# System Design Document
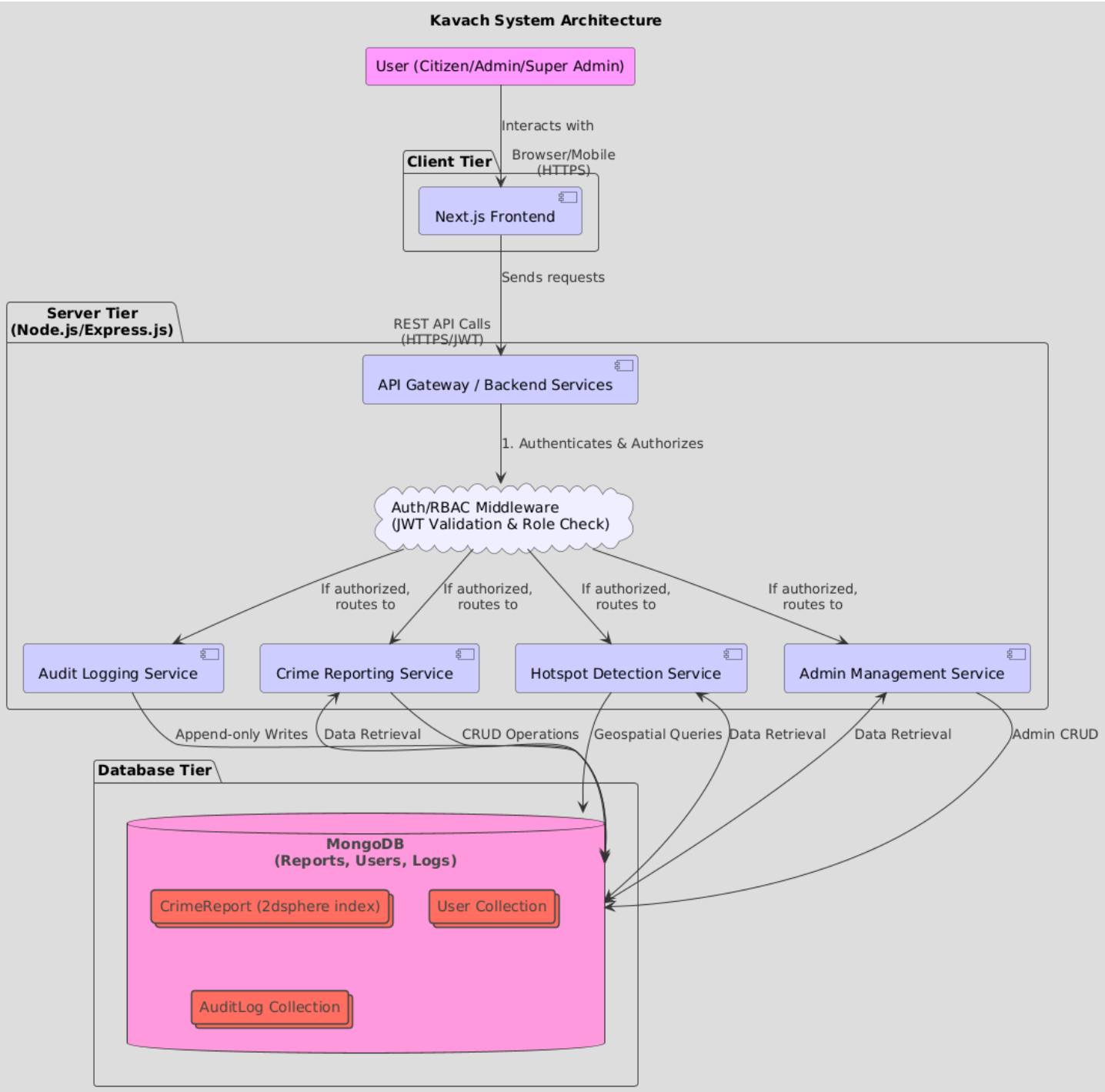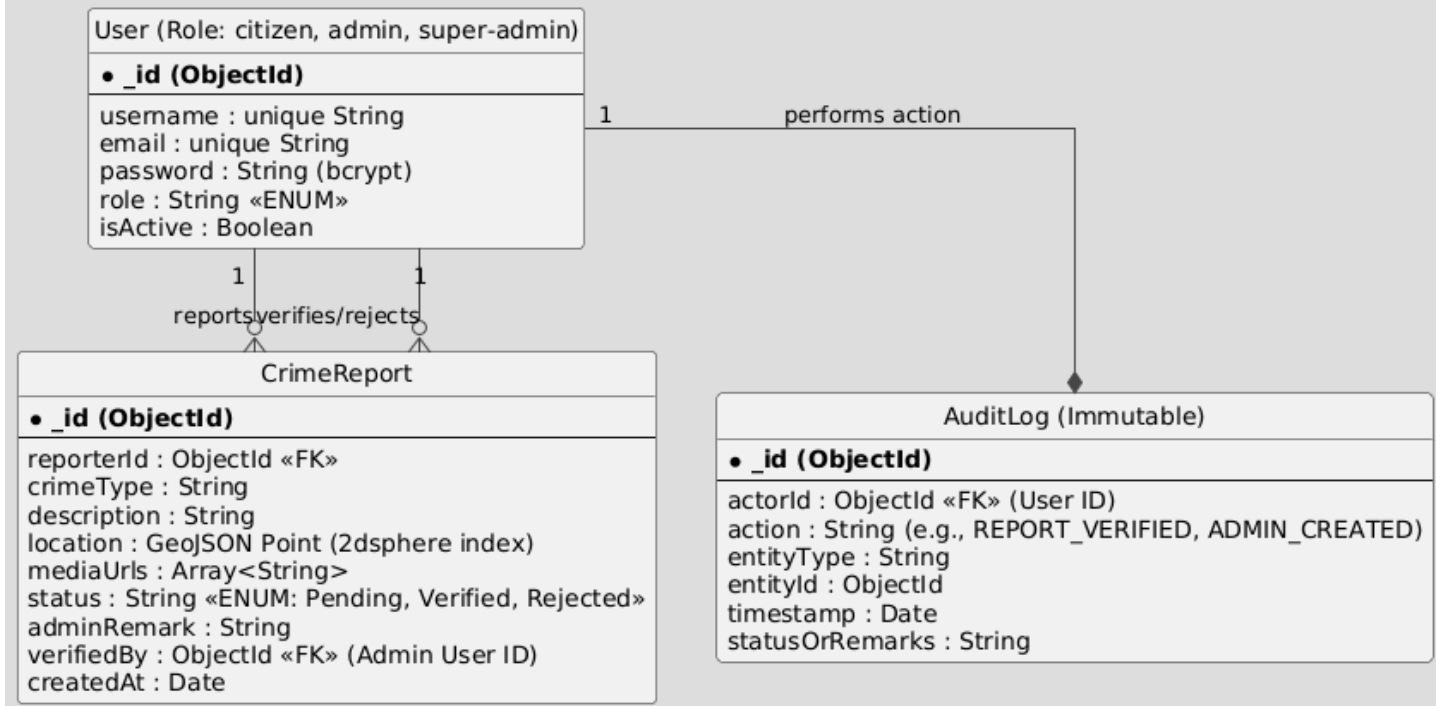
