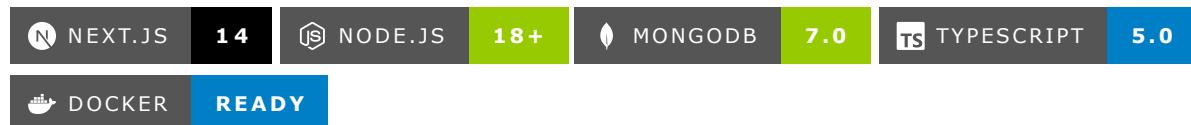
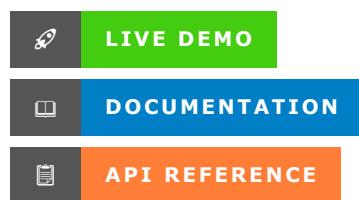




AI-Powered Urban Community Safety Platform



*Empowering communities through intelligent incident reporting and real-time safety insights*



## 🌟 Overview

### Real-time Community S

**TRINETRA** is a cutting-edge, full-stack civic technology platform that revolutionizes urban safety through community engagement. Built with modern technologies and enterprise-grade architecture, it empowers citizens to report, verify, and engage with urban incidents in real-time.

## 🎯 Key Highlights

### 🔧 Modern Architecture

- Next.js 14 with App Router
- Production-ready Node.js backend
- MongoDB with geospatial indexing
- Redis caching & session management
- Docker containerization

### 🔒 Enterprise Security

- JWT authentication with refresh tokens
- Rate limiting & DDoS protection
- Input validation & sanitization
- File upload security
- CORS & security headers

### 🤖 AI-Powered Features

- Real-time incident verification
- Confidence scoring algorithm
- Smart route optimization
- Automated threat assessment
- Community reputation system

## 📱 User Experience

- Mobile-first responsive design
- Dark/Light theme support
- Real-time notifications
- Interactive maps integration
- Smooth animations & transitions

## 🌐 Frontend - Next.js Application



## 💻 Modern Web Application

A **mobile-first**, responsive web application built with Next.js 14 (App Router) providing an intuitive interface for community safety engagement. Features smooth animations, real-time updates, and comprehensive theme support.

### Mobile-First Design

## ◆ Key Features

### 🎬 Splash Screen



Animated logo with video introduction and smooth transitions

### 🔒 Authentication



Secure signup/login with JWT integration and session management

### 📱 Urban Thread Feed



Community incident reports with filtering and reactions

## Interactive Maps



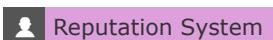
Smart routing (fastest/eco/safest routes) with real-time data

## Incident Reporting



Photo upload, geolocation, and category-based submission

## User Profiles



Statistics, contribution history, and reputation tracking

## Theme System



Smooth transitions and persistent storage

## Responsive Design



Optimized for all device sizes

## Performance



SSR, lazy loading, and code splitting

## Frontend Technology Stack

Technology	Version	Purpose	Badge
Next.js	14.x	App Router, SSR, Performance	Next.js 14
React	18.x	UI Components, Hooks	React 18
TypeScript	5.x	Type Safety, DX	TypeScript 5.0
Framer Motion	Latest	Animations, Transitions	Framer Motion Latest
Lucide React	Latest	Icons, UI Elements	Lucide Icons
CSS Modules	Built-in	Styling, Theming	CSS Modules



