

Climate Data Analysis in Simien Mountains National Park, Ethiopia

1. Introduction and Background

The Simien Mountains National Park (SMNP) is a UNESCO World Heritage site situated in northern Ethiopia. Known for its dramatic escarpments, deep valleys, and unique Afro-alpine ecosystems, the park is home to endemic and endangered species such as the Ethiopian wolf, gelada baboons, and numerous high-altitude plant species. Climate change is increasingly impacting the region, affecting biodiversity, water availability, and local agricultural systems. This project proposes integrating computer science, data analytics, and AI-based methods to monitor climate dynamics at fine spatial and temporal scales.

2. Project Objectives

- Data Acquisition: Deploy IoT-enabled sensors across multiple altitudes to collect continuous environmental data.
- Trend Analysis: Apply AI and machine learning to detect climate patterns, seasonal trends, and anomalies.
- Risk Identification: Identify areas vulnerable to climate stress such as drought, soil erosion, and habitat degradation.
- Conservation Support: Provide actionable insights for conservation of endemic species.
- Community Engagement: Develop workshops and outreach to enhance local awareness of climate change.

3. Methodology

3.1 Site Selection

Field sites will be selected to represent altitudes, vegetation types, and exposure to climatic variability.

3.2 Data Collection

IoT sensors will record temperature, humidity, soil moisture, and precipitation. Data will be transmitted to a central database.

3.3 Data Processing and Analysis

Collected data will be analyzed using Python and machine learning algorithms for trend analysis, anomaly detection, predictive modeling, and spatial analysis.

4. Expected Outcomes

- High-resolution climate dataset

- Identification of vulnerable ecosystems and microclimates
- Predictive models for biodiversity and agriculture
- Conservation recommendations
- Community awareness and education
- Dissemination through journals and collaborations

5. Education and Outreach

- Workshops for students and farmers
- Data visualization dashboards
- Public lectures and social media engagement
- Collaboration with The Explorers Club for educational materials

6. Project Team

- Muluken Mesfin, Principal Investigator: Computer Science graduate, AI and IoT expertise
- Yebletale Mesfin, Project Supervisor: Ecology and climate science specialist

7. Project Significance

This project fills a critical gap in climate monitoring in high-altitude Ethiopian ecosystems, producing actionable insights for conservation and sustainable community practices.