



15th- 16th
October 2024
Nairobi, Kenya

**Enabling
rural
economies:**



**Creating lasting
impact for the
digital ecosystem
in Africa.**

#ALE2024
#AgriFinALE2024



Utilization of Machine learning to Enhance the Early Warning Systems over the Greater Horn of Africa

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Role of Machine Learning in Early Warning Systems

Improved Prediction Accuracy: ML and AI algorithms can analyse vast amounts of data from various sources, including satellite imagery, weather stations, and climate models.

Tailored Forecasts: ML/AI can provide personalized forecasts tailored to specific locations or sectors. For example, agricultural stakeholders can receive forecasts optimized for their crops' growth stages, helping them make informed decisions about planting, irrigation, and harvesting.

Integration of Non-Traditional Data Sources: ML/AI techniques enable the integration of non-traditional data sources, such as social media feeds, crowd-sourced observations, and sensor networks.

Real-time Decision Support: Provides rapid, data-driven insights to guide early actions.

Strengthening Early Warning Systems for Anticipatory Actions

Objective:

Assess the skilfulness and sustainability of developing a cloud-based machine learning post processing technique for improved high-impact weather forecasts

Outcome 1: National stakeholders benefit from improved historical weather observational datasets and capacity to collect non-traditional weather observations

Outcome 2: National and regional stakeholders benefit from improved capacity to generate high resolution calibrated probabilistic weather forecasts

Duration:

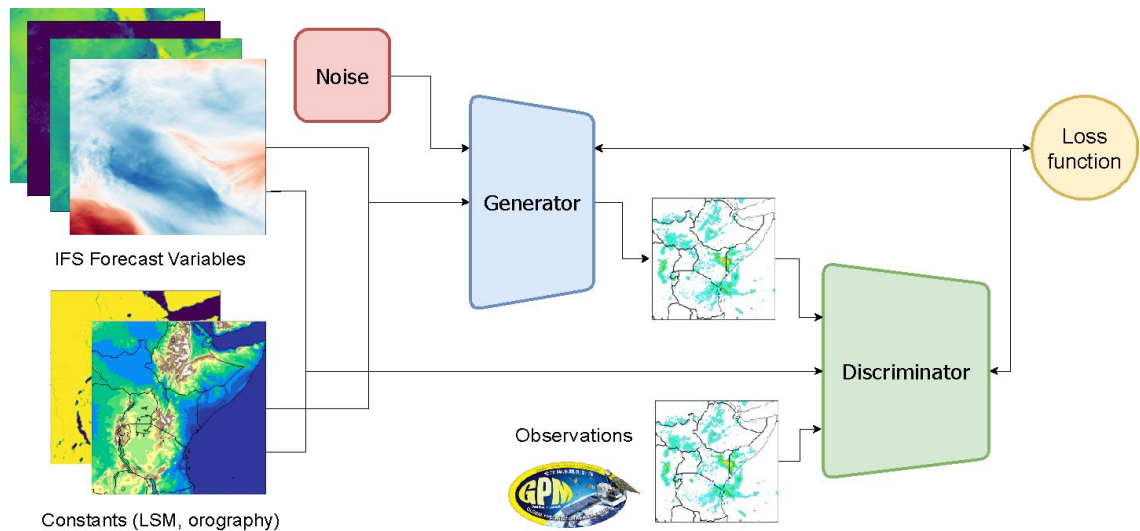
1st May 2023-31st December 2026

Partners



Modelling Approach

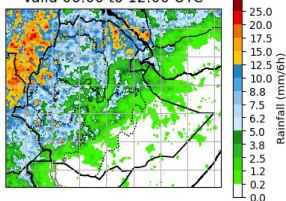
- Conditional Generative Adversarial Network (cGAN)
- Conditioned on IFS:
 - 14 forecast variables
 - Land-sea mask
 - Orography
- 6 Hourly
- 0.1 x 0.1 degrees resolution
- Observational: IMERG
- Probabilistic predictions.
- Training / validation data range: -2018-2020



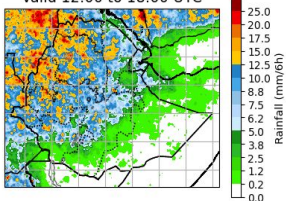
Example Products

Jurre Brishti cGAN ensemble: Valid 2024-08-13 to 2024-08-14
95% chance that rainfall is below this value.

