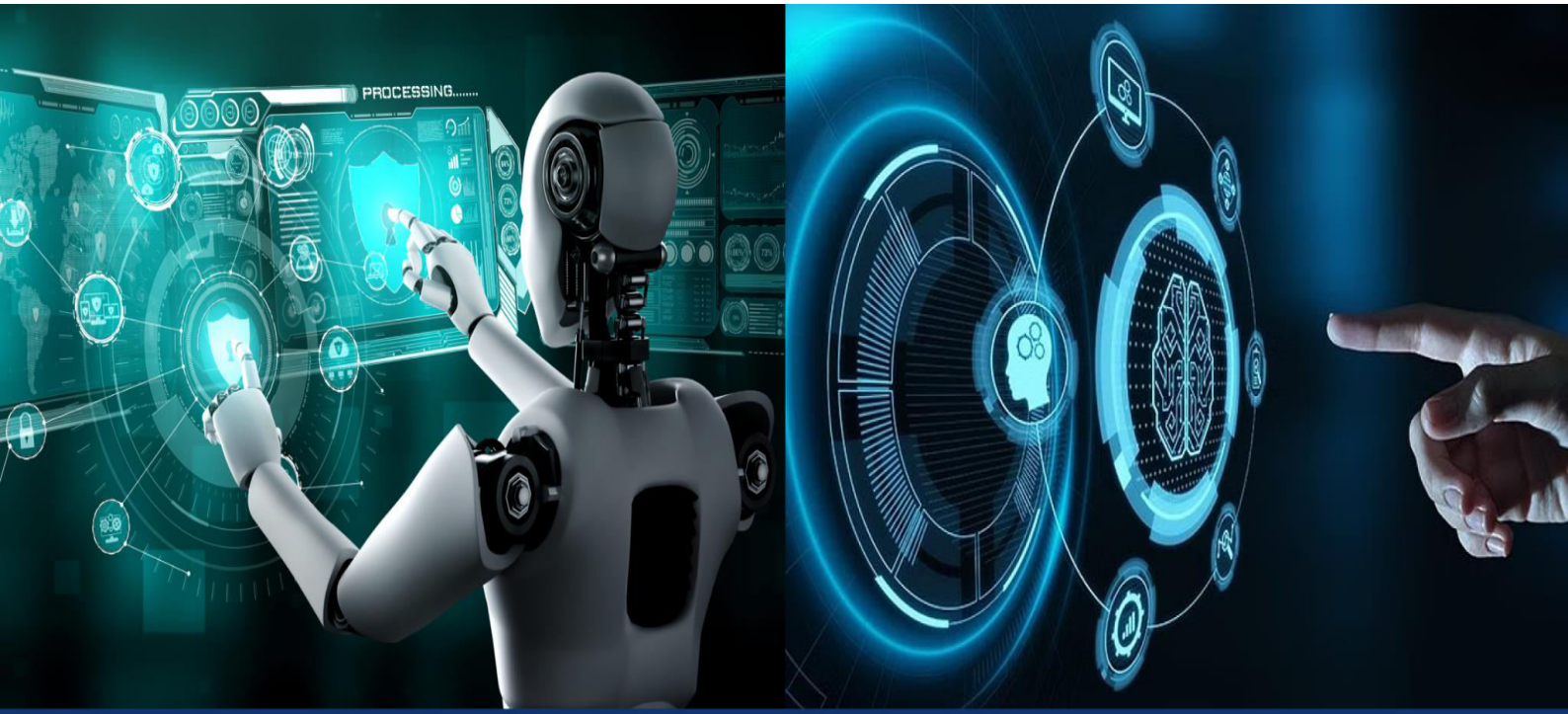

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Reliable Smart Notice Board with Offline Playback Capability

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ABSTRACT: The Smart LED Notice Board is a modern communication system designed to display notices digitally using an LED TV. Traditional notice boards require manual effort and take time to update information. In this system, messages are sent from a mobile device or web application through Wi-Fi. The Raspberry Pi acts as the main controller, receiving and processing the data efficiently. The processed information is then displayed on the LED TV screen in real-time, enabling instant updates. This eliminates the need for physical presence to change notices. The system is user-friendly, cost-effective, and reduces paper usage, making it eco-friendly. Overall, the Smart LED Notice Board improves communication efficiency by providing a reliable, wireless, and real-time display system.

KEYWORDS: Cloud Computing, Internet of Things (IoT), Raspberry Pi, Smart Notice Board, Firebase, Real-Time Updates, Remote Content Management, Data Synchronization.

