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VER 2.0

Meta

Llama 3

ECOLLAMA

LONG TERM TARGET VERSION 2.0

The EcoLlama project is currently under development for beta version 1.0. This information package focuses on the final long-term goals and development phases of EcoLlama.

2024 - 2025

ECOLLAMA VER 2.0: ADVANCED CLIMATE DATA ANALYSIS FOR AGRICULTURAL ACTIVITIES USING FEDERATED LEARNING

FEDERATED LEARNING - LLAMA3

The EcoLlama Ver 2.0 project aims to enhance Turkey's agricultural sector by adapting to climate change and increasing the efficiency of agricultural activities. To achieve this long-term goal, we will leverage Federated Learning technology to provide more comprehensive data analyses and advanced solutions for agricultural activities.

Project Phases
Phase 1:

Version 1.0 Beta: This version focuses on the Mediterranean climate, processing data via sensors and APIs using an external focus mechanism. It integrates with a fine-tuned LLaMA 3 model. This system analyzes all the needs of a single crop that can be grown in the region, planning the entire cultivation process and meeting all its needs.
Capabilities of the Beta Model:

Regional climate analysis for agricultural activities

Forward-looking climate change predictions based on historical climate comparisons

Assessing the impact of predictions on crops

Comprehensive data pool on soil structure, irrigation facilities, precipitation, and other factors in the region

Calculating the suitability of crops for the region and current climate

Planning the cultivation phase and creating an action plan

Emergency plans

Daily monitoring of plant health by comparing sensor data with LLaMA 3 data

Planning and action capability for unexpected and possible climate changes

Calculating the detection rate of climate change and its potential impacts on crops

Version 1.0: This version expands the functionalities of the beta version to all crops in the region. (See: Version 1.0 paper)

Phase 2:

Version 2.0 Beta: In the second phase, the system will be expanded and distributed to different regions for free and as open source. Our distributed architecture system will collect data from other pilot areas in the region and start from a general climate analysis for the Mediterranean region. These analyses will progress towards the desired agricultural field, performing climate and agricultural analyses based on a federated learning system.

What is Federated Learning?

Federated Learning is a method that enables the training of machine learning models using distributed data sources without a central data repository. This approach allows data collected from different locations to be processed locally, with only model updates being sent to a central server.

How Will It Work?

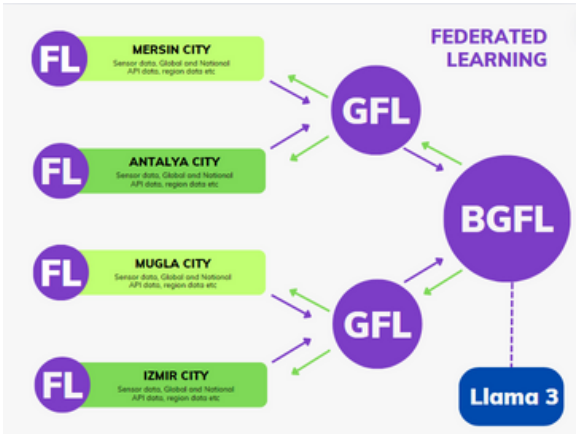
Data Collection: Climate sensors and agricultural API data will be collected from different climate regions of Turkey.

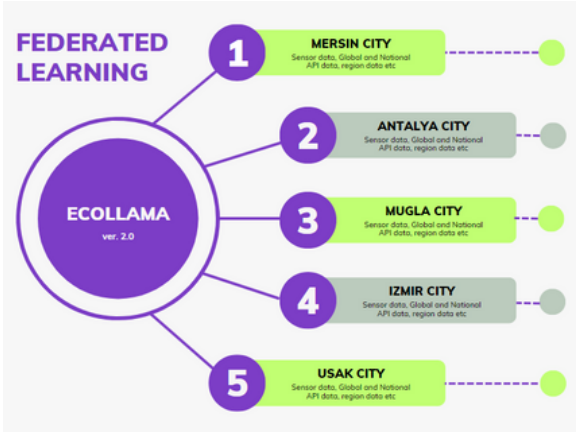
Local Model Training: Each data source will train a model locally with its data.

Central Updates: Local model updates will be sent to a central server to create a global model.

Model Fine-Tuning: The global model will be fine-tuned on LLaMA 3 and integrated into applications.

Advantages and Disadvantages





Step-by-Step Federated Learning Application

Data Collection:

- Cities: Four cities representing various climatic regions of Turkey will be selected.
- Data Sources: Climate sensors, agricultural API data, and other relevant data sources will be used.
- Data Types: Data such as soil moisture, temperature, rainfall, and plant health will be collected.

Local Model Training:

- In Each City: Each city will train a local model using its own data.
- Data Processing: Data will be processed on local servers to create model updates.
- Privacy: Data will remain local, with only model updates sent to the central server.

Centralized Updates:

- Global Model: Updates from local models will be aggregated at the central server.
- Model Integration: The global model will be updated with the incoming updates.
- Regular Updates: Regular updates from local models will continuously improve the global model.

Model Fine-Tuning and Distribution:

- LLaMA 3 Integration: The global model will be transferred to the latest version of LLaMA 3, and fine-tuning will be performed on this model.
- Redistribution: The updated LLaMA 3 model will be redistributed to the local systems in the four cities.
- Local Integration: Enhanced model results will be integrated into local applications for use.

Advantages:
Data Diversity and Accuracy: Data from different regions create a more flexible and general model.
Rapid Adaptation: Models constantly updated with local data quickly adapt to changing climate conditions.
Low Hardware Costs: Working with small data sets keeps hardware costs minimal.
Practical Integration: Data providers will contribute to data collection by continuing their agricultural activities, thus only doing their regular tasks.

Disadvantages:
Variations in Data Quality: The quality and format of data from different sources may vary, affecting model performance.
Solution: This can be mitigated by establishing a fixed data processing format and a monitoring system.
Responsible Use and Open Source
EcoLlama Ver 2.0 adopts the principles of transparency and openness according to EU standards. Our project will be developed as open source and will establish a system focused on openly sharing climate data. Data providers will contribute with both their activities and local climate sensor data, thus creating broad and comprehensive data sets for the agricultural sector.

With EcoLlama Ver 2.0, we aim to take an important step in combating climate change while preparing the agricultural sector for the future. This project will provide innovative solutions to Turkey's agricultural sector by increasing the sustainability of agricultural activities.

Phase 3: Decentralized EcoLlama climate network (in design phase).

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