## 1. Architecture Diagram
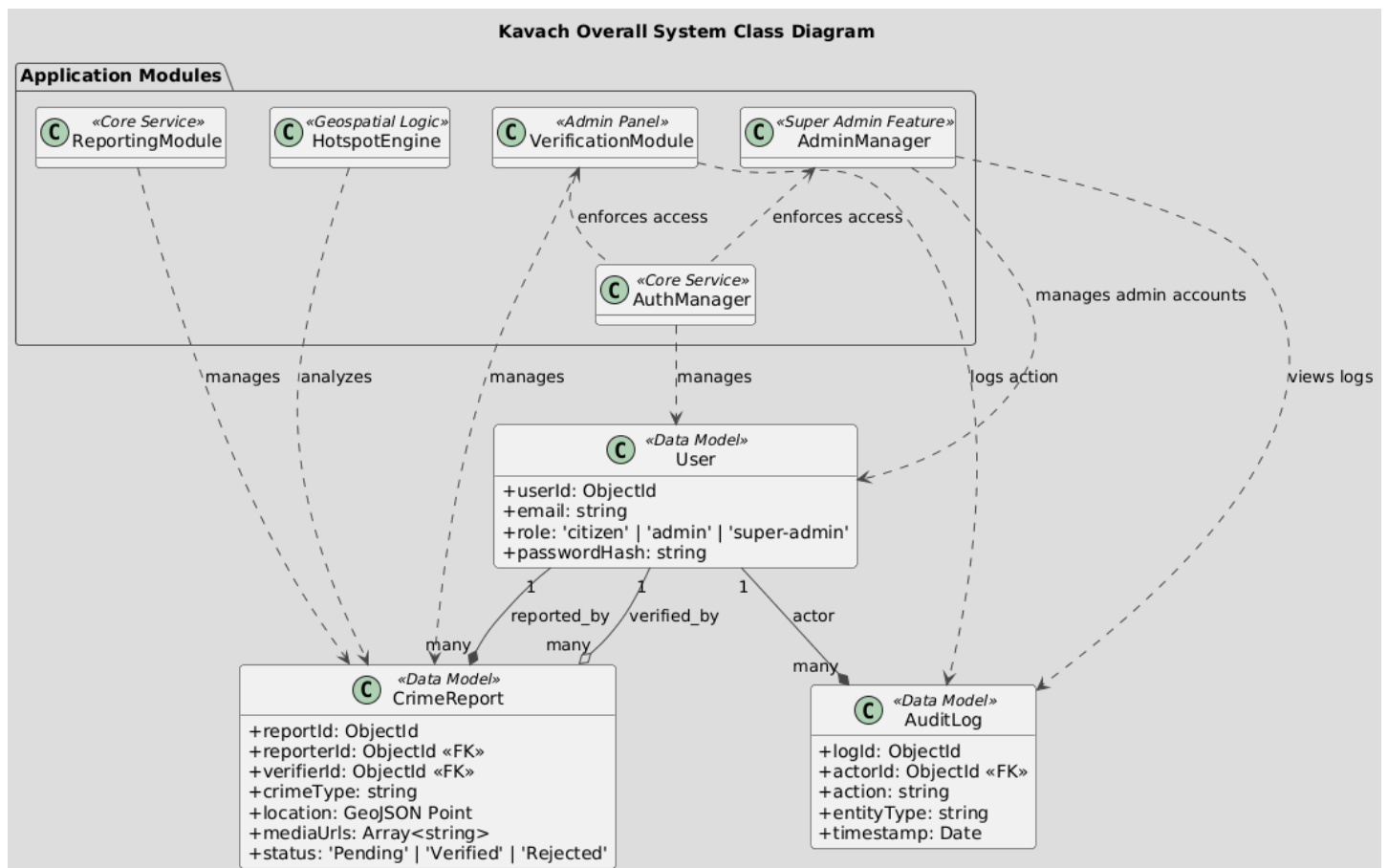