I. INTRODUCTION

Traditional notice boards are still widely used, but they require manual effort to update information and consume time. Also, there is a delay in delivering urgent messages, and it involves the use of paper, which is not eco-friendly.

To overcome these problems, the Smart LED Notice Board system is developed. This project uses modern technology to display notices digitally on an LED TV screen. The system allows users to send messages wirelessly using a mobile phone or web application.

The core component of this system is the Raspberry Pi, which acts as a mini computer to receive and process the data. The received message is then displayed on the LED screen instantly. This makes the communication process faster, easier, and more efficient.

This system is highly useful in places like colleges, offices, hospitals, and public areas where information needs to be updated frequently. It reduces manual work, saves time, and provides a modern way of communication.

Additionally, the system supports seamless upload and download of data, ensuring reliable communication between the cloudand the display unit. Its scalability allows multiple notice boards to be controlled from a centralized platform, making it

highly suitable for large-scale deployments. Overall, the system enhances efficiency, reduces human effort, and provides a modern approach to information sharing.

II. LITERATURE SURVEY

The paper by Bhardwaj et al. (2020) presents an IoT-based smart notice board for wireless message display from remote locations. It replaces traditional notice boards with a real-time automated system, reducing manual effort. Conventional boards are inefficient for dynamic environments like schools and offices. The system uses a PIC16F877A microcontroller and GSM modem to display messages on an LED matrix. Supporting components like MAX232 and voltage regulators ensure proper functioning. It enables wireless updates, making it useful in various public applications. However, it depends on GSM networks, while newer systems offer more advanced features.

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The paper by Sumathi and Uthirasamy (2024) presents a smartphone-integrated wireless LED notice board for efficient communication. It allows users to send messages from smartphones using Bluetooth or Wi-Fi. The system replaces traditional notice boards, reducing manual effort and improving communication speed. A microcontroller is used to process and display messages on the LED board. It provides real-time updates, making it suitable for colleges and offices. The system is low-cost, reliable, and easy to use. However, it depends on network connectivity and has limited communication range.

The paper by Gemeda et al. (2021) presents a smart wireless electronic notice board system for efficient information display. It replaces traditional paper-based boards with a digital and automated solution. The system uses wireless communication to send messages from a remote user to an electronic display. A microcontroller controls the system and manages data processing. It provides real-time updates, improving communication speed and reliability. The system is user-friendly, cost-effective, and suitable for schools, offices, and public places. However, it depends on network connectivity and may have limited communication range.

The paper by Nathanson and Wickstrom (1965) introduces a resonant-gate silicon surface transistor with high Q bandpass characteristics. It is an early development in MEMS technology, combining mechanical resonance with electronic operation. The resonant gate enables precise frequency filtering. The transistor acts as a high-quality bandpass filter, improving signal selectivity and reducing noise. The design supports miniaturization and integration of filtering devices. It highlights the combination of mechanical and electrical properties in semiconductors. However, early fabrication methods limited performance and scalability.

The paper by James H. Smith and Steven T. Walsh (1997) discusses selecting suitable process paradigms for emerging disruptive technologies, especially microsystems technology. It highlights challenges where standard processes are not yet established. The authors analyze different approaches to find the most effective one. They emphasize flexibility, experimentation, and iterative design in early innovation stages. Overall, it provides insights into managing emerging microsystems technologies under uncertainty.

The paper by Lemkin et al. (1997) presents a 3-axis surface micromachined sigma-delta accelerometer for motion sensing. It measures acceleration along three axes, improving accuracy and functionality. The system uses sigma-delta modulation to enhance resolution and reduce noise. The design integrates MEMS technology with electronic circuits. Overall, it contributes to compact and high-performance accelerometer development.

The report “Micromachine DevThe authors higices” (1997) highlights the rapid growth of the MEMS market, projecting it to exceed $34 billion. It emphasizes increasing demand across industries. Applications include automotive, healthcare, and consumer electronics. Advancements in fabrication technologies are driving this growth. Overall, it shows strong commercial potential of MEMS devices.

The paper by David Bishop, Randy Giles, and Charles Roxlo (2000) discusses using micromirrors to reduce communication bottlenecks in optical networks. It explains how micromirror technology enables efficient optical signal switching. hlight improved bandwidth and faster data transmission. The system enhances performance by reducing network congestion. Overall, it shows the importance of MEMS-based micromirrors in modern communication systems.

