A REPORT ON

Development of a Geolocation-Based Attendance Tracking Mobile Application

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Under the guidance of,

Mr. Tanveer Ahmed

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

At

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY

BENGALURU

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PRESIDENCY UNIVERSITY

PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the Internship/Project report **"Development of a geolocation based attendance tracking mobile application"** being submitted by "K. Harshitha, P. Reshma Reddy, Saanjh Mohanty, Shreya Dhatri Gowda, Syeda Shariffa Moosa" bearing roll number "20211CCS0015, 20211CCS0181, 20211CCS0070, 20211CCS0155, 20211CCS0135" in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering is a bonafide work carried out under my supervision.

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DECLARATION

I hereby declare that the work, which is being presented in the report entitled **"Development of a geolocation based tracking mobile application"** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering**, is a record of my own investigations carried under the guidance of **Mr. Tanveer Ahmed, Assistant Professor, Presidency School of Computer Science and Engineering, Presidency University, Bengaluru.**

I have not submitted the matter presented in this report anywhere for the award of any other Degree.

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ABSTRACT

Meeting attendance and streamlining employee attendance tracking is becoming a challenge for organizations especially in large companies with multiple office locations in order to ease this burden, we propose developing a mobile application that will automatize employee sign-in and sign-out using geolocation features. This app will log attendance as employees enter or leave a 200-meter radius from their respective offices without manual actions required.Automatic geolocation check-in/check-out Each employees entry and exit are logged, recorded in the app by both geolocation and timestamp at the designated office region, ensuring that all check-ins are paired with corresponding check-outs.

Manual Check-in/check-out for offsite Locations Verification removals for mobile employees or remote workers allows these client sites to input their attendance, while the app will provide GPS coordinates of nearby verified locations.Working Hours Calculation: Total hours worked will be automatically calculated and updated in real time using recorded time of entry and exit.Data Reliability and security: Safeguarding of all records will be guranteed as secure attendance logs will be kept in real time synchronized storage to avoid data loss or malicious alterations.

The guidelines provided by GAIL (India) Limited for the Smart India initiative stipulate that all technologies used for development will be free and open source.

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Chapter 1

INTRODUCTION

1.1 Background

In the modern-day high speed business scenario, the efficient handling of employee attendance across different office locations is one of the key issues. Manual attendance systems are susceptible to errors, time- consuming and most frequently inefficient. With the high-speed development of mobile technology and GPS services, there is greater scope to automate and streamline attendance monitoring through geolocation based solutions.

1.2 Problem Statement

Organizations struggle to keep precise records of employee attendance, particularly if employees work at many locations or outside the main office building. Manual procedures tend to lead to errors, data loss, and administrative burdens. There is an immediate need for an automated, secure and accurate attendance monitoring system that minimizes human intervention and errors.

1.3 Purpose of the project

The primary goal of this project is to design a mobile app with geolocation technology that auto-checks in and checks out staff. The application will automatically monitor attendance based on the employee's proximity to the office location. Offer an on-site check-in/check-out faculty for off-site workers. Accurately compute total working hours. Guarantee accuracy, security, and real time synchronization of data

1.4 Scope of the project

The proposed application will be capable of automatically checking in employees as they enter within 200 meters of their designated office. Automatically checking out employees the moment they leave the 200-meter radius. Enabling manual marking of attendance at off-campus locations, as per the current GPS location. Calculating total working hours from check-in/check-out records. Data storage protection and offering real-time synchronization with a cloud database. The solution will be developed using free and open-source technologies, as per GAIL(India) LTD guidelines for the smart India Hackathon.

1.5 Significance of the project

This software enhances the effectiveness of operations, eliminates human errors, and give workers a seamless experience as they monitor their attendance. It also gives administrators accurate and tamper-evident records, which increases transparency and accountability in the organization.

Chapter 2

LITERATURE SURVEY

Recent advancements in digital attendance systems have leveraged geolocation technologies such as GPS, geofencing, and biometric verification to enhance accuracy, prevent proxy attendance, and automate workforce management. This section reviews key studies from the past five years, analysing their methodologies, technological implementations, and limitations.

2.1 Mobile and Web-Based Attendance Systems

- **Mane et al. (2024)** proposed a mobile-based attendance system integrating GPS, geofencing, and facial recognition. The system allows employees to check in and out via their smartphones, automatically verifying location within a designated geofence. Additionally, posture analysis using face-tracking cameras is suggested to assess productivity. While the system claims seamless integration with payroll and HR modules and supports offline functionality, the study remains conceptual. No empirical data or field-testing results are presented to support its feasibility or accuracy.

- **Chavda et al. (2025)** developed a web-based attendance system that utilizes browser geolocation APIs to log employee check-in/out times along with their GPS coordinates. The system enables centralized access for administrators through a secure portal and eliminates the need for manual record-keeping. However, the lacks detailed discussion of the geolocation methods employed and does not assess location accuracy. Moreover, there is no analysis of data privacy measures or security protocols implemented in the system. portal and a mobile application. Employees can mark attendance using GPS data combined with a selfie, and administrators monitor entries via Google Maps. The system automates report generation and secures attendance records digitally

- **Papade (2023)** introduced GEO-ATS, a hybrid solution offering both a responsive web portal and a mobile application. Employees can mark attendance using GPS data

combined with a selfie, and administrators monitor entries via Google Maps. The system automates report generation and secures attendance records digitally. While the prototype is reported to function effectively, the study does not present quantitative evaluations, such as GPS accuracy in urban environments or system perform metrics under real-world usage.

2.2 Geofencing and Biometric Integration

- **Viswanath et al. (2023)** presented a geofencing-based mobile application that automatically records attendance when an employee enters a pre-defined GPS zone. Facial recognition is employed to confirm identity, removing the need for physical biometric devices. The approach is noted for its flexibility and cost-effectiveness. However, the study lacks implementation details, and no testing or performance evaluations are included, leaving questions regarding scalability and reliability unanswered.
- **Jadhav et al. (2025)** developed an integrated web-based attendance and payroll system, utilizing facial recognition and geofencing technologies. Implemented using Python/Django and Next.js, the system verifies employee identity using webcam-based face recognition, cross-referenced with real-time GPS data. Attendance data is linked with payroll and leave management systems, and JWT-based authentication is used for security. Despite showcasing a complete enterprise-level solution, the study does not provide performance, particularly regarding facial recognition accuracy in varied lighting conditions.

- **Gedam et al. (2021)** implemented an Android based attendance system that utilizes GPS-based geofencing in conjunction with fingerprint authentication. Attendance is automatically recorded when employees attend a predefined geofence area. While the study reports successful deployment in replacing traditional biometric systems, it acknowledges limitations in GPS accuracy in dense urban settings and indoor environments. Additionally, no formal performance benchmarks or energy efficiency analyses were conducted.

2.3 Hybrid and Real-Time Tracking Systems

- **Prasada and Ikrimach (2024)** combined facial recognition using the Local Binary Patterns Histogram (LBPH) algorithm with GPS verification for attendance logging. The system demonstrated 96.4% face recognition accuracy in well-lit environments and 90% accuracy outdoors. Location detection accuracy ranged from 90% to 94%. While the study provides empirical results, challenges related to low-light performance, environmental robustness, and scalability are noted as areas for future improvement.

