Practice Abstract 5: AI Forecasting Tools to Predict Renewable Energy Generation on Farms

COUNTRY AND CLIMATIC ZONE

Pan-European

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3 BENEFITS OF THE PRACTICE

- Empowers farmers with reliable forecasts for renewable energy generation, improving planning and self-consumption.
- Supports short-, mid-, and long-term operational and strategic decision-making.
- Enables data-driven optimisation of energy resources in agriculture through tailored AI models.

PRODUCTION SYSTEM

N/A

KEYWORDS

HarvRESt, RES, Analytics, Forecasting, Machine Learning

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

The HarvRESt project is developing AI-based tools to forecast renewable energy generation on farms. These forecasting models help farmers and stakeholders anticipate energy production based on weather and other data, so they can better plan operations, maximise self-use of energy, and reduce reliance on the grid.

LONGER DESCRIPTION – IN ENGLISH

The HarvRESt project is designing advanced AI analytics pipelines to accurately forecast renewable energy generation at the farm level. This work is essential for supporting energy autonomy and better resource planning in agricultural communities increasingly adopting on-site renewable energy sources.

The forecasting system is structured around short-, mid-, and long-term timeframes and makes use of AI algorithms such as Artificial Neural Networks (ANNs), Multi-layer Perceptrons (MLPs), and Long Short-Term Memory (LSTM) networks. These models are tailored to the specific conditions and needs of HarvRESt's Use Cases.

Key steps include defining necessary input data (e.g., weather patterns, solar irradiance, wind speed), designing training methodologies, and validating models using both historical and experimental data collected from the project's demonstration sites.

The resulting deliverable – *Forecasting Scenarios and Algorithms* – will include a Generation Analytics Catalogue, which outlines the business relevance, technical configuration, and evaluation criteria of each model. This catalogue will also contain:

- A review of the current state-of-the-art in forecasting research
- Practical guidance on input data types, preprocessing, and feature extraction
- Details on model selection rationale and forecast accuracy metrics
- Limitations and assumptions to ensure transparent application

The Generation Analytics Catalogue is designed as a living resource, which will grow with ongoing data collection and modelling work throughout HarvRESt. It aims to provide meaningful insights for both near-term farm planning and long-term energy strategy development, fostering smarter and more sustainable agricultural energy use.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Generation Analytics Catalogue (forthcoming)

URL: https://eu-cap-network.ec.europa.eu/projects/harnessing-vast-potential-res-sustainable-farming_en#practice-abstract--172964