🌍 Climatee

Climate Data Management System - Comprehensive Documentation

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🎯 Project Overview

Climatee is a comprehensive climate data management and monitoring system built with Django. It provides real-time climate data visualization, alert management, user role-based access control, and administrative tools for environmental monitoring organizations.

🚀 Key Objectives

🌡️ Real-time Climate Monitoring

Track temperature, CO2 levels, sea level changes, and Arctic ice data with live updates and historical analysis.

👥 Role-based Access Control

Three-tier user system with Administrator, Analyst, and Viewer roles, each with specific permissions.

🚨 Alert Management

Automated climate anomaly detection with severity-based notification system and acknowledgment tracking.
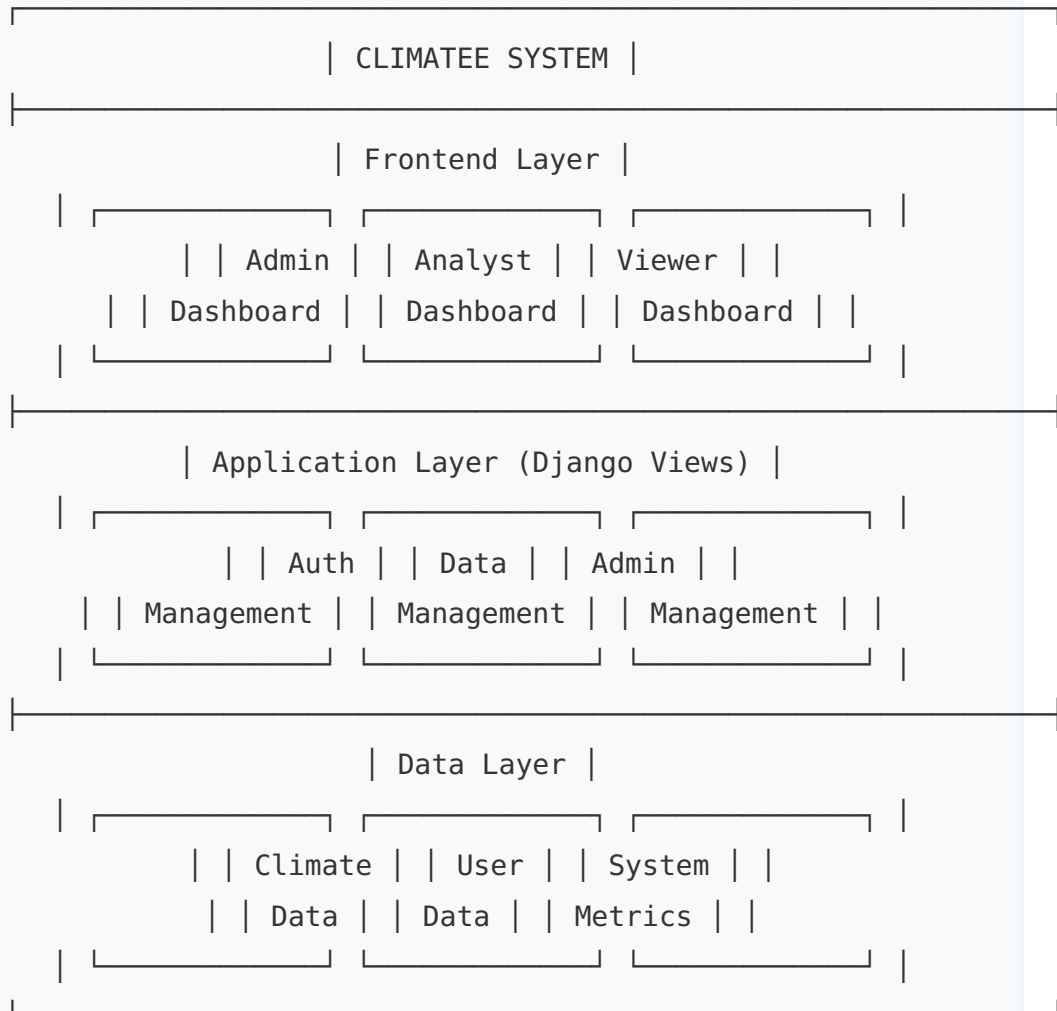
📊 Data Visualization

Interactive charts and dashboards using Chart.js and Plotly.js for comprehensive climate data analysis.