- **Tile et al. (2024)** introduced GeoWorkTrack, a real-time GPS and geofencing system designed for continuous workforce monitoring. The system stream's live location data from a mobile application to a Spring Boot server with an average latency of approximately 2 seconds. Although effective for real-time tracking, field tests indicated location inaccuracies of up to 10 meters in urban areas and high-power consumption (15-20% battery drain per hour), raising concerns about long-term usability and energy efficiency.

2.4 Conceptual and Privacy Considerations

- **IJPRESM (2025)** conducted a review focusing on geolocation-based attendance systems, outlining advantages such as automated check-ins, reduced fraud, and real-time analytics. The paper also highlights significant challenges, particularly regarding user privacy, data encryption, and adherence to regulatory standards such as the General Data Protection Regulation (GDPR). Concerns are also raised about remote connectivity, user acceptance, and device dependency, suggesting the need for more privacy-centric and adaptable system designs.

- **Gudage et al. (2023)** proposed a mobile attendance system that uses personalized geofences and facial recognition to eliminate the need for external biometric hardware. While the solution is designed to enhance accountability and reduce costs, the study does not include empirical evaluation. Key limitations such as GPS drift and reduced accuracy of facial recognition in suboptimal lighting conditions are not addressed.

Chapter 3

RESEARCH GAPS OF EXISTING METHODS

Over the past five years, several studies have explored the potential of geolocation-enabled attendance systems, especially within employee-focused mobile and web-based platforms. While these solutions demonstrate innovation through technologies like GPS, geofencing, and facial recognition, a critical analysis reveals consistent gaps that limit their effectiveness in real-world, large-scale, and secure deployments. The following section outlines key research gaps consolidated from the literature review.

3.1 Inadequate Privacy and Data Security Measures

Most attendance systems collect highly sensitive data, including real-time location coordinates and biometric identifiers such as facial features or fingerprints. However, few implementations address encryption, anonymization, or compliance with regional and international data protection regulations (e.g., GDPR, PDP Bill in India). Notably, only IJPRESM (2025) raised significantly privacy considerations, leaving substantial research void in designing privacy-by-default systems.

3.2 Low Accuracy in Complex or Indoor Environments

While systems such as those by Prasada & Ikrimach (2024) and Tile et al. (2024) provide promising results in controlled environments, their effectiveness diminishes in real-world conditions. GPS drift, signal attenuation indoors, and facial recognition failures in low-light conditions remain unresolved. Few studies attempt to integrate indoor localization technologies (e.g., BLE, Wi-Fi RTT) that could compensate for GPS shortcomings.

3.3 Poor Offline Capability and High Connectivity Dependence

Attendance systems generally assume uninterrupted internet connectivity, making them unreliable in remote worksites, industrial zones, or regions with limited network infrastructure. Only Mane et al. (2024) suggest offline functionality, and even that remains a theoretical proposal. This limitation restricts the accessibility and flexibility of these systems in diverse deployment scenarios.

3.4 Lack of Scalability and Performance Validation

A majority of the reviewed implementations were developed as prototypes or within small organizational units. There is limited discussion of system scalability with respect to concurrent users, real-time data processing, or integration with enterprise scale backend systems. As a result, these solutions lack credibility for deployment in large organizations with thousands of employees.

3.5 Limited Integration with enterprise HR and Payroll Ecosystems

Although some systems (e.g., Jadhav et al., 2025) demonstrate integration with payroll modules, most require manual export or synchronization of attendance data. This fragmentation introduces inefficiencies, increase administrative workload, and reduces the value of automation. Seamless interoperability with HR platforms is essential for widespread adoption, yet rarely addressed in depth.

3.6 Usability and User Compliance Challenges

High battery consumption (15-20% per hour as reported by Tile et al., 2024), inconsistent recognition performance, and multi-step authentication processes contribute to poor user experience. Furthermore, none of the reviewed papers conduct longitudinal studies to assess user adoption, compliance rates, or behavioral resistance to surveillance-based attendance systems.

3.7 Energy Inefficiency and Power Optimization Oversight

Continuous use of location services, background app activity, and real-time tracking significantly strain mobile battery life. Despite this, few systems implement energy efficient strategies such as adaptive geolocation polling, hybrid GPS-Wi-Fi switching, or contextual triggers for location checks. Power optimization remains an overlooked but crucial factor for sustained daily use.

3.8 Indoor Localization Deficiency

Many workplaces-corporate offices, factories, warehouses-operate primarily indoors where GPS signals are unreliable or completely unavailable. However, the use of BLE beacons, Wi-Fi triangulation, or ultra-wideband (UWB) technologies is scarcely explored in attendance systems. This limits system reliability in the very environments where they are most needed.

Chapter 4

PROPOSED METHODOLOGY

Smartphones and GPS technology in our mobiles have made it easier to learn about geolocation technology phenomena. Geographical boundaries and restrictions in here can be defined. A particular phone or device for every employee must be indicated. On every check-in or check-out of an employee, these devices calculate their longitude and latitude and altitude, and thereby, makes sure that only attendance within the needful area of work is calculated. Virtual access points have been installed in the workplaces with this technology. GPS tracking tools can be mindful if the employee is at the specified location to tag themselves as present to work, setting boundaries or zones. If the boundary is not satisfied, the employee will not be tagged as present to carry out tasks assigned on the agenda. Watchfulness is eased and automated. A high-definition Graphic Interchange Format or GP has a system of video viewing that uses the implementation of face-tracking technology software that is trustworthy. It helps to identify employees' presence within proximity and monitors the existing behaviors like, sitting, ego motions, and movement patterns. In addition to using videos to monitor attendance and track the presence of employees, sophisticated Artificial Intelligence systems use Machine Learning algorithms to learn about the processed sections of the gathered data to find frequency of presence, consistency of how often an employee clocks in and other behavioral anomalies. These employees or workers will act as blueprints for all the HR management programs required in an effort to fix attendance issues as well as in promoting employee participation. Automated workflows with incorporation into Payroll Solutions will assist in collecting data and correcting records through HR Management. The methodology of a worker contribution based on geolocation and further infrastructure involves an arrangement of meaningful steps, every step contributing to the larger value, accuracy, and effectiveness of the infrastructure. This technique entails careful planning, integration with technology, and pilot runs to respond to the demand of organizations operating on-site, remote, or field agents. Below is a summary of the technique in orderly phases.

4.1 Prerequisite Analysis and Framework Plan

One must first conduct a critical necessity survey to realize individual requirements of the organization. This entails understanding aspects such as the number of representatives, where they will trailed from, and to what degree accuracy in tracking following. Such experiences are the realities on which the system plan can be formulated. Geo-fences or virtual boundaries

at certain work locations are established in this phase. These geo-fences allow the platform to monitor worker interaction upon entering and exiting these locations remotely. In addition, security needs are met through the analysis of legal and organizational strategies, where compliance adheres to laws and values

4.2 Geolocation Innovation Decision

Geolocation innovation decision is fundamental to ensuring that the capabilities work effectively in unique circumstances. GPS is the default choice for outdoor tracking since it gives reliable area data when subordinate signals are present. GPS might not be trusted indoors, and thus Wi-Fi Situating Framework (WPS) is utilized to compute area depending on close-by Wi-Fi networks. Cellular triangulation is a fall back for environments where GPS and Wi-Fi are not present, employing cell signals to calculate area. This multi-technology solution provides robust and reliable following in most environments.