III. PROPOSED METHODOLOGY

1. System Overview

The system is designed to allow users to update and manage notice board content remotely using cloud technology. Messages are sent from a web/mobile interface to an LED display via the internet.

2. Architecture Design

The system follows a client–server architecture:
Client Side: Web app / mobile app for sending messages Cloud Server: Stores, processes, and forwards data Hardware Unit: Microcontroller + LED display

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3. Components Used

Hardware

Microcontroller (e.g., ESP8266 Node-MCU or ESP32) LED Display Panel (P10 / Matrix display)

Power Supply Unit

Internet connectivity (Wi-Fi module) Software

Cloud platform (e.g., Firebase or AWS IoT Core)

Web/mobile interface

Embedded C / Arduino IDE firmware

4. Methodology Steps

Step 1: User Authentication

Users log in via a secure web/mobile application Authentication handled using cloud services Step 2: Message Creation & Upload

User types notice/message

Message is sent to the cloud database in real time Step 3: Cloud Data Processing

Cloud server:

Stores message

Formats content (text, scrolling, timing) Sends updates to subscribed devices Step 4: Data Transmission

Microcontroller connects to cloud via Wi-Fi

Uses APIs or MQTT protocol to fetch latest message Step 5: Display Output

Received message is processed LED board displays:

Static text

Scrolling text

Scheduled messages

Step 6: Real-Time Updates

Any changes in cloud database are instantly pushed to LED board Enables remote and real-time control

5. Data Flow Diagram (Conceptual)

User →Web App

Web App →Cloud Server Cloud Server →Microcontroller Micro-controller →LED Display

6. Key Features

Remote access from anywhere Real-time updates

Low power consumption

Scalable (multiple boards connected)

Secure communication (HTTPS/MQTT)

7. Security Considerations Encrypted communication (SSL/TLS) Role-based access control Authentication tokens

8. Testing & Validation

Unit testing (hardware + software) Network reliability testing

Real-time performance validation

9. Deployment

Install LED board in target location Configure Wi-Fi credentials Connect to cloud service

Go live for remote updates

10. Future Enhancements Voice-to-text notices Mobile app notifications

Integration with AI-based scheduling Multi-language display

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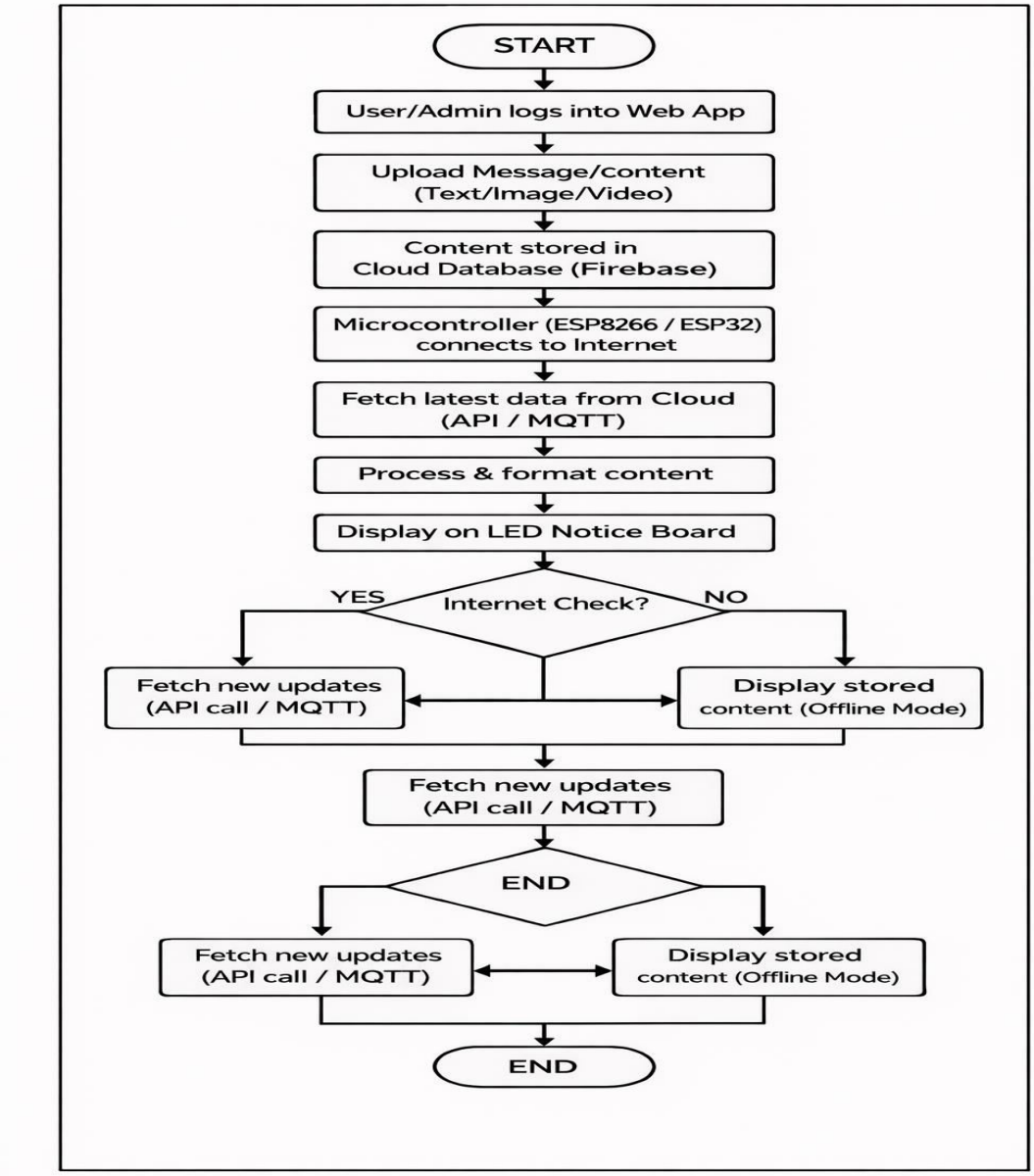
IV. ARCHITECTURE