🛠️ Technology Stack

- **Backend:** Django 5.1 (Python)
- **Database:** SQLite (Development) / PostgreSQL (Production Ready)
- **Frontend:** Bootstrap 5, Chart.js, Plotly.js
- **Authentication:** Django's built-in authentication with custom user model
- **Styling:** Custom climate-themed CSS with responsive design

🏗️ System Architecture

```
┌─────────────────────────────────────────────────┐
│ CLIMATEE SYSTEM │
├─────────────────────────────────────────────────┤
            │ Frontend Layer │
│ ┌──────────────┐ ┌──────────────┐ ┌──────────────┐ │
│ │ Admin │ │ Analyst │ │ Viewer │ │
│ │ Dashboard │ │ Dashboard │ │ Dashboard │ │
│ └──────────────┘ └──────────────┘ └──────────────┘ │
├─────────────────────────────────────────────────┤
      │ Application Layer (Django Views) │
│ ┌──────────────┐ ┌──────────────┐ ┌──────────────┐ │
│ │ Auth │ │ Data │ │ Admin │ │
│ │ Management │ │ Management │ │ Management │ │
│ └──────────────┘ └──────────────┘ └──────────────┘ │
├─────────────────────────────────────────────────┤
                │ Data Layer │
│ ┌──────────────┐ ┌──────────────┐ ┌──────────────┐ │
│ │ Climate │ │ User │ │ System │ │
│ │ Data │ │ Data │ │ Metrics │ │
│ └──────────────┘ └──────────────┘ └──────────────┘ │
└─────────────────────────────────────────────────┘
```

👥 User Roles & Permissions

🔴 Administrator

Full System Access

- ✅ User management (promote/demote users)
- ✅ System configuration and settings
- ✅ All data sources and climate data
- ✅ Alert management and system monitoring
- ✅ Support ticket management
- ✅ ML model configuration
- ✅ System credentials access

🟡 Climate Analyst

Data Analysis & Management

- ✅ Climate data analysis and visualization
- ✅ Data source management
- ✅ Alert monitoring and acknowledgment
- ✅ Support ticket creation
- ✅ ML model usage
- ❌ User management
- ❌ System administration

🟢 Data Viewer

Read-Only Access

- ✅ View climate data and dashboards
- ✅ View alerts (read-only)
- ✅ Create support tickets
- ❌ Data modification
- ❌ User management
- ❌ System administration

🌟 Core Features

📊 Climate Data Management

- Real-time data ingestion from multiple sources
- Interactive data visualization with Chart.js
- Historical analysis (30-day, 90-day, yearly)
- Data quality monitoring and anomaly detection

🚨 Alert System

- Automated climate parameter monitoring
- Severity levels: Low, Medium, High, Critical
- Real-time notifications for anomalies
- Alert acknowledgment and tracking

📁 Data Source Management

- Multiple source types (Satellites, Weather Stations, etc.)
- Geographic tracking with GPS coordinates
- Active/inactive source monitoring
- Seamless data integration

👤 User Management

- Role promotion/demotion system
- User status control (activate/deactivate)
- Detailed user profiles and activity tracking
- Comprehensive system credentials overview

🔑 User Credentials

ClimateUser Accounts (Primary System)

Username	Password	Role	Status	Access Level
admin	admin123	Administrator	✅ **Active**	Full system access
analyst	analyst123	Climate Analyst	✅ **Active**	Data analysis & management

Username	Password	Role	Status	Access Level
viewer	viewer123	Data Viewer	❌ **Inactive**	Read-only access

Legacy Signup Accounts (Backward Compatibility)

Username	Password	Status	Notes
abc	abc123	Legacy	For backward compatibility
Hamza	hamza123	Legacy	For backward compatibility

⚠️ **Security Recommendations**

- **Change default passwords** in production environment
- **Enable two-factor authentication** for admin accounts
- **Regular password rotation** policy implementation
- **Monitor login attempts** and suspicious activities

🚀 Installation & Setup

Prerequisites

```
- Python 3.8+ - Django 5.1 - SQLite (included) or
PostgreSQL - Node.js (for frontend dependencies)
```

Installation Steps

```
# 1. Clone the repository git clone https://
github.com/jivaniiiii/Climatee.git cd Climatee # 2.
Create virtual environment python -m venv venv
source venv/bin/activate # On Windows:
venv\Scripts\activate # 3. Install dependencies pip
install -r requirements.txt # 4. Run migrations
python manage.py makemigrations python manage.py
migrate # 5. Create sample data python
create_sample_data.py # 6. Start development server
python manage.py runserver
```

> ### ✅ Quick Start
>
> After installation, access the system at **http://localhost:8000**
> and login with the admin credentials: `admin` / `admin123`

📊 High-Level System Diagrams

User Role Hierarchy

```
            ┌───────────────┐
            │ Administrator │
            │ (Full Access) │
            └───────────────┘
                    │
            ┌───────▼───────┐
            │ Climate Analyst │
            │ (Data + Alerts) │
            └───────────────┘
                    │
            ┌───────▼───────┐
            │ Data Viewer   │
            │ (Read Only)   │
            └───────────────┘
```