4.3 Flexibles Application Development

Flexible Application Development The primary interface of the delegate is the mobile application. The application has GPS following and contribution logging feature, hence recording an employee's entry and exit from a geo-fenced area. The client UI of the application is simple to use, enabling representatives to see their contribution status, see area history, and be alerted. In order to have strides client experience, the app is low information usage and battery optimized since recurring area monitoring may exhaust device resources rapidly. Also, a high priority for this phase is smooth performance across devices and platforms.

4.4 Backend Infrastructure and Database Management

There should be efficient backend infrastructure provided in order to propel the real-time data that is produced by the following framework. A master server coordinates information preparation tasks, i.e., receiving neighborhood upgrades, holding participation records, and creating reports. The database is built to store and hold representative minute details, participation logs, and neighborhood details with ease, to quickly access and restore to analyze. Security is a bare necessity at this stage, with data encryption, security of access, and secure protocols for communication achieved to protect sensitive worker details from misuse.

4.5 Geo-Fencing and Area Following Implementation

Geo-fencing capability is a key component of the following design, allowing programmed participation logging based on worker location. Upon detection by an employee's multi-purpose device of entering or exiting a defined geo-fenced area, activities such as attendance taking are triggered. For agents in field regions or security-critical applications, real-time area monitoring is triggered, with continuous tracking of area updates at regular intervals. Furthermore, development and course discovery calculations are executed to track work advancement, which may help in streamlining courses and increasing productivity.

4.6 Testing and Optimization

Intensive testing of different scenarios is conducted to ensure framework accuracy and unflinching quality. Variable environments are tested, including indoor to outdoor environments, and on flag areas with limited scope. Battery and arrangement optimization are included in the testing as well so that the mobile application is able to perform optimally without necessarily sacrificing gadget resources. Criticism is accumulated from workers and chairmen both to further enhance convenience, fix any bugs with region accuracy, and refine the overall structure experience.

4.7 Deployment and Maintenance

Once testing is finished, the framework is deployed company-wide. This entails making sure all workers can access the mobile app and get it how to use it best. Customary upkeep is vital to keep the framework working easily; this includes observing framework execution, discharging overhauls, and improving security measures as required. Standard information reinforcements are conducted, and a recuperation arrange is built up to ensure against information misfortune in case of specialized disappointments. By taking after a organized arrangement and support arrange, the framework remains dependable and proceeds to meet the organization’s needs over time.

Chapter 5

OBJECTIVES

1. Correct Attendance Record

The prime objective is to ensure the system correctly logs the user from actual-world real-time location data. The users ought to actually be within an assigned boundary (geofence) to mark their presence effectively. The application should not record proxy attendances or fake check-ins by verifying legitimate location coordinates through attendance action.

2. Authentication and Securing for Users

Implement proper security policies to protect user identity and information.

Enforce multi-factor authentication (MFA) or biometric authentication (fingerprint/face recognition) to authenticate users. Store and exchange sensitive data such as location history and attendance records in encrypted form.

3. Offline Functionality

The app should support offline attendance marking. Storing attendance data locally in the event of internet disconnection and automatic syncing with the server upon connectivity is regained makes it robust even with poor network coverage or in remote areas.

4. Geofencing for Location Boundary Implementation

In order to mark attendance only from within sanctioned areas:

- Utilize geofencing technology to create virtual fences around a real-world location.
- Record attendance only when the device is within the specified radius.
- Make dynamic geofence settings update possible via the admin panel to be flexible.

5. Real-Time Reporting and Analytics

Provide real-time dashboards and attendance reports in detail to administrators. Features should comprise:

- Live status of present, absent, or late employees/students in real-time.
- Attendance trend analysis for various time spans (daily, weekly, monthly).
- Export facility (e.g., CSV, PDF) to aggregate payroll, HRMS, or academic records.

6. Notifications and Reminders

Implement automated user communication through:

- Push reminders to users for check-in or check-out according to their calendar.
- Alert notifications to administrators for anomalies like lost check-ins, unexpected locations, or attempts of unauthorized login.

7. Scalability and Multi-Location Support

- The app needs to be scalable easily to support:
- Thousands of users without degrading performance.
- Multiple office locations, branches, or classrooms with independent geofences and time zones.
- Admin distribution by region/location for distributed administration.

8. Admin Controls and Customization

Allow administrators through a stand-alone portal or mobile application to:

- Add or remove geofenced areas.
- Set up attendance rules (e.g., check-in hours, late charges).
- Manage user roles and permission levels (Admin, Manager, User).
- See and edit attendance records, approve fixes, or create reports.

9. Data Privacy and Compliance

Make the app respect user privacy and adhere to applicable legal and ethical standards:

- Inform users of the information they're harvesting and utilizing in terms of location information.
- Obtain permission from users prior to tracking locations.
- Impose data protection law such as GDPR, CCPA, or their equivalent where necessary.
- Permit users to see or remove their location history upon request.

10. Natural User Experience

Mobile app should be a natural and unforced one:

- Single one-click check-in/check-out feature.
- Visual feedback of location status (in/out of geofence).

- Access to attendance history and user records in real time.
- Low battery and data usage to encourage user adoption.

Chapter 6

SYSTEM DESIGN & IMPLEMENTATION

SYSTEM DESIGN

The System design and implementation of the Geolocation- Based Attendance Tracking Mobile Application were carried out using structured methodologies and a user centric approach. The objective was to build a robust, scalable, and responsive mobile application that utilizes geolocation technology to streamline the attendance process.

6.1 System Architecture overview

The application follows a client-server model with the mobile application acting as the client and firebase cloud as the backend. The system is composed of the following core components:

FrontEnd: Built using flutter, which allows cross-platform deployment on both android and ios.

Backend: Powered by firebase services including firebase authentication, firestore (NO SQL database) and firebase cloud functions(optional).

Geolocation Engine: Utilizes the geolocator and geofence service packages in flutter to monitor user location and trigger actions based on geofencing rules.

6.2 Design Methodology

The design process was divided into the following stages:

6.3 Requirement Analysis

Gathered detailed functional and non-functional requirements

We identified the following use cases auto check-in/check out, manual check-in/check-out working hours calculation and secure login.

6.4 User Interface Design

Low fidelity fire games were created using figma

Each screen was designed to be simple responsive and intuitive.

6.5 Database Design

Firestore was structured with the following collections:

Users: Stores user profiles.

Attendance records: Stores check-in and check-out logs with timestamps and co-ordinates.

Locations: Store office locations and radius data for geofencing. Each

entry is uniquely identified and timestamped for data integrity.

IMPLEMENTATION

6.4 Authentication Module

Firebase authentication handles registration, login and session management.

Email/password-based login is supported for simplicity and ease of access.

6.5.1 Geofencing Check-in/out:

The app continuously monitors the user location in the background.

When the user enters the defined 200 meters geofence radius of the office location the system triggers an automatic check-in if not already logged in.

Similarity exiting the radius triggers a checkout

All records include

- User ID
- Checkin/out timestamp
- Latitude and longitude
- Location name

6.5.2 Manual check in/out frame

For employees working off-site a manual check in mode is enabled.

The app fetches current location coordinates and suggests place names using reverse geocoding APIs.

Users can confirm their locations and log their attendance manually.

6.5.3 Working Hours Calculation

Each valid check-in/check-out is matched.

The time difference is calculated and summed for daily and monthly totals.

The working hours summary is displayed on a separate dashboard.

6.5.4 Real time database synchronization

Firestone listeners ensure real-time updates of attendance records.

Data is instantly reflected in the app improving transparency and trust.