## 📁 Frontend Architecture

⚛️ ARCHITECTURE    **MODULAR**    TS STRUCTURE    CLEAN CODE

```
📦 frontend/
  └── app/
    ├── components/      # Reusable UI components
    │   ├── ui/           # Base components (Button, Input, Modal)
    │   ├── forms/         # Form components (Auth, Profile)
    │   └── layout/        # Layout components (Header, Nav)
    ├── contexts/         # React Context providers
    │   ├── AuthContext.tsx # Authentication state
    │   └── ThemeContext.tsx # Theme management
    ├── hooks/            # Custom React hooks
    │   ├── useAuth.ts     # Authentication logic
    │   ├── useLocation.ts # Geolocation services
    │   └── useTheme.ts    # Theme switching
    ├── lib/               # API service layer
    │   ├── api.ts          # HTTP client
    │   ├── auth.ts         # Auth utilities
    │   └── utils.ts        # Helper functions
    ├── pages/             # Route components
    │   ├── auth/           # Authentication pages
    │   ├── dashboard/       # Main dashboard
    │   └── profile/         # User profile
    ├── types/              # TypeScript definitions
    ├── globals.css         # Global styles
    ├── layout.tsx          # Root layout
    └── page.tsx            # Entry point

  ⚙ Configuration Files
  ├── next.config.js      # Next.js config & proxy
  ├── .env.local            # Environment variables
  ├── tsconfig.json         # TypeScript config
  └── tailwind.config.js    # Tailwind CSS config
  └── package.json          # Dependencies & scripts

  🛡 public/
  ├── icons/                # App icons
  ├── images/                # Static images
  └── videos/                # Video assets
```

## 🚀 Quick Start Guide

SETUP    **EASY**    TIME    5 MINUTES

## 📋 Prerequisites

```
# Required versions
Node.js >= 18.0.0
npm >= 9.0.0
```

## ⚡ Installation

```
# [1] Clone the repository
git clone https://github.com/your-org/trinatra.git
cd trinatra/frontend

# [2] Install dependencies
npm install

# [3] Setup environment
cp .env.example .env.local
# Edit .env.local with your configuration

# [4] Start development server
npm run dev
```

## 🌐 Available Scripts

Command	Description	Usage
npm run dev	Development server	Hot reload on localhost:3000
npm run build	Production build	Optimized build in .next/
npm run start	Production server	Serve built application
npm run lint	Code linting	ESLint + Prettier
npm run type-check	TypeScript check	Validate types



## ⚡ Backend - Enterprise Node.js API



## 🏗 Production-Ready API Server

A **enterprise-grade** RESTful API server built with Node.js and Express, featuring comprehensive security, performance optimization, and intelligent data processing. Designed for high-traffic production environments with advanced monitoring and scaling capabilities.

# Production-Ready Architecture

## ◆ Core Features

### 🔒 Security & Authentication

- JWT with refresh token rotation
- Rate limiting & DDoS protection
- Input validation & sanitization
- File upload security
- IP filtering & CORS
- Security headers & CSP

### ⚡ Performance & Scalability

- Redis caching & session storage
- Database connection pooling
- Compression & response optimization
- Clustering support
- Memory monitoring
- Graceful shutdown

### 🧠 AI & Intelligence

- Real-time incident verification
- Confidence scoring algorithm
- SerpAPI integration
- Automated threat assessment
- Smart route optimization
- Community reputation system

### 📊 Monitoring & Logging

- Structured logging with Winston
- Performance metrics
- Health check endpoints
- Error tracking & reporting
- Request correlation IDs
- Prometheus integration

## 🛠 Backend Technology Stack

Technology	Version	Purpose	Badge
Node.js	18+	Runtime Environment	 Node.js 18+
Express.js	4.x	Web Framework	 Express.js 4.x

Technology	Version	Purpose	Badge
<b>MongoDB</b>	7.0+	Database	 MongoDB 7.0
<b>Redis</b>	7.2+	Caching & Sessions	 Redis 7.2
<b>JWT</b>	Latest	Authentication	 JWT Auth
<b>Winston</b>	Latest	Logging	 Winston Logging
<b>Joi</b>	Latest	Validation	 Joi Validation
<b>PM2</b>	Latest	Process Management	 PM2 Process Manager
			     

