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PONS2train: tool for testing the MLP architecture and local traning methods for runoff forecast

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The purpose of presented poster is to introduce the PONS2train developed for runoff prediction via multilayer perceptron – MLP. The software application enables the implementation of 12 different MLP's transfer functions, comparison of 9 local training algorithms and finally the evaluation the MLP performance via 17 selected model evaluation metrics. The PONS2train software is written in C++ programing language. Its implementation consists of 4 classes. The NEURAL_NET and NEURON classes implement the MLP, the CRITERIA class estimates model evaluation metrics and for model performance evaluation via testing and validation datasets. The DATA_PATTERN class prepares the validation, testing and calibration datasets. The software application uses the LAPACK, BLAS and ARMADILLO C++ linear algebra libraries. The PONS2train implements the first order local optimization algorithms: standard on-line and batch back-propagation with learning rate combined with momentum and its variants with the regularization term, Rprop and standard batch back-propagation with variable momentum and learning rate. The second order local training algorithms represents: the Levenberg–Marquardt algorithm with and without regularization and four variants of scaled conjugate gradients. The other important PONS2train features are: the multi-run, the weight saturation control, early stopping of trainings, and the MLP weights analysis. The weights initialization is done via two different methods: random sampling from uniform distribution on open interval or Nguyen Widrow method. The data patterns can be transformed via linear and nonlinear transformation. The runoff forecast case study focuses on PONS2train implementation and shows the different aspects of the MLP training, the MLP architecture estimation, the neural network weights analysis and model uncertainty estimation.