7 Security and Data Integrity:

Authentication tokens ensure that only authorized users access the app.

Firestore security rules are applicable to control data access.

Attendance records are immutable once written they cannot be edited maintaining transparency.

8 Testing and Validation

Multiple rounds of unit testing and manual testing were conducted

- Various edge cases were tested
- Entering/Exiting the geofence multiple times
- Logging in from an off-site locations
- Handling network delays and permission issues.
- Testers validated the accuracy of timestamps and geolocations boundaries.

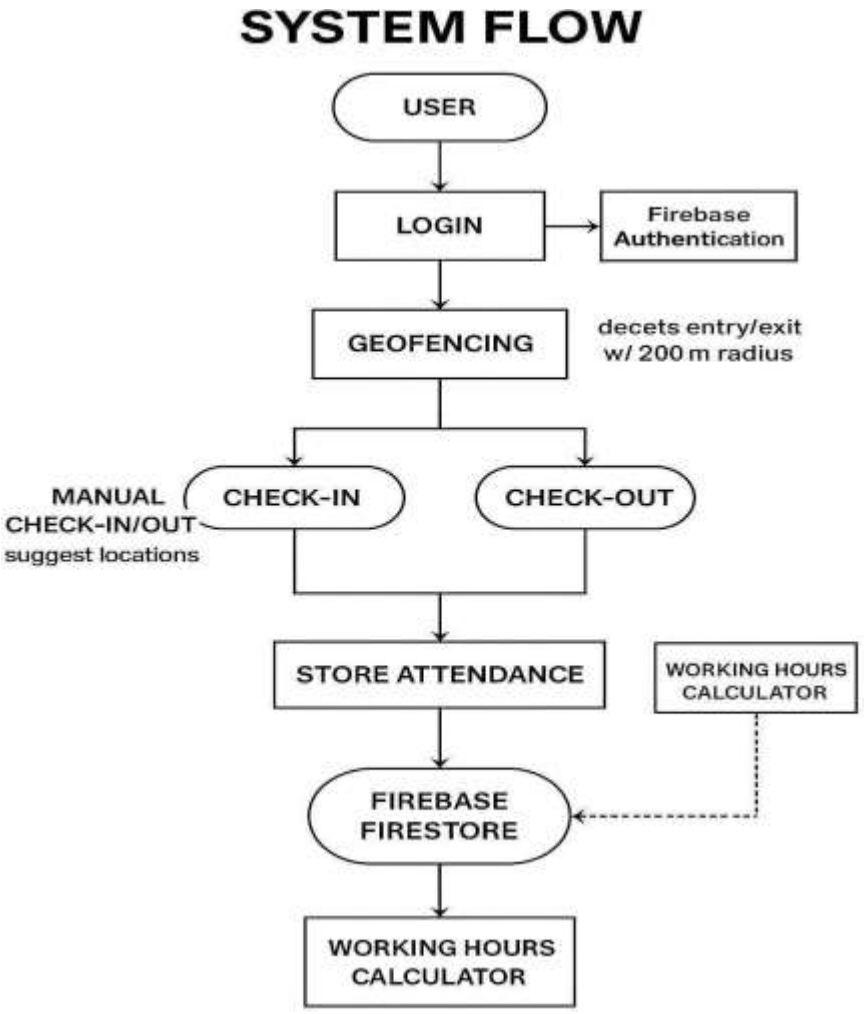
9 Tools and technologies used

Component	Technology Used
Mobile framework	flutter
Launguage	Dart
Authentication	Firebase Authentication
Database	Firebase Firestore
Geolocation	geolocator , geofence service
UI design	Figma
State Management	Provider (or setstate)

10 Conclusion of Implementation

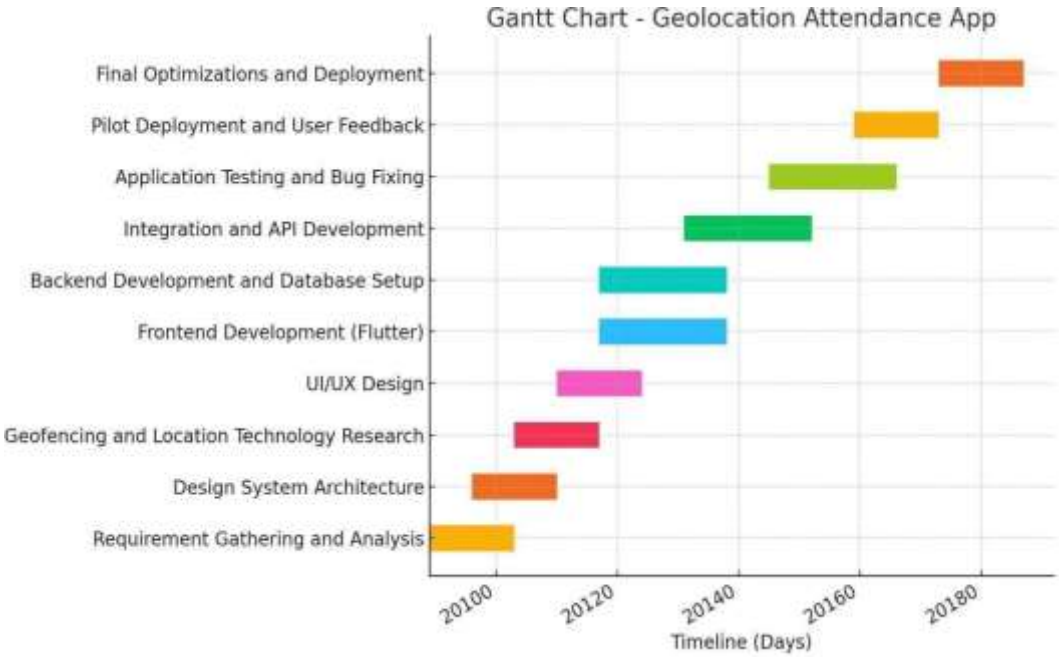
The system was successfully implemented and meets the objectives defined in the problem statement. It offers a seamless and secure solution to automate employee attendance using geolocation technology.

System flow of the geolocation attendance app



Chapter-7

TIMELINE FOR EXECUTION OF PROJECT (GANTT CHART)



Chapter 8

OUTCOMES

1 Automated attendance tracking:

Employees attendance is automatically logged through geolocation, minimizing manual errors and enhancing accuracy.

2 Enhance data security:

Realtime synchronization and secure data storage reduce risk of data lose or unauthorized modifications.

3 Operational efficiency:

Significant reduction in administrative efforts for attendance management allowing the HR department to focus on strategic initiatives.

4 User friendly interface:

Intuitive mobile application that ensures smooth adaption among employees and seamless interaction with attendance logging systems.

5 Realtime Analytics:

Administrators can access live data and analytics, providing actionable insights for workforce management and resource allocation.

6 Support for remote work:

Facilitates flexibility by allowing manual attendance marking for remote or offsite employees, aligning with modern hybrid work environments.

7 Scalable solution:

Application architecture supports scaling across multiple office locations, easily accommodating increased user volume without degradation in performance

8 Sustainability Impact:

Contribution to sustainable urban development by reducing commuting needs through effective remote work management, thus lowering carbon emissions.

9 Regulatory compliance:

Implementation ensures adherence to data protection, regulations such as GDPR, maintaining user privacy and ethical data usage standards.

10 Positive user adoption:

High user satisfaction through reliable attendance tracking, transparent operational

procedures and responsive user support mechanisms.

