Daily Streamflow Forecasting in the Mahanadi River Basin using a Novel Deep Learning-based Model

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Introduction

• Flood is one of the widespread natural disasters posing a threat to the life and property of millions of people worldwide (Lechowska 2018).
• In operational flood forecasting, rainfall-runoff simulation is a complex non-linear hydrological process that is influenced by various factors, such as the catchment’s geography, climate and underlying surface, and human activities (Feng et al. 2021).
• Few improvements to the classic LSTM modelling framework have been incorporated to date (Kao et al. 2020).

Study Area and Data used

- Geographical area = 141,589 km²
- Average annual rainfall = 1500 mm
- Tropical monsoon (June-September) region
- Input data to Smooth-LSTM: Time-lagged discharges at Mundali gauging site (immediately upstream of Naraj)

Methodology

- The LSTM network is able to learn better at smaller network and batch sizes.
- The Smooth-LSTM showed consistency in discharge prediction up to 5-days lead-time.
- The Smooth-LSTM has less sensitivity to redundant information and noise in the input dataset.
- The Smooth-LSTM is robust in daily streamflow forecasting characterized with the narrowest uncertainty bands.

References


Results

Conclusions

Comparison of observed vs forecasted streamflows at 1-5 days lead-time
Thus, Smooth-LSTM shows satisfactory performance in daily streamflow forecasting