



ML-based Flood Forecasting for Small Catchments in Germany: The KI-HOPE-DE project

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Heavy rainfall and flooding in small river catchments represent one of the most serious natural hazards in Central Europe, with substantial impacts on human life and infrastructure. Small river catchments react quickly to extreme rainfall, which shortens warning times and increases forecast uncertainties. Current hydrological forecast models are not capable of adequately representing the complexity of the rainfall and runoff processes involved.

The KI-HOPE-DE project (<https://ki-hope.de/>) aims at closing this critical gap by applying modern machine learning (ML) methods to enable robust and Germany-wide consistent hydrological forecasting in small catchments. The focus is on catchment areas of approximately 5 to 500 km² and forecasts of up to 48 hours.

The KI-HOPE-DE project is funded by the Federal Ministry of Education and Research (BMBF). It started in December 2024 and brings together partners from both operational services (German Weather Service and the flood forecasting centers of the Federal states of Rheinland-Pfalz and Nordrhein-Westfalen) academia (Karlsruhe Institute of Technology and University of Marburg). The core objectives are the creation and publication of a comprehensive hydro-meteorological dataset for training ML-based forecasting models, the development of a prototype ML-based forecasting model for Germany, and its transfer to operational services.

In response to the way ML models are trained and rely on optimized data sets, KI-HOPE-DE lays the foundation for a new degree of collaboration in the development of flood forecasting systems between weather service and flood forecasting centers, between meteorologists and hydrologists.

In our poster, we will give a detailed overview of the objectives and planned activities in KI-HOPE-DE.