V. ACKNOWLEDGMENT

The Cloud-Based Smart LED Notice Board system was successfully developed and tested for effective real-time communication. The system is capable of displaying various types of content such as text messages, images, and videos on a digital LED screen.

The results confirm that the Raspberry Pi or microcontroller can efficiently receive data from the cloud-based Content Management System (CMS) and display it instantly. With the help of wireless technologies like Wi-Fi or Bluetooth, users can update notices remotely without needing direct access to the display unit.

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The CMS offers an easy-to-use interface where administrators can upload content, schedule messages, and manage multiple displays from a single platform. This makes the system highly scalable and suitable for large environments.

The output on the display is clear, dynamic, and updated in real time. Any changes made in the CMS are immediately reflected on the screen. Overall, the system minimizes manual work, reduces paper usage, and provides a reliable, flexible, and cost-effective solution for communication in institutions and public spaces.

VI. CONCLUSION

The Internet-based advertisement kiosk using Raspberry Pi 4 provides a modern and efficient solution for communicating announcements within a college campus. The system enables authorized faculty members to upload notices and circulars remotely through a web portal, which are then automatically displayed on the screen using a controller such as the Raspberry Pi 4 Model B.

This solution minimizes manual effort and reduces paper usage while supporting real-time updates and centralized control of campus information. Overall, the project highlights how digital signage combined with internet connectivity can create a cost-effective, scalable, and eco-friendly communication system for educational institutions.

The system also improves communication speed by delivering instant updates to all users. It enhances the visibility and attractiveness of notices through digital display formats. The centralized control makes it easy to manage multiple displays from a single platform. Additionally, the system is flexible and can be expanded for use in offices, public places, and commercial areas. Thus, it proves to be a reliable and future-ready communication solution.

VII. RESULTS

We would like to express our sincere gratitude to the Design Space Lab, Department of Electronics and Communication Engineering at Nadimpalli Satyanarayana Raju Institute of Technology (NSRIT) for providing the necessary resources and support to successfully carry out this research work.

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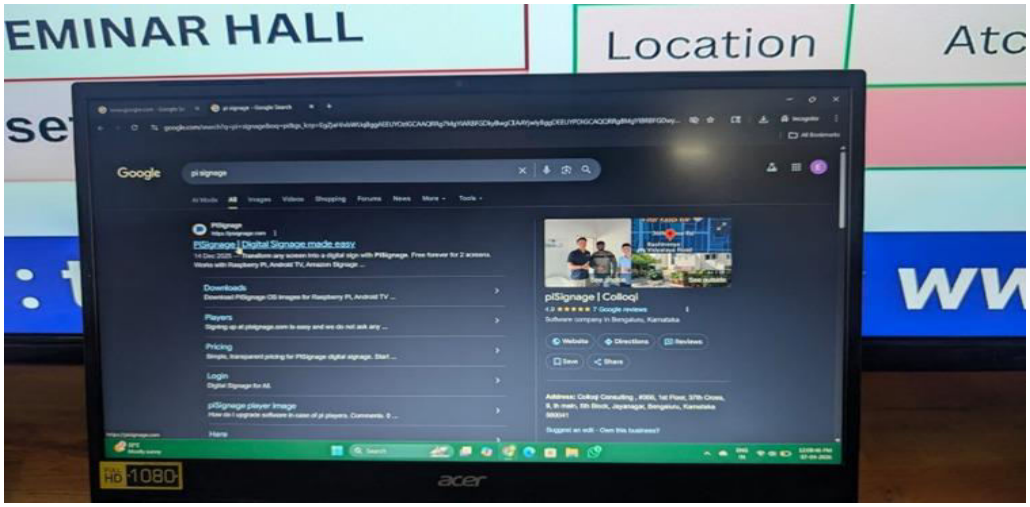