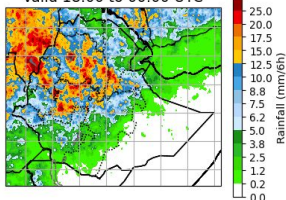
Valid 06:00 to 12:00 UTC



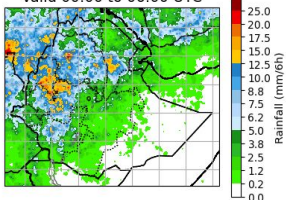
Valid 12:00 to 18:00 UTC



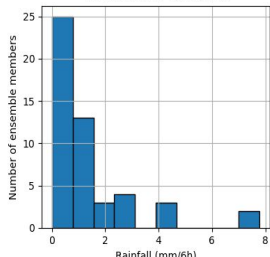
Valid 18:00 to 00:00 UTC



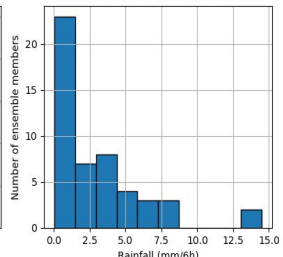
Valid 00:00 to 06:00 UTC



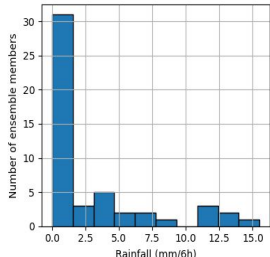
Valid 06:00 to 12:00 UTC



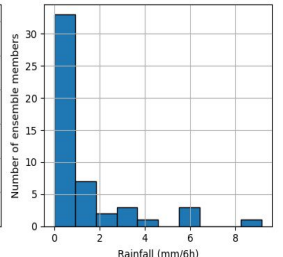
Valid 12:00 to 18:00 UTC



Valid 18:00 to 00:00 UTC

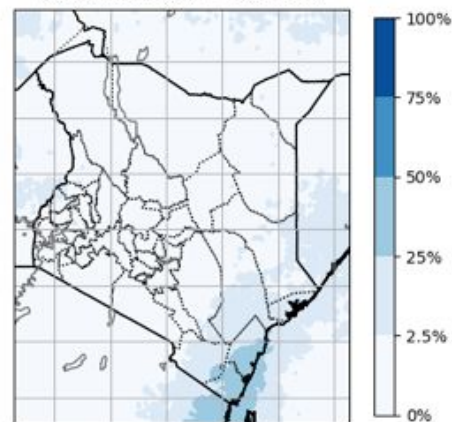


Valid 00:00 to 06:00 UTC



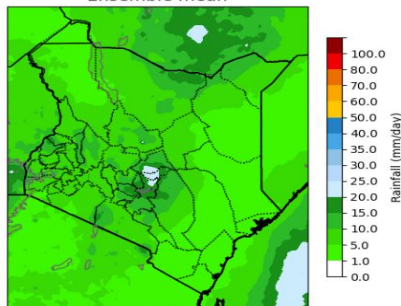
Jurre Brishti cGAN ensemble: 2024-10-12 - 2024-10-12 UTC
Chance of rainfall above 5.0 mm/6h.

Valid 06:00:00 - 12:00:00

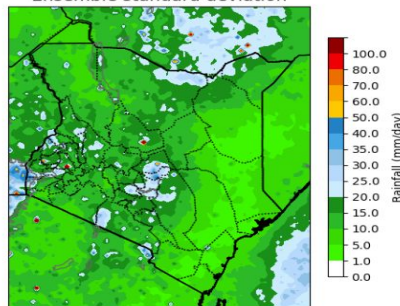


Jurre Brishti cGAN forecast: Valid 2024-04-27 06:00:00+00:00 - 2024-04-28 06:00:00+00:00 UTC

Ensemble mean



Ensemble standard deviation



Benefits/ Limitation of the Method

- Generates more ensemble members (probabilistic forecasts) at low computational cost, thus gives a better presentation of forecast uncertainty
- Able to generate many forecasts in a day as it is low cost
- Improves the IFS forecast
- **Unable to capture rainfall distribution well especially the extreme events**

WAY FORWARD

Improving the model to get the distribution of extreme events right by for example using the quantile mapping approach



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Thank you
for your
attention.

