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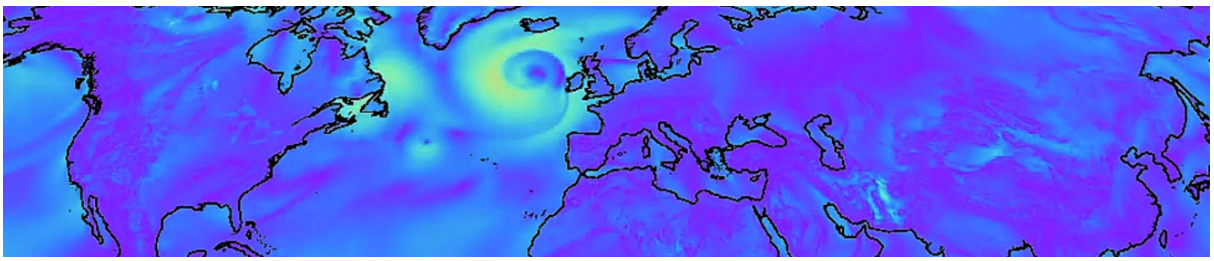
Artificial Intelligence Weather Forecasts for Agriculture

Supervisor: Maximilian Zachow (max.zachow@tum.de)
Period: 10/2025 - 03/2026
Lecture (in parallel): Crop Yield Models and Weather Forecasts (LS10056)



Context

Extreme weather events, such as heatwaves or heavy rainfall, are becoming more frequent due to climate change. These events can severely impact agricultural yields, especially during key stages of crop development. Hence, early warning systems are critical to mitigate risks and support food security. Recent breakthroughs in artificial intelligence have given rise to a new generation of globally available AI weather forecasts for 10-14 days. Unlike traditional models, these AI-based forecasts (e.g., NVIDIA FourCastNet, Google GraphCast, Huawei Pangu-Weather) offer faster inference and a higher spatial and temporal resolution. However, these AI models are still new and underexplored for agricultural early warning.

Objective

This IDP will prototype early warning pipelines that leverage AI weather forecasts to detect upcoming agricultural risks across Europe. You will design alerting systems for scenarios such as late-spring frost in vineyards, summer heatwaves in wheat regions, or excess rainfall during maize harvests.

Work packages

- Data preparation (e.g., crop land mask, weather forecasts, weather observations)
- Benchmark AI weather models with traditional weather models and observations
- Set up a pipeline for automatic alerts and integrate it into a frontend/webapp

This is an applied research project designed for students who want to work at the frontier of AI, climate, and agriculture. Previous IDP students supervised by our chair have successfully presented their work at international conferences and co-authored peer-reviewed publications. While this is not mandatory, strong student contributions will be supported and rewarded accordingly.

If you are interested in this project, please send a short email with your CV, previous projects, etc., to supervisor Maximilian Zachow (max.zachow@tum.de).