## 🔌 External Integrations

Service	Purpose	Status
<b>SerpAPI</b>	Real-time data verification	 Status Active
<b>Google Maps</b>	Geolocation & routing	 Status Active
<b>Google Vision</b>	Image analysis	 Status Active
<b>Prometheus</b>	Metrics collection	 Status Active
<b>Grafana</b>	Monitoring dashboard	 Status Active

## 📁 Backend Architecture

 ARCHITECTURE  ENTERPRISE  STRUCTURE  PRODUCTION READY

```

🚀 backend/
  ├── controllers/          # Business logic & request handlers
  │   ├── authController.js    # 🔒 Authentication & JWT
  │   ├── contributeController.js # 📝 Incident reporting
  │   ├── threadsController.js  # 📡 Community feed
  │   ├── profileController.js   # 🚙 User management
  │   ├── routesController.js    # 🗺 Route planning
  │   └── commentsController.js  # 💬 Comments system
  ├── models/                # MongoDB schemas
  │   ├── User.js              # 🚙 User model + geolocation
  │   ├── Post.js              # 📝 Incident reports + TTL
  │   └── Comment.js           # 💬 Community comments
  ├── routes/                # API endpoint definitions
  └── middleware/            # Security & validation
    └── auth.js               # 🔒 JWT authentication

```

└ security.js	# 🔒 Security middleware
└ performance.js	# ⚡ Performance optimization
└ errorHandler.js	# 🚨 Global error handling
└ utils/	# Helper functions
└ confidence.js	# 🤖 AI verification engine
└ storage.js	# 📁 File handling utilities
└ config/	# Configuration
└ database.js	# 📄 MongoDB connection
└ logger.js	# 📋 Winston logging
└ validation/	# Input validation
└ schemas.js	# 📋 Joi validation schemas
└ Docker Files	# 🚤 Production container
└ Dockerfile	# 🛠 Multi-service setup
└ docker-compose.yml	# 🚫 Docker ignore rules
└ Deployment	# 🚀 PM2 configuration
└ ecosystem.config.js	# 🌐 Reverse proxy config
└ nginx/	# 🛍 Deployment scripts
└ scripts/	# 📂 Temporary file storage
└ uploads/	# 📁 Application logs
└ logs/	# 🌎 Environment template
└ .env.example	# 🌐 Application entry point
└ server.js	

## 🔧 Backend Setup

```
# Install dependencies
npm install

# Configure environment
cp .env.example .env
# Edit .env with your database URL and API keys

# Start server
node server.js

# Access API
http://localhost:8080
```

## 🔧 Environment Configuration

### Frontend (.env.local)

```
# API Configuration
NEXT_PUBLIC_API_URL=http://localhost:8080
NEXT_PUBLIC_APP_NAME=UrbanThreads
NEXT_PUBLIC_APP_VERSION=1.0.0
```

```

# API Keys
NEXT_PUBLIC_SERPAPI_KEY=your_serpapi_key
NEXT_PUBLIC_GOOGLE_MAPS_API_KEY=your_maps_key

# Feature Flags
NEXT_PUBLIC_ENABLE_LOCATION_SERVICES=true
NEXT_PUBLIC_ENABLE_PHOTO_UPLOAD=true
NEXT_PUBLIC_DEBUG_MODE=true

```

## Backend (.env)

```

# Server Configuration
PORT=8080
NODE_ENV=development

# Database
MONGODB_URI=mongodb://127.0.0.1:27017/TRINETRA

# Authentication
JWT_SECRET=your_secure_jwt_secret

# API Keys
SERPAPI_KEY=your_serpapi_key

# File Upload
MAX_FILE_SIZE=5000000
UPLOAD_PATH=./uploads

```

**⚠ Security Note:** Never commit `.env` files with production secrets to version control!

---

## 🔗 API Integration

The frontend and backend communicate through a proxy configuration in `next.config.js`:

```

async rewrites() {
  return [
    {
      source: '/api/:path*',
      destination: 'http://localhost:8080/api/:path*'
    }
  ]
}

