A versatile data-visualization application for the Norwegian flood forecasting service

Florian Kobierska (1,2), Elin G. Langsholt (1), Byman H. Hamududu (1), and Kolbjørn Engeland (1)

(1) NVE, Norwegian water and energy directorate, Oslo, Norway, (2) Western Norway University of Applied Sciences, Institute of Natural Sciences, Sogndal, Norway

- General motivation

A graphical user interface has been developed to visualize multi-model hydrological forecasts at the flood forecasting service of the Norwegian water and energy directorate. It is based on the R 'shiny' package, with which interactive web applications can quickly be prototyped. The app queries multiple data sources, building a comprehensive infographics dashboard for the decision maker.

- Main features of the app

The visualization application comprises several tabs, each built with different functionality and focus. A map of forecast stations gives a rapid insight of the flood situation and serves, concurrently, as a map station selection (based on the 'leaflet' package). The map selection is linked to multi-panel forecast plots which can present input, state or runoff parameters. Another tab focuses on past model performance and calibration runs.

- Software design choices

The application was programmed with a focus on flexibility regarding data-sources. The parsing of text-based model results was explicitly separated from the app (in the separate R package 'NVEDATA'), so that it only loads standardized RData binary files. We focused on allowing re-usability in other contexts by structuring the app into specific 'shiny' modules. The code was bundled into an R package, which is available on GitHub.

- Documentation efforts

A documentation website is under development. For easier collaboration, we chose to host it on the 'GitHub Pages' branch of the repository and build it automatically with a continuous integration service. The aim is to gather all information about the flood forecasting methodology at NVE in one location. This encompasses details on each hydrological model used as well as the documentation of the data-visualization application.

- Outlook for further development

The ability to select a group of stations by filtering a table (i.e. past performance, past major flood events, catchment parameters) and exporting it to the forecast tab could be of interest for detailed model analysis. The design choices for this app were motivated by a need for extensibility and modularity and those qualities will be tested and improved as new datasets need integrating into this tool.