WATER INFORMATICS SCIENCE & ENGINEERING
EPSRC CENTRE FOR DOCTORAL TRAINING

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Artificial Neural Networks for Urban Drainage Forecasting – Barriers to Adoption

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What information do operators need?

There is growing researcher interest in the use of data-driven methods, such as **Artificial Neural Networks, for forecasting influent** to Waste Water Treatment Plants in order to improve the efficiency of their operation. However, information about the range of influent forecasting methods used by WWTP operators is limited, and there doesn't seem to be a consensus amongst research papers as to **what input data is most practical**, and **what forecast information is most valuable**…

This calls for some **structured interviews** with WWTP operators to evaluate, prioritise, and expand these key forecast characteristics!

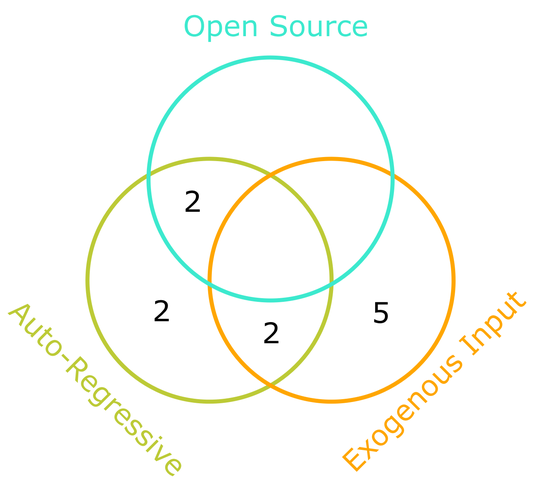
Hypothesis

✓ Accurate forecasts, Uncertainty quantification, High temporal resolution, Long lead-time, Adaptable to change…

✗ Inaccessible input data, Closed source software, Involved forecasting procedure, High maintenance demand…

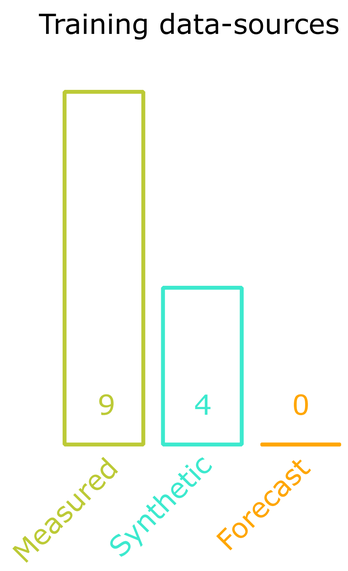
What information are we giving them?

We are currently conducting a **systematic review** of 60 existing research projects that produce influent flow forecasts using Artificial Neural Networks. Provisional (n=22) results:



Less than 10% of the relevant papers posted their source code for exploitation or inspection, reducing the likelihood of their successful implementation in practice.

Furthermore, less than 10% of the papers reviewed made use of both exogenous inputs such as rain-gauge data on top of auto-regressive exploitation of historic flow data from the system; and none defended this decision.



Finally, none of the evaluated papers trained their networks on forecasted data, meaning that to include these methods in a functional forecasting system would require the implementation of high specificity and accuracy rain-gauge forecasts before forecasts of flow in the network could be made.

Key research areas:

Overcoming these barriers demands an operator-centric approach, which will direct our research to help answer questions such as:

1. How do we measure our model's **accuracy**, and how does this shape them?
2. What is the best way to **illustrate uncertainty** in forecasts?
3. Do practical models need to be **trained on forecast data**? What are the impacts of this, and can we mitigate against them?
4. How can **emerging architectures** allow us to overcome the limitations of existing implementations?

Comments

What are your **priorities** for influent forecasting?
What do you **currently use**?
What **lead times** are important to you?
Anything else…?

Contact

Please take a card and get in touch!

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