```

---

## Key API Endpoints

- `POST /api/auth/register` - User registration
  - `POST /api/auth/login` - User authentication
  - `GET /api/threads` - Get community incidents with location filtering
  - `POST /api/contribute` - Submit incident reports
  - `GET /api/profile/me` - Get user profile and statistics
  - `POST /api/routes` - Calculate optimal routes
- 

## 🚀 Deployment

### Frontend Deployment

#### Recommended: Vercel

```
# Connect your GitHub repository to Vercel  
# Configure environment variables in Vercel dashboard  
# Automatic deployments on push to main branch
```

#### Alternative: Traditional Hosting

```
npm run build  
npm start
```

### Backend Deployment

#### Options: Heroku, AWS, DigitalOcean, Railway

```
# For Heroku  
git push heroku main  
  
# For Docker  
docker build -t trinetra-backend .  
docker run -p 8080:8080 trinetra-backend
```

### Production Checklist

- Update API URLs in environment variables
  - Configure HTTPS for both frontend and backend
  - Set up MongoDB Atlas for production database
  - Configure CORS for production domains
  - Set up monitoring and logging
  - Configure rate limiting for production load
-

## Security Features

- **JWT Authentication:** Secure token-based authentication
  - **Rate Limiting:** API protection against abuse
  - **Input Validation:** Comprehensive request sanitization
  - **File Upload Security:** Safe handling of user uploads
  - **CORS Configuration:** Proper cross-origin resource sharing
  - **Environment Variables:** Secure configuration management
- 

## Testing

### Frontend Testing

```
# Run tests
npm test

# Run tests in watch mode
npm run test:watch

# Test build
npm run build
```

### Backend Testing

```
# Test API endpoints
npm test

# Test with specific environment
NODE_ENV=test npm test
```

## Contributing

We welcome contributions! Please follow these steps:

1. **Fork** the repository
2. **Create** a feature branch (`git checkout -b feature/amazing-feature`)
3. **Follow** existing code style and patterns
4. **Add** tests for new functionality
5. **Commit** your changes (`git commit -m 'Add amazing feature'`)
6. **Push** to the branch (`git push origin feature/amazing-feature`)
7. **Open** a Pull Request

### Development Guidelines

- Write clear, descriptive commit messages
  - Add comments for complex logic
  - Follow TypeScript best practices
  - Test thoroughly before submitting
  - Update documentation as needed
- 

## Troubleshooting

### Common Issues

#### **Frontend not connecting to backend:**

- Verify backend is running on port 8080
- Check `next.config.js` proxy configuration
- Confirm API URL in `.env.local`

#### **Geolocation not working:**

- Ensure HTTPS in production
- Check browser permissions
- Verify location services are enabled

#### **Image uploads failing:**

- Check file size limits
  - Verify upload directory permissions
  - Confirm multer configuration
- 

## License

This project is licensed under the **MIT License** - see the [LICENSE](#) file for details.

---

## Acknowledgments

- Next.js team for the amazing framework
  - MongoDB team for the database platform
  - SerpAPI for real-time data verification
  - Google Maps for location services
  - The open-source community for inspiration
- 