## 2. ER Diagram

Kavach System Entity-Relationship Diagram (MongoDB Schemas)

**User (Role: citizen, admin, super-admin)**
- _id (ObjectId)

username : unique String
email : unique String
password : String (bcrypt)
role : String «ENUM»
isActive : Boolean

**CrimeReport**
- _id (ObjectId)

reporterId : ObjectId «FK»
crimeType : String
description : String
location : GeoJSON Point (2dsphere index)
mediaUrls : Array<String>
status : String «ENUM: Pending, Verified, Rejected»
adminRemark : String
verifiedBy : ObjectId «FK» (Admin User ID)
createdAt : Date

**AuditLog (Immutable)**
- _id (ObjectId)

actorId : ObjectId «FK» (User ID)
action : String (e.g., REPORT_VERIFIED, ADMIN_CREATED)
entityType : String
entityId : ObjectId
timestamp : Date
statusOrRemarks : String

## 3. Class Diagram



Kavach Overall System Class Diagram

# 4. Rest API Contracts

## 1. Authentication & User Management

| Endpoint | Method | Description | Auth Required | Allowed Roles |
|---|---|---|---|---|
| `/api/v1/auth/register` | POST | Register a new Citizen account. | No | Public |
| `/api/v1/auth/login` | POST | Login for all user roles (Citizen, Admin, Super Admin). | No | Public |
| `/api/v1/users/me` | GET | Fetch the current authenticated user's profile and role. | Yes | All Authenticated |

## 2. Crime Reporting & Tracking (Citizen Focus)

| Endpoint | Method | Description | Auth Required | Allowed Roles |
|---|---|---|---|---|
| `/api/v1/crime/report` | POST | Submit a new crime report (includes location and media upload). | Yes | Citizen |
| `/api/v1/crime/my-reports` | GET | View the citizen's submitted crime reports and their current status. | Yes | Citizen |
| `/api/v1/crime/public` | GET | Fetch all verified crime reports for public map display. | No | Public |

## 3. Verification & Management (Admin Focus)

| Endpoint | Method | Description | Auth Required | Allowed Roles |
|---|---|---|---|---|
| `/api/v1/admin/reports/pending` | GET | Retrieve a list of all unverified (`Pending`) crime reports. | Yes | Admin |
| `/api/v1/admin/reports/:id/verify` | PATCH | Update a report status to Verified or Rejected with a remark. (Triggers Audit Log) | Yes | Admin |
| `/api/v1/admin/reports/verified` | GET | Retrieve all verified crimes (used for Admin analytics dashboard). | Yes | Admin |
| `/api/v1/admin/analytics` | GET | Access aggregated crime trend data (e.g., counts by type, date range). | Yes | Admin |

## 4. Super Admin Management & Audit

| Endpoint | Method | Description | Auth Required | Allowed Roles |
|---|---|---|---|---|
| `/api/v1/admin/manage` | GET | Retrieve a list of all current Admin accounts. | Yes | Super-Admin |
| `/api/v1/admin/manage` | POST | Create a new Admin account.(Triggers Audit Log) | Yes | Super-Admin |
| `/api/v1/admin/manage/:id` | PATCH | Update or deactivate an existing Admin account.(Triggers Audit Log) | Yes | Super-Admin |
| `/api/v1/admin/manage/:id` | DELETE | Remove an Admin account (physical or soft delete).(Triggers Audit Log) | Yes | Super-Admin |
| `/api/v1/admin/logs` | GET | Retrieve and filter all systemAudit Logs for accountability. | Yes | Super-Admin |

## 5. Geospatial & Hotspot Detection

| Endpoint | Method | Description | Auth Required | Allowed Roles |
|---|---|---|---|---|
| `/api/v1/geo/verified-crimes` | GET | Fetch detailed locations of verified crimes within a specified bounds (for map pins). | Yes | Citizen, Admin |
| `/api/v1/geo/hotspots` | GET | Execute the geospatial clustering query to find areas with $\ge 10$ verified crimes within a $\mathbf{1}$ km radius. (Used for Heatmap) | Yes | Citizen, Admin |

# 5. Wireframes

[Wireframe](Wireframe)