Chapter 9

RESULTS AND DISCUSSIONS

The development of the geolocation based attendance tracking mobile application has led to several significance outcomes aligned with the original objectives of the project. The application was successfully built using flutter for the front-end interface and firebase as the backend service offering both geofencing based and manual attendance functionalities.

1. Functional validation

The core features such as automatic check in and check out using geolocation and manual attendance logging for off-site work were thoroughly tested. When the user enters or exits a predefined 200-meter radius from the registered office location, the system accurately logs the time and geo coordinates . Manual check in options based on real time location suggestions were also validated and performed efficiently allowing flexibility for field employees.

2. Working Hours Calculation

A major functional achievement was the correct calculation of total working hours based on paired check in and out logs. The system disregards duplicate entries and ensures only valid time intervals are computed. Firebase Firestore was instrumental in storing timestamp data in real-time and the backend logic correctly calculated daily totals, visible to both employees and admin users.

3. Accuracy and Reliability

The application demonstrated high accuracy in location detection using Android and ios location services. Testing in various environments showed that the geofencing logic performed reliably.

Moreover data integrity was ensured by using real time updates and security rules configured within firebase thus preventing tampering or data loss.

4. User interface and Experience

Feedback collected from test users indicated that the app was intuitive and user friendly The use of drawer navigation clear check in and out buttons and real time location display improved usability. The minimalistic design with essential features ensured a clutter free experience for the employees.

5. Discussion of limitations.

While the application fulfilled its core goals a few limitatons were observed. For

instance continuous location tracking consumed battery resources on same devices. Also the areas with weak GPS signals location accuracy was slightly affected. However these challenges are common in location based apps and can be mitigated with further opportunities.

6. Future Enhancements

Future versions of the application could incorporate facial recognition at check in and check out points for added security offline data caching for areas with no internet and deeper analysis dashboards for employees to track performance trends.

Chapter 10

CONCLUSION

Implementing a geolocation- based attendance monitoring mobile application targets an essential organizational requirement for organizing and automating attendance management to improve organizational processes. Through the use of geolocation technology, the application provides, valid real time capture of employees' check in and check out times and minimizes potential manual errors and inefficiencies in management.

The solution not only optimizes operational efficiency but also facilitates flexible work models with a manual attendance feature foe offsite workers. The solution also maintains high data accuracy, security, and integrity through real time synchronization and secure cloud storage.

In line with a number of sustainable development goals including encouraging decent work, innovation, sustainable use of resources, and sustainable urban development, this project makes a significant contribution towards creating a smarter, more sustainable future

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5. GEOLOCATION-BASED EMPLOYEE ATTENDANCE AND TRACKING SYSTEM Prof. Sagar Mane*1, Mr. Atharva Bharambe*2, Mr. Mihir Gawade*3, Mr. Nikhil Gandhi*4, Mr. Suyash Bhanwase

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APPENDIX-A

PSUEDOCODE

Home screen page:

```
Import 'package: flutter/material.dart';

class HomeScreen extends StatelessWidget {
  const HomeScreen({super.key});

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      appBar: AppBar(title: const Text('Home')),
      body: Center(
        child: Column(
          mainAxisAlignment: MainAxisAlignment.center,
          children: [
            ElevatedButton(
              onPressed: () {
                Navigator.pushNamed(context, '/dashboard')
                ;
              },
              child: const Text('Dashboard'),
            ),
            const SizedBox(height: 20),
            ElevatedButton(
              onPressed: () {
                Navigator.pushNamed(context, '/history');
              },
              child: const Text('Check-In History'),
            ),

          ],
```

```
        ),

      ),
    );
  }
}
```

Main. dart file

```
import 'package: flutter/material.dart';
import 'package:firebase_core/firebase_core.dart';
import 'screens/splash_screen.dart';
import 'screens/dashboard_screen.dart';
import 'screens/history_screen.dart';
import 'screens/home_screen.dart';
import 'screens/login_screen.dart';
import 'screens/register_screen.dart';
import 'screens/manual_check_screen.dart';
import 'firebase_options.dart'; // Make sure this import exists

void main() async {
  WidgetsFlutterBinding.ensureInitialized();
  await Firebase.initializeApp(
    options: DefaultFirebaseOptions.currentPlatform,
  );
  runApp(const MyApp());
}

class MyApp extends StatelessWidget {
  const MyApp({super.key});

  @override
  Widget build(BuildContext context) {
    return MaterialApp(
      title: 'Employee Attendance App',
      theme: ThemeData(primarySwatch: Colors.blue),
```

```
      home: SplashScreen(),
      routes: {

        '/dashboard': (context) => DashboardScreen(),
        '/history': (context) => HistoryScreen(),
        '/home': (context) => HomeScreen(),
        '/login': (context) => LoginScreen(),
        '/register': (context) => RegisterScreen(),
        '/manual-check': (context) => ManualCheckScreen(),
        // add others if needed
      },
    );
  }
}
```

Manual check screen dart

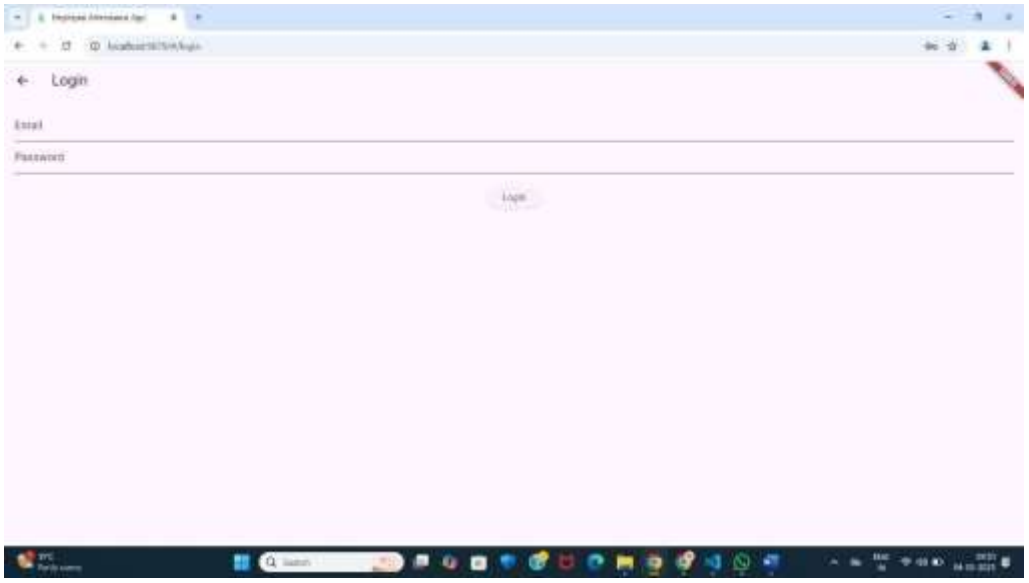
```
import 'package: flutter/material.dart';
import 'package:google_fonts/google_fonts.dart';

class ManualCheckScreen extends StatelessWidget {
  const ManualCheckScreen({super.key});

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      appBar: AppBar(
        title: Text(
          'Manual Check-In/Out',
          style: GoogleFonts.poppins(fontWeight: FontWeight.w600),
        ),
        backgroundColor: Colors. teal,
      ),
      body: Padding(
        padding: const EdgeInsets.all(24.0),
        child: Center(
```