## Screenshots

### User Interface

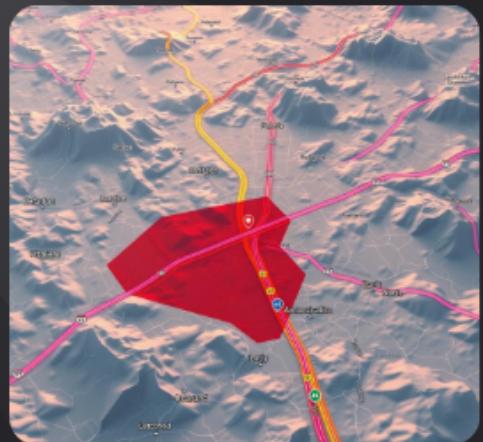
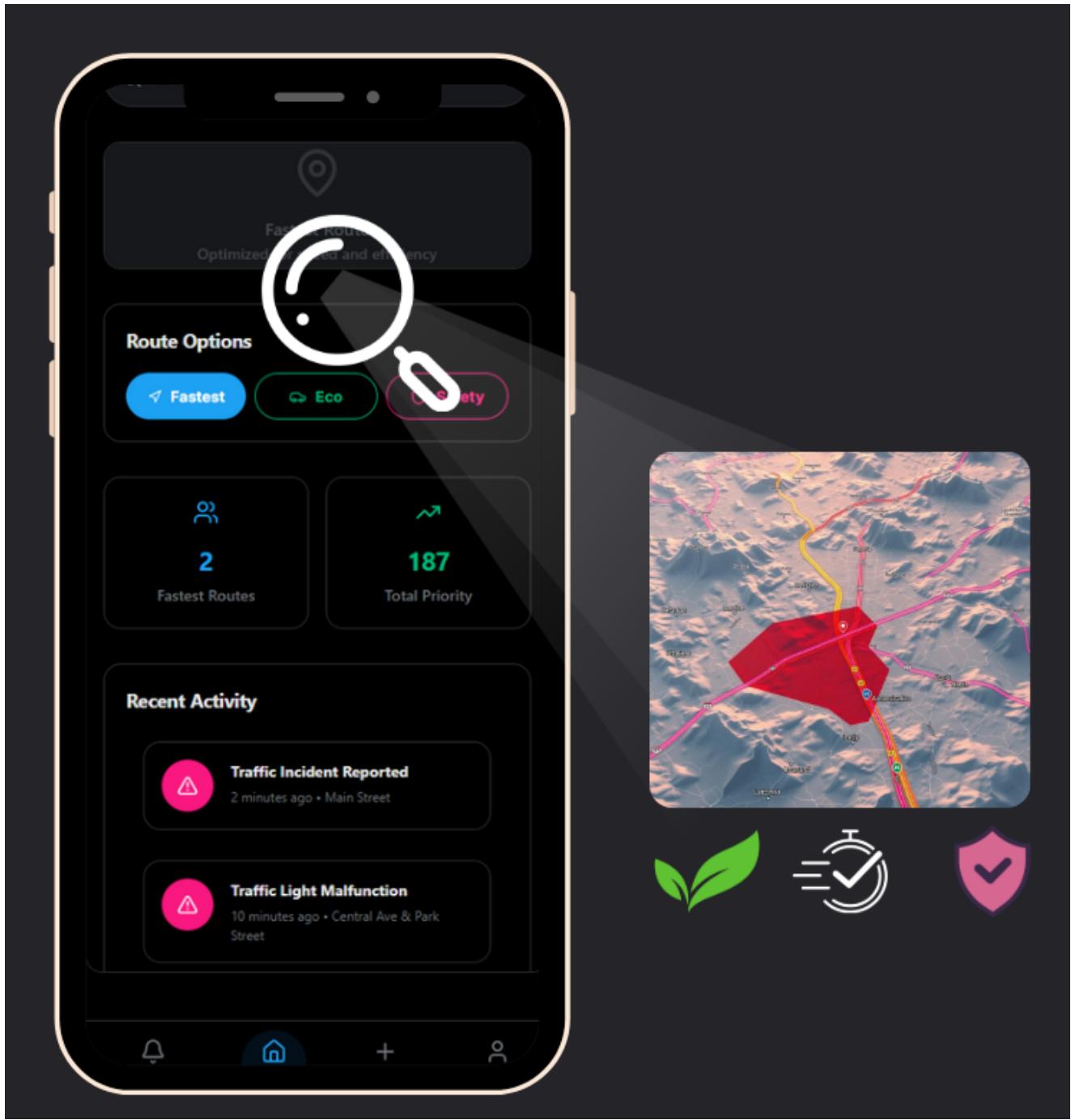
# Media Validation: Vision API & Object Detection

Visual evidence is critical. Our Vision API integration verifies authenticity and identifies incident specifics from images/videos.