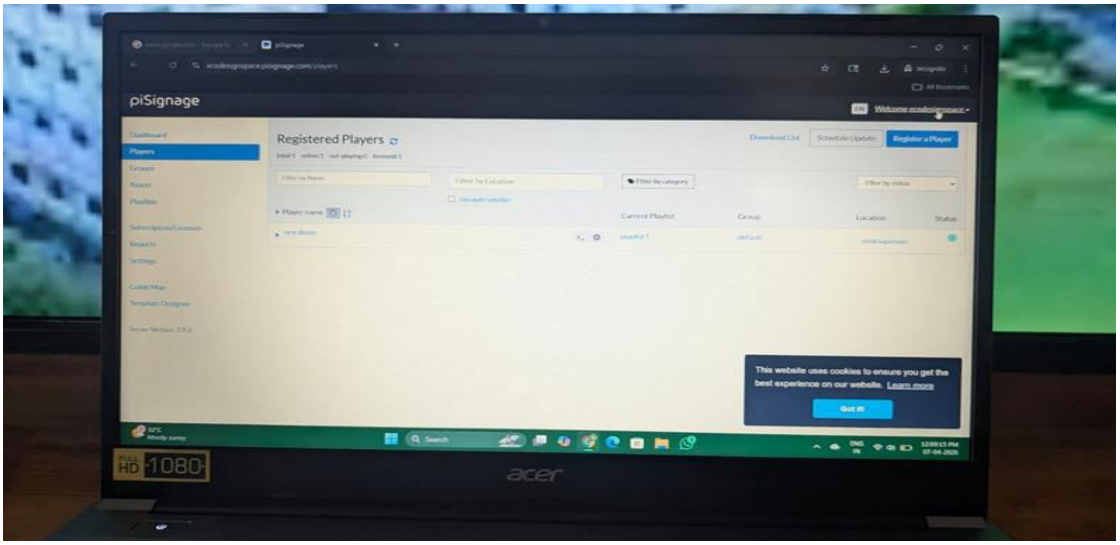

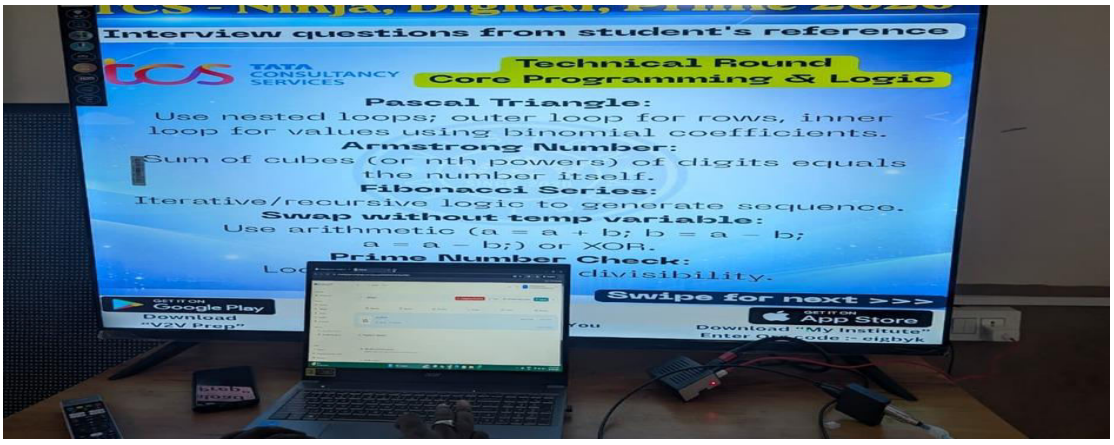

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