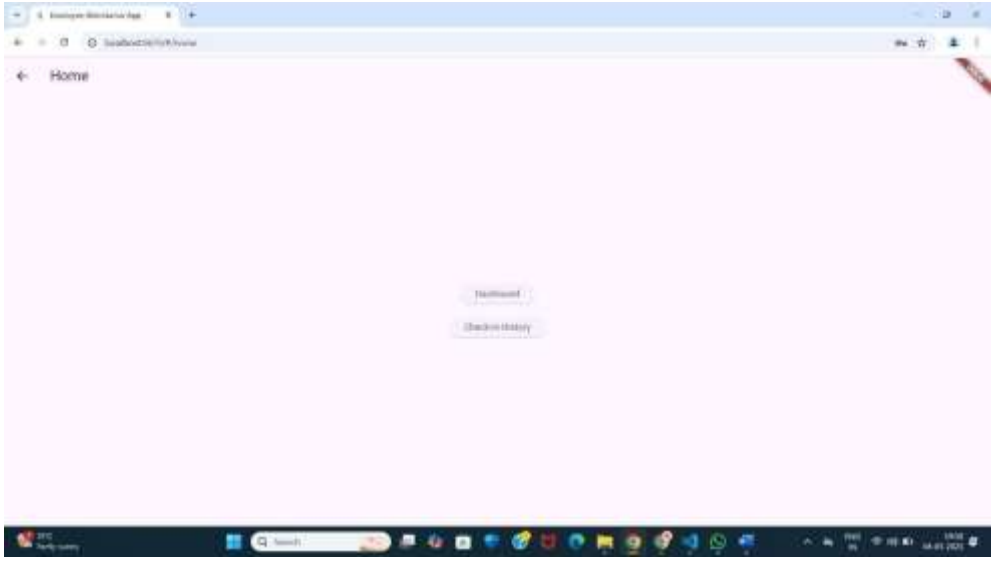
```
child: Column(
  mainAxisAlignment: MainAxisAlignment.center,
  children: [

    Text(
      'Manual Location Access',
      style: GoogleFonts.poppins(
      fontSize: 24,
        fontWeight: FontWeight.w600,
        color: Colors. teal,
      ),
      textAlign: TextAlign.center,
    ),
    const SizedBox(height: 40),

    ElevatedButton.icon(
      onPressed: () {},
      icon: const Icon(Icons.login),
      label: const Text('Check In'),
      style: ElevatedButton.styleFrom(
      backgroundColor: Colors. green,
      foregroundColor: Colors. white,
        padding: const EdgeInsets.symmetric(
          horizontal: 30,
          vertical: 15,
        ),
        shape: RoundedRectangleBorder(
          borderRadius: BorderRadius.circular(12),
        ),
      ),
    ),

    const SizedBox(height: 20),
```

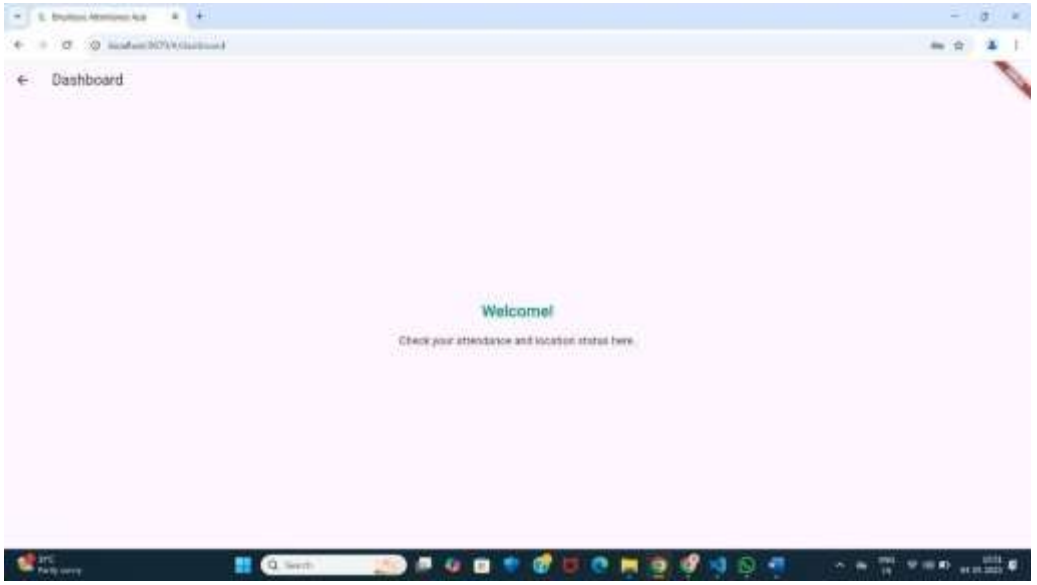
```
            style: ElevatedButton.styleFrom(
              backgroundColor: Colors.red,
              foregroundColor: Colors. white,
              padding: const EdgeInsets.symmetric(
              horizontal: 30,
                vertical: 15,
              ),
              shape: RoundedRectangleBorder(
                borderRadius: BorderRadius.circular(12),
              ),
            ),
          ),
        ],
      ),
    ),
  ),
 );
 }
}
```

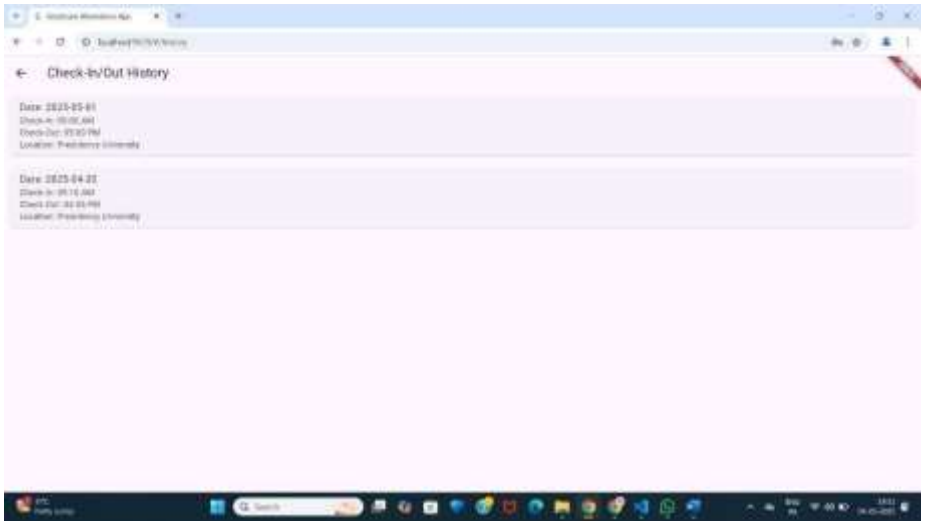
APPENDIX-B

SCREENSHOTS






Dashboard
Welcome!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APPENDIX-C
ENCLOSURES

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ENCLOSURES

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How should I interpret Turnitin's AI writing percentage and false positives?

The percentage shown in the AI writing report is the amount of qualifying text within the submission that Turnitin's AI writing detection model determines was either likely AI-generated text from a large-language model or likely AI-generated text that was likely revised using an AI-paraphrase tool or word spinner.

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AI detection scores under 20%, which we do not surface in new reports, have a higher likelihood of false positives. To reduce the likelihood of misinterpretation, no score or highlights are attributed and are indicated with an asterisk in the report (*%).