- **Authenticity Check:** Detects manipulated media using Metadata from the images and forensic analysis techniques.
- **Object Detection:** Identifies specific objects (e.g., "car wreck," "floodwater," "protest signs") to categorize incidents.
- **Geo-Tag Verification:** Cross-references image EXIF data with reported GPS location.
- **Scene Understanding:** Contextualizes the visual information to enhance incident accuracy (e.g., "heavy traffic," "damaged infrastructure").



*Dashboard - Main Interface*



User Profile Management



## Smart Routes

From

📍 Current Location



To

🔍 Enter destination

↗️ Get Directions

### Route Options



Fastest



Eco



Safest



Ready to Navigate

Enter your destination to get smart route suggestions



Urban Thread



Routes



Report



Profile

Active Issues      Verified      Avg Confidence

All      Traffic      Construction      Hazards      Other

 **Other**  90%  
car accident

② 22.246564000000003,  
84.81560623076922 • 0.1km  
away 1 minutes ago

Reported by Anonymous

 **Incident**

---

 Like  Comment  Share

Real-time Analytics Dashboard

The logo for Trinetr, featuring the word "Trinetr" in a white, sans-serif font. The letter "T" has a small blue square with a white arrow pointing right at its top. The letter "e" has a small blue circle with a white magnifying glass icon at its bottom right.