Data Flow Architecture

```
┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│ Data Sources │──▶│ Data Ingestion│──▶│ Climate Data │
│ (External)   │   │ Pipeline     │   │ Storage      │
└──────────────┘   └──────────────┘   └──────────────┘
                          │                   │
          ┌──────────┐   ┌──────────────┐    │
          │ Alerts   │◀──│ ML Models &  │◀───┘
          └──────────┘   └──────────────┘
```

```
                 | System |  | Analytics |
                 |_____|  |_____|
```
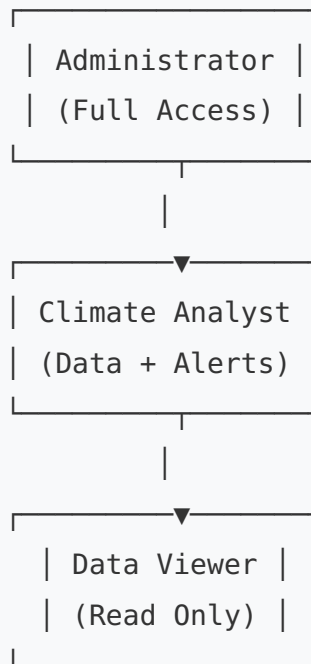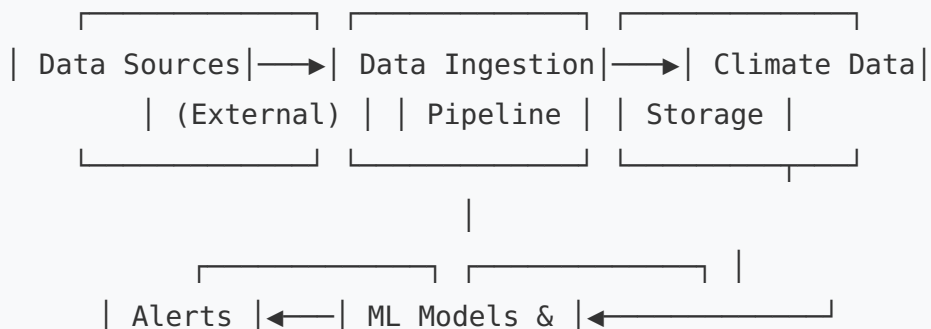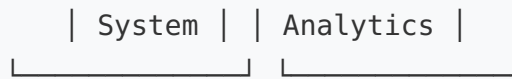
User Management Workflow

```
      _____      _____      _____
      | Admin  |--->| User   |--->| Role   |
      |Dashboard|   |Management|  |Assignment|
      |_____|    |_____|    |_____|
                      | | |
                      | ▼ |
              |    _____    |
              | | Status | |
         _____| Management |<_____
              |(Active/Inactive)|
                 |_____|
```
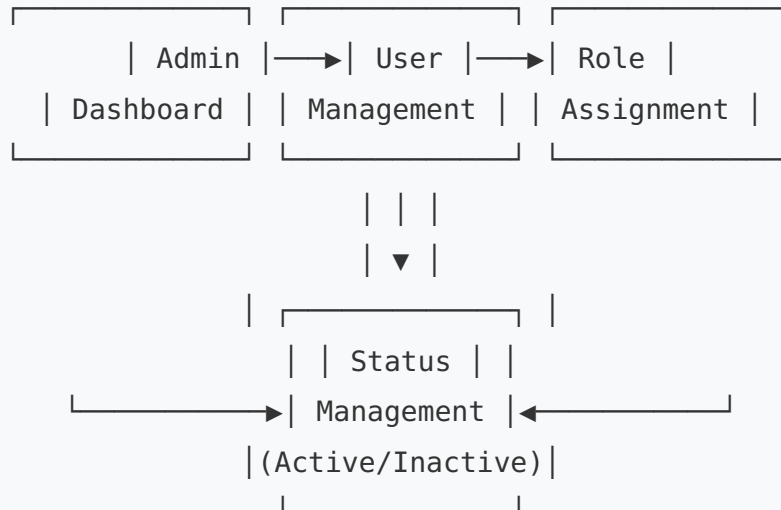
🔌 Key API Endpoints

Authentication

- POST /login/ - User authentication
- POST /register/ - New user registration
- POST /logout/ - User logout

Dashboards

- GET /dashboard/admin/ - Administrator dashboard
- GET /dashboard/analyst/ - Analyst dashboard

- GET `/dashboard/viewer/` - Viewer dashboard

User Management (Admin Only)

- GET `/management/users/` - User management dashboard
- POST `/management/users/promote-demote/` - Change user role
- POST `/management/users/toggle-status/` - Activate/deactivate user
- GET `/management/credentials/` - System credentials overview

🔒 Security Features

🔐 Authentication & Authorization

- Role-based access control (RBAC)
- Secure session management
- CSRF protection
- Password hashing with Django's built-in security

🛡️ Data Protection

- Input validation and sanitization
- SQL injection prevention via Django ORM
- XSS prevention with template auto-escaping
- Content Security Policy implementation

📝 Audit Trail

- User activity logging
- Security event monitoring
- Data change tracking with timestamps
- Login attempt monitoring

⚡ Performance Monitoring

- Real-time system metrics
- CPU and memory usage tracking
- Network I/O monitoring
- Database performance optimization

📞 Support & Contact

Development Team: Climate Data Systems Team

Technical Support: support@climatee.org

Emergency Contact: +1 (555) CLIMATE

Project Repository: https://github.com/jivaniiiii/Climatee

Climatee Climate Data Management System

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