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What does 'qualifying text' mean?

Our model only processes qualifying text in the form of long-form writing. Long-form writing means individual sentences contained in paragraphs that make up a longer piece of written work, such as an essay, a dissertation, or an article, etc. Qualifying text that has been determined to be likely AI-generated will be highlighted in cyan in the submission, and likely AI-generated and then likely AI-paraphrased will be highlighted purple.

Non-qualifying text, such as bullet points, annotated bibliographies, etc., will not be processed and can create disparity between the submission highlights and the percentage shown.

GEOLOCATION-BASED EMPLOYEE ATTENDANCE AND TRACKING SYSTEM

ABSTRACT

Accurate and efficient attendance management systems are critical in modern workplaces.

This system employs geofencing technology, where a virtual boundary is established around the office premises. Using GPS or other location-based technologies, the system can detect when an employee enters or exits this boundary, automatically marking them as logged in or logged out, respectively. The core idea is simple: if an employee is within the geofence area, they are considered present at the office, and if they move outside the boundary, the system marks them absent.

By automating attendance logging, this system removes dependency on traditional manual methods such as check-ins, punch cards, or biometric scans, providing a seamless and real-time attendance tracking experience. Additionally work hours are computed automatically by analyzing time spent inside the virtual boundary offering an accurate record of work hours without any administrative overhead. By ensuring that only those p physically present in the office are marked logged in, the system not only enhances accountability but also improves productivity monitoring. Furthermore, it provides transparency in attendance records, reducing errors and time fraud while simplifying administrative tasks. This paper discusses the design and implementation of the geolocation-based tracking system, the role of geofencing in ensuring precision, and the positive impact this system could have on office environments looking for an efficient, automated solution for attendance and time keeping.

Keywords

Geolocation, Employee tracking, Geofencing, GPS-based System, Real-time monitoring

INTRODUCTION

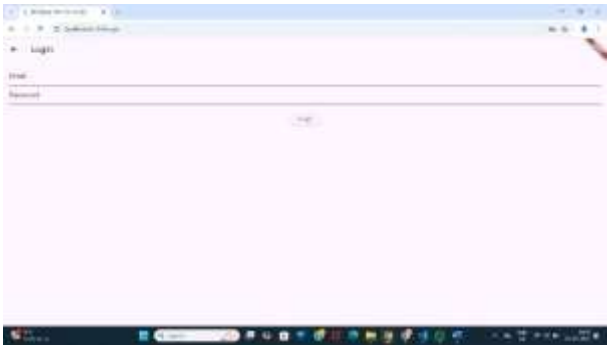
With the speedy, technology-driven contemporary world, efficient and effective systems to handle day-to-day administrative operations have become necessary many times over. One of the most important areas where technology can be a huge game-changer in terms of time saving, effort reduction, and human error is attendance tracking—whether at schools, colleges, offices, or in the field. The age-old practices of sign-in registers or biometric devices are generally time-intensive, prone to hacking, and inflexible.

Picture employees or students standing at the start of their day waiting to sign their name on an attendance sheet or have their fingerprint read. And worse, picture how much time managers or administrators would have to spend gathering all that information manually, only to find out afterwards that there were discrepancies or errors. With remote or hybrid work, the issue is compounded—how do you even know who's on site and where?

It is here that geolocation-based mobile apps come forward as a strong and contemporary solution.

The concept of an attendance system based on geolocation is straightforward but effective: leverage a user's smart phone location features to determine their distance from a pre-defined zone (such as an office, class, or job site). A double tap or single tap is all the users need to mark their attendance when they're in the intended geofenced region, maintaining integrity and freeing the users from hassle-based systems.

Our suggested project is the creation of a mobile application that will make use of GPS and real-time location tracking to tag and mark attendance in a secure way. The application should be easy to use, cheap, and adaptable enough for usage in schools, business organizations, or by organizations with field personnel serving different locations.



METHODOLOGY

Attendance management is perhaps th e most basic but time-consuming for school, corporate, and field workers administrative task. Despite being a ro utine practice, it is still plagued by inefficiencies
and issues whose origin lies in antiqua ted methodologies and low penetration of cutting-edge technology.

Attendance in most schools, colleges, and workplaces is taken manually—either by roll-calling names, signing registers, or marking on physical registers. This is not only time-consuming but also very prone to error, manipulation, and "proxy attendance" when an individual acts on behalf of another's attendance. In commercial setups, biometric syste ms or RFID cards are normally emplo yed,but such options
entail expensive infrastructure, regular maintenance,
and technical malfunctions or misuses (e.g., lending access cards).Additionally,
the traditional systems are rigid to the dynamic and mobile work culture of the contemporary
age. The majority of
businesses have employees working at home, meeting customers, or working outside the workplace. For those purposes, fixed-site attendance systems do not function at all. Managers and employers cannot confirm that
workers are indeed at the specified location. The
same applies to institutions with off-campus activities, industrial trips, or field trips,
where monitoring attendance is
a tedious and manual process.

Some of the inherent problems with existing attendance tracking systems are:

- Time Inefficiency: Semi-automated or manual systems are inefficient in terms of time for end-users and administrators.
- Lack of Flexibility: Existing systems are often associated with particular hardware (e.g., biometric readers) or physical locations (e.g., classrooms or offices).
- Manipulation and Forgery: Buddy punching, proxy attendance, or inaccurate records compromise the integrity of attendance reports.
- Cost and Maintenance: Hardware-based solutions imply

initial capital outlay and regular maintenance.

- Weak Remote or Field Work Flexibility: The traditional systems cannot verify the based-on-location authentication of users when they are not at a given location.

- Weaknesses in Data Handling: Manually maintaining, storing, and handling attendance data is slow and prone to errors.

There clearly is a need for a smart, mobile, location-enabled, and user-friendly system to auto-collect based on real-time user location and do so at low hardware or man-effort expense.

This is where we aim to sit with our Geolocation-Based Attendance Tracking Mobile Application. With smartphone onboard GPS functionality and geofencing approaches, our app will allow users to mark attendance only when they are actually in a specific region. This authenticates attendance, makes it real-time, and geolocation-validated, restricting falsification possibility.

The application will also aid administrators and managers in:

- Real-time reporting of attendance.
- Auto recording and synchronization of data.
- Historical analysis of attendance patterns.
- Smooth integration with existing systems like HR or student administration software.
-
- In short, lack of affordable, scalable, mobile-focused attendance solution is a critical operational issue—and our project seeks to supply the trailblazing, people-focused solution that makes it convenient, accurate, and secure to track attendance.

Objective :

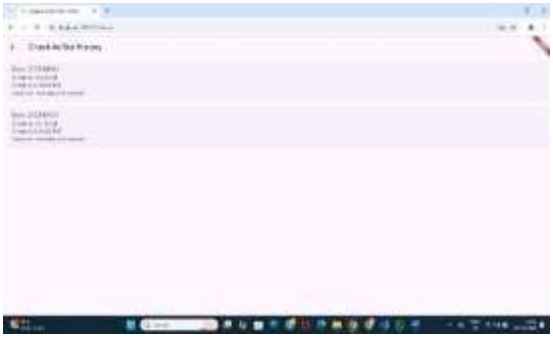
The goal of this project is to create a simple, smart, and reliable way for employees to mark their attendance using their phone's location—making the process easier for everyone, while ensuring accuracy

and fairness for both the company and its people.

