Enhanced flow rating using neural networks with water stage and EC as predictors

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The point of departure:
- What we usually get on a continuous basis, is stage
- The typical rating function is discharge vs. stage

The idea:
- EC can be recorded continuously at comparatively low cost
- So, why not use both?
Result (scaled), ANN (MLP) 2-5-1
The Q-EC relationship is hysteretic

- Both stage and EC are available (quasi-)continuously
- So is the time derivative of either
- ANN can be improved
- 2 more inputs: trends of stage, EC

4-5-1 MLP
RMSE (testing):

- 0.043 for 1-3-1 MLP ($W \Leftrightarrow Q$)
- 0.022 for 2-5-1 MLP ($W, EC \Leftrightarrow Q$)
- 0.014 for 4-5-1 MLP ($W, \Delta W, EC, \text{sgn}(\Delta EC) \Leftrightarrow Q$)
Conclusions:

- Use of stage and EC improves performance over stage alone.
- Inclusion of temporal trends in stage and EC permits concentrating, flushing, anti-diluting and diluting conditions to be reproduced and results in notable further improvement of Q computed.