Data

From



Current Location



To



ambagan food court , rourkela

Get Smart Routes

## Route Options



Fastest

28h 44m

1435.1 km

₹11481



Eco

36h 10m

1549.9 km

₹9300



Safest

44h 1m

1650.4 km

₹11553

### Fastest Route Details



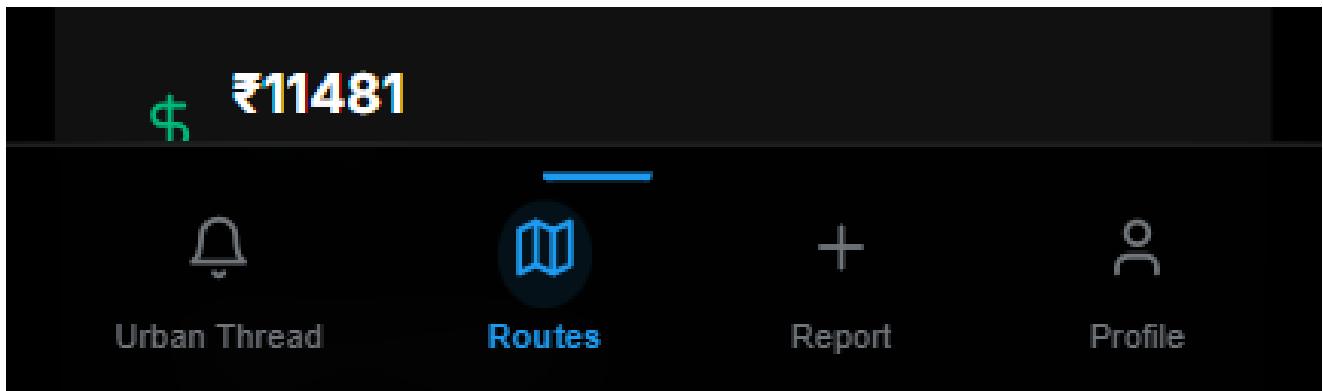
28h 44m

Duration

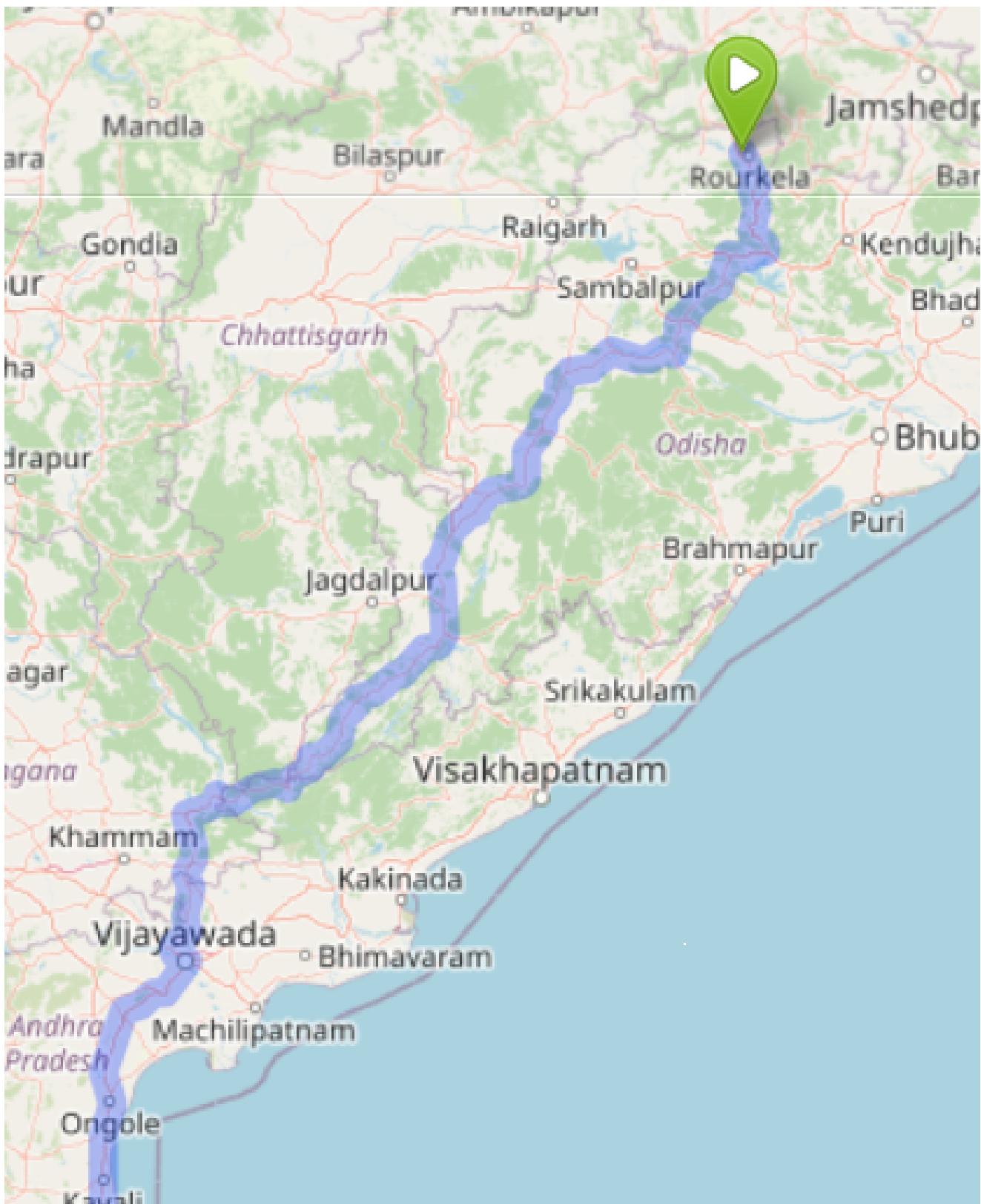


1435.1 km

Distance



*Advanced Security Configuration*



User Authentication System

## Route Options



## Fastest

2h 55m

145.6 km

₹1165

0 incidents



## Eco

3h 40m

157.2 km

₹943

0 incidents

← Swipe to see all options →

## Fastest Route Details

Safety: 90%



**2h 55m**

Duration



**145.6 km**

Distance



**₹1165**

Est. Cost

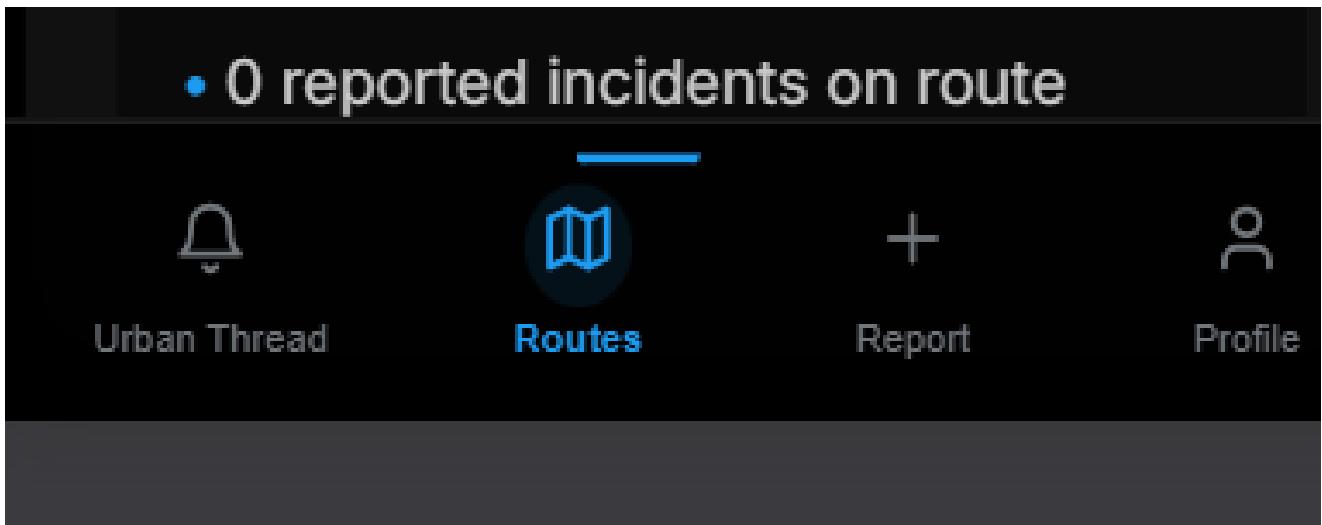


**0**

Incidents

## Route Features:

- Highway routes preferred
- Minimal stops
- Real-time traffic considered



### System Architecture Overview

A screenshot of a MongoDB database interface. On the left, there is a sidebar with a tree view of databases and collections. Under the "TRINETRA" database, the "users" collection is selected and expanded, showing sub-collections "comments", "posts", and "..." (ellipsis). On the right, a detailed view of a single user document is shown. The document contains the following fields and their values:

```
_id: ObjectId('68b4244837b8e585d24bce36')
userId : "d8dca01a-fc20-4ab1-b3da-d763f0fb03be"
email : "rohan2100254@gmail.com"
name : "Rohan Kumar Jena"
profilePicture : ""
city : "Unknown"
joinDate : 2025-08-31T10:30:32.586+00:00
reports_submitted : 1
credibility_score : 54
total_vision_analyses : 1
high_credibility_posts : 0
avg_confidence_score : 60
vision_api_stats : Object
last_active : 2025-09-01T10:29:15.033+00:00
location : Object
createdAt : 2025-08-31T10:30:32.586+00:00
updatedAt : 2025-09-01T10:32:15.914+00:00
password : "$2a$12$PbwDEdlMx8B3/i8X/QeWyureoc/aYFm6k5eUdc0VDIAK0CtYM8fC."
```

### Integration and Data Flow

---

❤️ Thank You

Thank you for exploring TRINETRA!

We appreciate your interest in our AI-powered urban safety platform. Your support helps us make communities safer and more connected.



GitHub Stars

your-org/trinatra

September

Date

 star-history.com

Made with ❤️ by the TRINETRA Team

 Star us on GitHub |  Report Bug |  Request Feature