Verification and Validation (V&V) Document

Project Title: Mobile-Based Attendance Management System Based on Geofencing and Facial Recognition
Phase: Analysis Phase
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1. Introduction

This V&V document ensures that the system meets stakeholder expectations (validation) and conforms to documented requirements (verification), serving as a quality gate before transitioning to the design phase.

2. Purpose of V&V

- **Verification**: Ensuring the product matches its documented specifications.
- **Validation**: Ensuring the product fulfills stakeholder needs.

3. Verification Activities

Activity	Method	Outcome
Requirements Review	Peer review of SRS	Logical consistency confirmed
Internal Audits	Checklist-based analysis	No duplicate/conflicting requirements
Document Consistency Check	Traceability assessment	Each requirement mapped to a use case

4. Validation Activities

Activity	Method	Participants	Outcome
Stakeholder Survey	Google Form	30+ students & lecturers	Confirmed system needs
Interview	Session with department staff	Team members	Validated admin & reporting needs
Use Case Walkthrough	Scenarios presented to peers	Team members	Validated real-life relevance

5. Requirements Traceability Matrix (RTM)

Req. ID	Requirement Description	Source	Mapped Use Case	Validation Method	Status
FR-01	User Registration and Login	Stakeholder Form	UC-01: Account Access	Form Feedback	Validated
FR-02	Facial Recognition on Check-In	Survey Response	UC-02: Attendance Check-In	Survey	Validated
FR-03	Geolocation Validation (Geofencing)	Lecturer Interview	UC-02: Attendance Check-In	Interview	Validated
FR-04	Record Attendance with Timestamp	Team Discussion	UC-03: Record Generation	Use Case Review	Validated
FR-05	Admin Dashboard for Monitoring	Lecturer Interview	UC-04: Admin Oversight	Interview & Form	Validated
FR-06	Notifications on Attendance Events	Stakeholder Form	UC-05: Notify User/Admin	Survey	Validated
FR-07	Role-Based Access Control (RBAC)	Team Analysis	UC-06: Access Management	SRS Review	Validated
NFR-01	Facial recognition attendance must complete within 5 seconds	Stakeholder Expectations	UC-02: Attendance Check-In	Performance Benchmarking	Verified
NFR-02	Mobile app must support up to 500 concurrent users	System Design	UC-02: Attendance Check-In	Load Testing Plan	Verified
NFR-03	System uptime must	Deployment Plan	General Use	SLA Draft Review	Verified

	be at least 99.9% daily				
NFR-04	Facial recognition data must be encrypted in transit and at rest	Data Privacy Policy	UC-01: Account Access UC-02: Attendance Check-In	Compliance Checklist	Validated
NFR-05	JWT tokens expire after 2 hours and require refresh	Security Protocols	UC-01: Account Access	Token Expiry Test	Validated
NFR-06	UI should be intuitive with onboarding under 3 minutes	User Feedback	UC-01: Account Access	Usability Testing	Validated
NFR-07	Daily backups and auto-recovery within 5 minutes	Backup Policy	General Use	Failover Simulation	Verified

6. Issues Identified and Resolved

Issue	Resolution
Facial recognition trigger mechanism unclear	Clarified as auto-trigger within geofenced GPS zone
GPS issues in weak signal areas	Added Wi-Fi/BLE fallback and 10-meter tolerance in design constraints
User privacy concerns	Included consent prompt and AES-256 encryption for biometric data
System scalability concerns	Adopted cloud-based architecture with auto-scaling and load balancing
High facial recognition processing time	Optimized with lightweight on-device ML models
Access control vulnerabilities	Implemented RBAC using JWT and role-based permissions
Notification delays	Integrated FCM for real-time mobile push alerts

Biometric data storage compliance	Aligned with privacy laws; secured storage and retention policies defined
UI accessibility for all users	Designed interface using WCAG-compliant color and layout standards
Cross-platform compatibility challenges	Adopted React Native with platform-specific UI adjustments

7. Conclusion

This document confirms that all system requirements have undergone thorough verification and validation. The RTM demonstrates complete mapping between requirements and use cases, confirming readiness for the design and implementation phase.