Project Objectives:

1. Make Attendance Easier for Everyone

We want to get rid of old, frustrating attendance methods—no more paper registers, forgotten ID cards, or waiting in line at fingerprint scanners. With just a phone, employees can check in from their work location quickly and effortlessly.



2. Ensure Everyone is Actually Present

By using GPS and geofencing, the system can tell whether someone is really at the right place when they check in. This helps stop things like "buddy punching" (when someone checks in for a friend) and keeps everything fair and honest.

3. Support Remote and On-the-Go Teams

Work doesn't always happen in an office anymore. Whether someone's working from home, visiting a client, or out in the field, they should still be able to mark their attendance. Our system makes sure that wherever work happens, attendance can follow.

4. Make Life Easier for Employees

Employees shouldn't have to jump through hoops just to say they've arrived at work. With this system, checking in becomes a one-tap task. No extra devices. No queues. Just a quick, modern way to start the day.

5. Track Movement When It's Needed

For jobs that require being on the move—like delivery drivers, site supervisors, or field technicians—this system can (with permission) track their location during work hours. It helps with safety, better planning, and knowing who's where when needed.

6. Give Managers Real-Time Insights

Team leaders and HR staff get a clear view of who's present, where they are, and when they arrived. The system can also create reports, track patterns, and even send alerts if

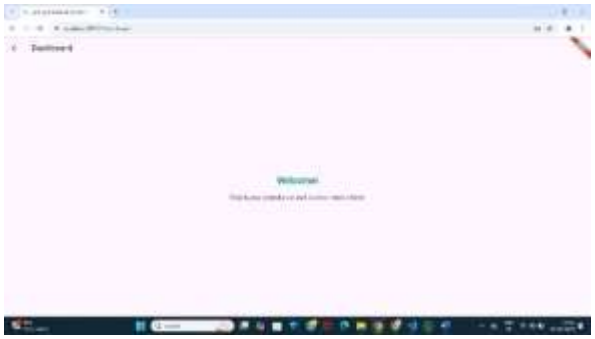
something unusual happens—like someone checking in from the wrong place.

7. Cut Down on Admin Work
No more chasing down missing timesheets or manually entering hours into a spreadsheet. The system does the heavy lifting—collecting attendance, creating reports, and syncing with payroll—so managers and HR teams can focus on what really matters.

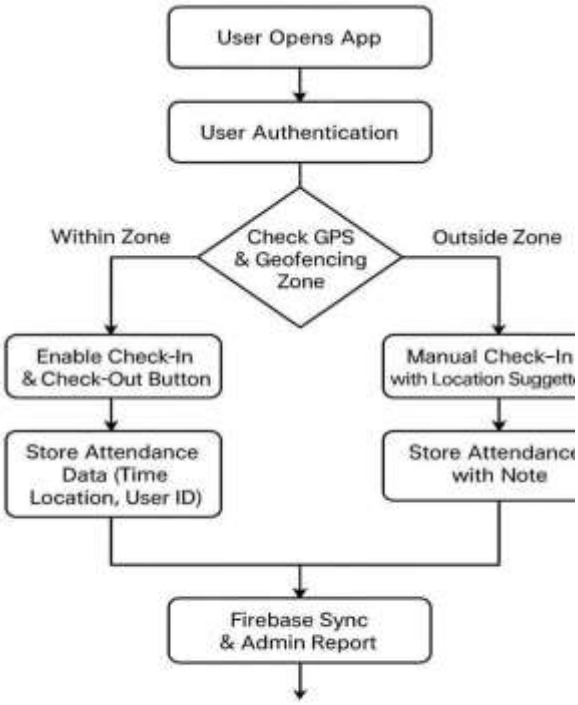
8. Build a Culture of Trust and Responsibility
When employees know the system is fair and transparent, they feel respected—and they respond with responsibility. This project is about creating a system that supports people doing their best work without being micromanaged.

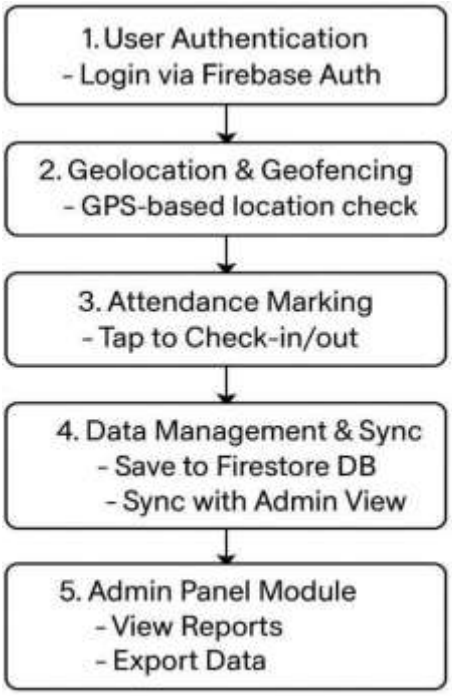
9. Work for All Kinds of Teams
Whether it's a small startup, a large office, or a group of employees spread across multiple locations, the system is designed to scale and adapt. It fits into different work styles and industries—from tech to construction to sales and beyond.

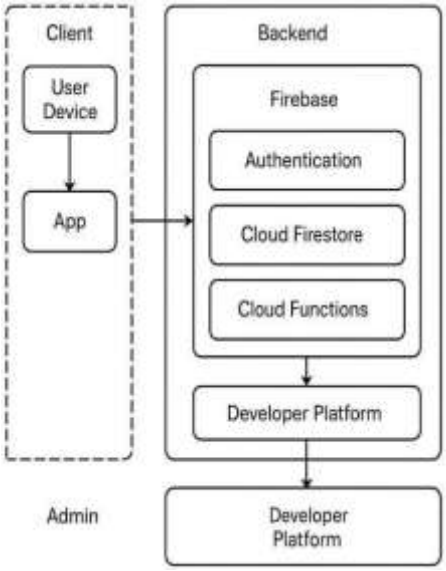
10. Protect Privacy and Respect Boundaries
Tracking only happens during working hours and only in approved work zones. The system is built to protect privacy, giving employees control over what's shared, while still giving managers the tools they need to stay informed.



Use cases







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IV. Al-Muhtadi, J., Al-Ameen, M., & Adnan, A. (2021). "Location-Based Employee Attendance System Using Geofencing and GPS Technologies". Jou

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SUSTAINABLE DEVELOPMENT GOALS

1. **SDG-8: Decent work and economic growth**

By automating the tracking of attendance, the app enables organizations to enhance the efficiency of operations and minimize administrative burden.
It ensures improved workforce management, leading to more productive and minimize administrative burdens.
Staff can devote more time to their core work rather than manual reporting, hence a cultural of decent and effective work.

2. **SDG 9: Industry, Innovation, and Infrastructure**

The project utilizes cutting-edge technologies such as geolocation real time data synchronization and secure cloud storage to transform conventional attendance systems.
It facilitates digital transformation in organizations, promoting the use of smart technologies and infrastructure upgrades.

3. **SDG 11: Sustainable cites and communities**

By providing remote checkin/checkout functionality the app minimizes unneccesary travel to office premises, thus facilitating remote work and flexible job models.
This helps decrease traffic jam and lower the level of carbon emissions in towns and cities.

4. **SDG 12: Responsible consumption and production**

The app reduces the number of paper-based manual attendance lists and physical registers, encouraging electronic documentation. It a movement towards digital practices that encourages green consumption of resources minimize waste.