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Keynote: How ML is transforming our approach to seamless weather forecasting

Wednesday 19 March 2025 08:45 (30 minutes)

Seamless forecasting is an important paradigm in operational weather prediction, aimed at delivering consistent and actionable forecasts across temporal and spatial scales. Traditionally, achieving this vision relies on a combination of diverse strategies such as data assimilation, rapid update cycles, heuristic nowcasting techniques, blending schemes, and statistical postprocessing. While these approaches have often produced valuable results in practice, they also exposed fundamental limitations in achieving true seamlessness. Moreover, these solutions can be resource-intensive, both in computational cost and maintenance effort, placing a considerable burden on operational weather services.

The emergence of machine learning (ML) methods presents a powerful opportunity to overcome such limitations and break down traditional silos in weather prediction. Neural networks, with their capacity to model complex non-linear relationships and efficiently handle high-dimensional data, are particularly well-suited to serve as a unifying forecasting framework spanning nowcasting to extended range. Once trained, these models run orders of magnitude faster than traditional numerical models and integrate heterogeneous observational and model data, enhancing forecast accuracy while enabling seamless transitions across forecast time scales.

This talk will present and discuss the strategies driving seamless forecasting at MeteoSwiss, with a particular focus on innovations in ML-based frameworks and their role in achieving scalable, operationally sustainable, and truly seamless weather prediction.

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