ANN modeling for flood prediction in the upstream Eure's catchment (France)

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Rainfall-Runoff relationship at basin scale is strongly depending on the catchment complexity including multi-scale interactions. In extreme events cases (i.e. floods and droughts) this relationship is even more complex and differs from average hydrological conditions making extreme runoff prediction very difficult to achieve. However, flood warning, flood prevention and flood mitigation rely on the possibility to predict both flood peak runoff and lag time. This point is crucial for decision making and flood warning to prevent populations and economical stakes to be damaged by extreme hydrological events.

Since 2003 in France, a dedicated state service is in charge of producing flood warning from national level (i.e. SCHAPI) to regional level (i.e. SPC). This flood warning service is combining national weather forecast agency (i.e. Meteo France) together with a fully automated realtime hydrological network (i.e. Rainfall-Runoff) in order to produce a flood warning national map online and provide a set of hydro-meteorological data to the SPC in charge of flood prediction from regional to local scale. The SPC is in fact the flood service delivering hydrological prediction at operational level for decision making about flood alert for municipalities and first help services.

Our research in collaboration with the SPC SACN (i.e. "Seine Aval et fleuves Côtiers Normands") is focused on the implementation of an Artificial Neural Network model (ANN) for flood prediction in deferent key points of the Eure's catchment and main subcatchment.

Our contribution will focus on the ANN model developed for Saint-Luperce gauging station in the upstream part of the Eure's catchment. Prediction of extreme runoff at Saint-Luperce station is of high importance for flood warning in the Eure's catchment because it gives a good indicator on the extreme status and the downstream propagation of a potential flood event. Despite a good runoff monitoring since 27 years Saint Luperce flood prediction remains a challenge for modeling tools used by the SPC SACN. Calibration phases (i.e. learning, test and validation) of Saint Luperce ANN model will be presented and the efficiency assessment will be discussed by mean of RMSE and Cp indicators for different lag time predictions (i.e. +6h, +12h, +24h, +48h). Our conclusions will address the overall added value of using ANN modeling for flood prediction in the Eure's catchment regarding to the SPC SACN objectives.