Machine Learning inflow forecast for real- time control of WWTP (Copenhagen)

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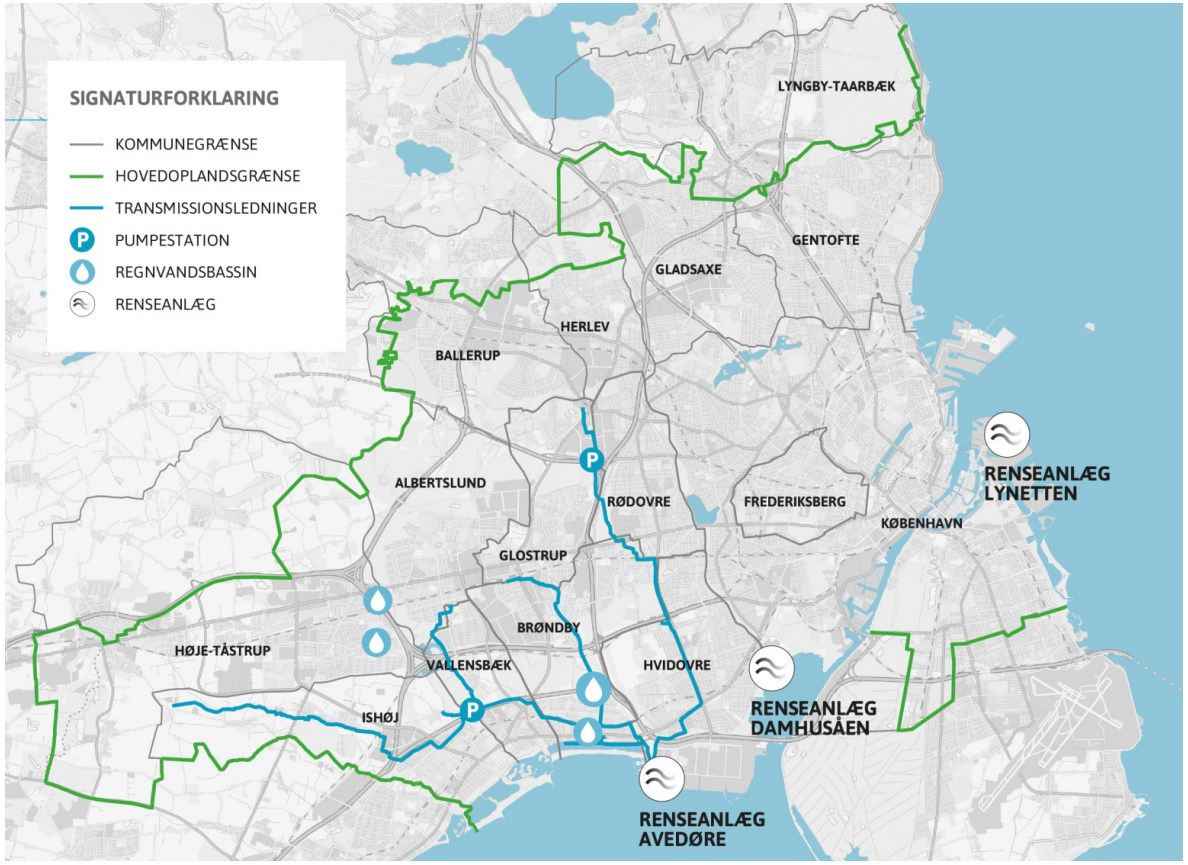
Setting the scene



Background:

- BIOFOS operates three WWTP, servicing 15 municipalities and 1,2 mio. people.
- Two of the three catchments have mainly a combined sewer system, generating considerable rain runoff and inflow to the WWTP.
- BIOFOS operates only the WWTP in these two catchments and does not control pumps or retention bassins.
- BIOFOS WWTP operate in two modes: dry whether mode and a wet weather mode of operation, depending on the size of inflow to the plants.

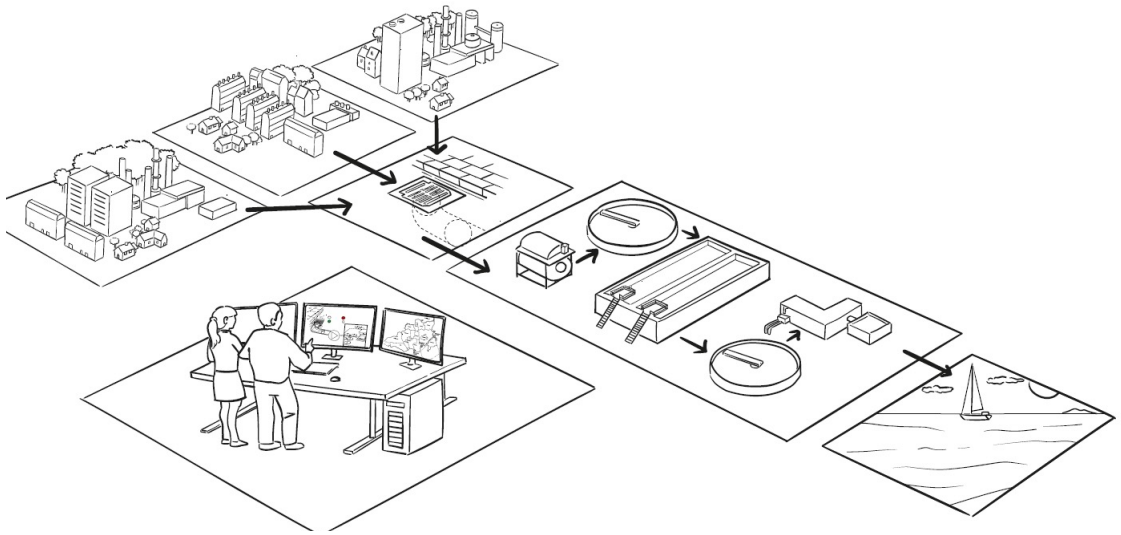
Problem:

- With more rain events, it is crucial to ensure that capacity available in urban drainage systems is leveraged optimally.
- BIOFOS currently uses a simple forecast model and control points in the catchment to change from dry to wet weather operation. –> we observe wrong starts.

Why machine learning for real- time control of WWTP?

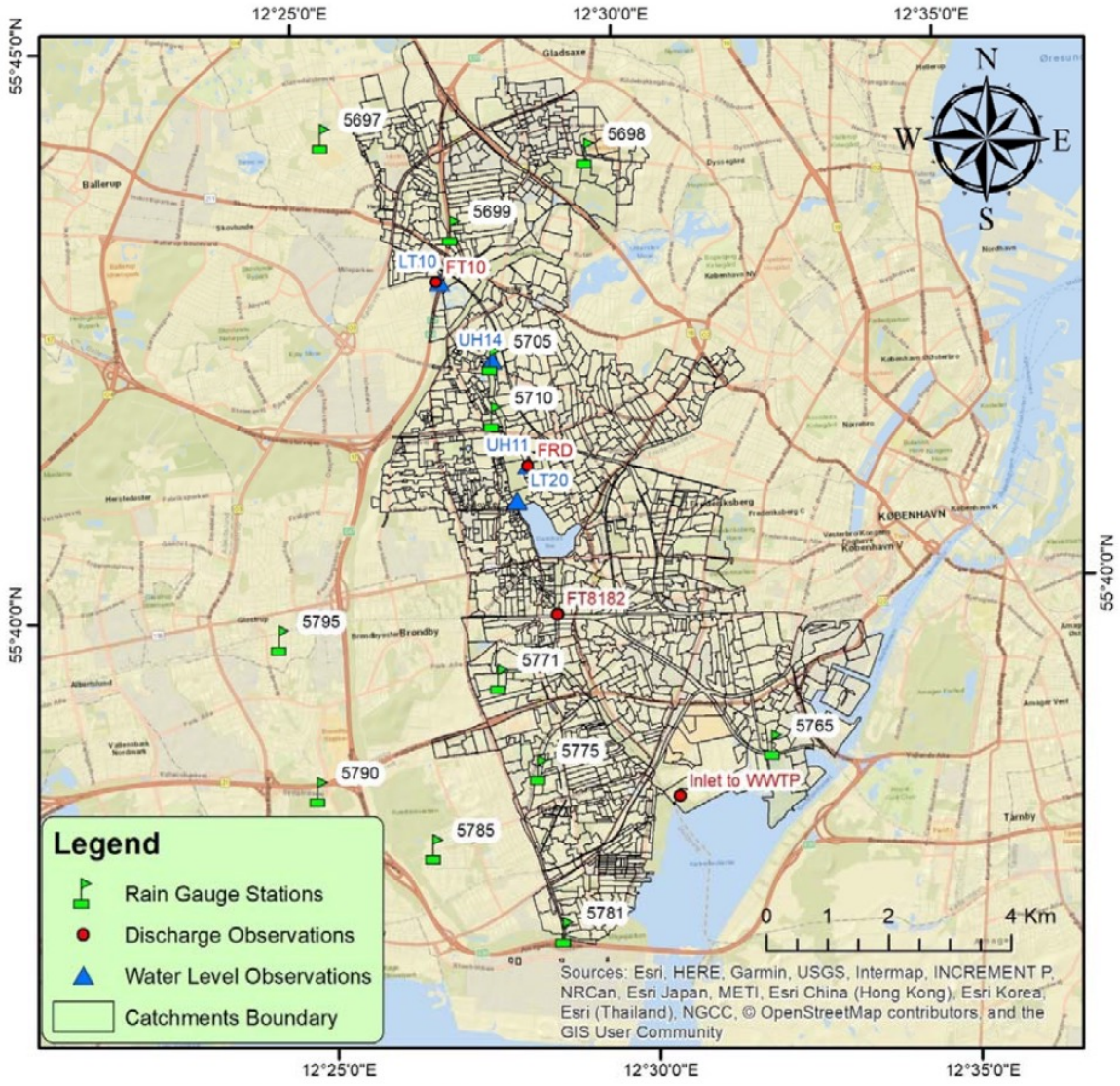
Motivation and expected benefits:

- We expect ML to be a valuable tool to generate fast and reliable forecast, facilitating optimal operation of wastewater treatment plants (WWTPs) and better utilization of detention basin storage during rain events.
- Improve decision making at the plant regarding dry or wet weather operation.
- Increase flexibility in operations, both at the WWTP and the catchment.
- Minimize bypass (only mechanically cleaned water) at the WWTP.
- Investment in new infrastructure can be reduced, saving environmental and monetary costs.
- Leverage on the existing online- data.

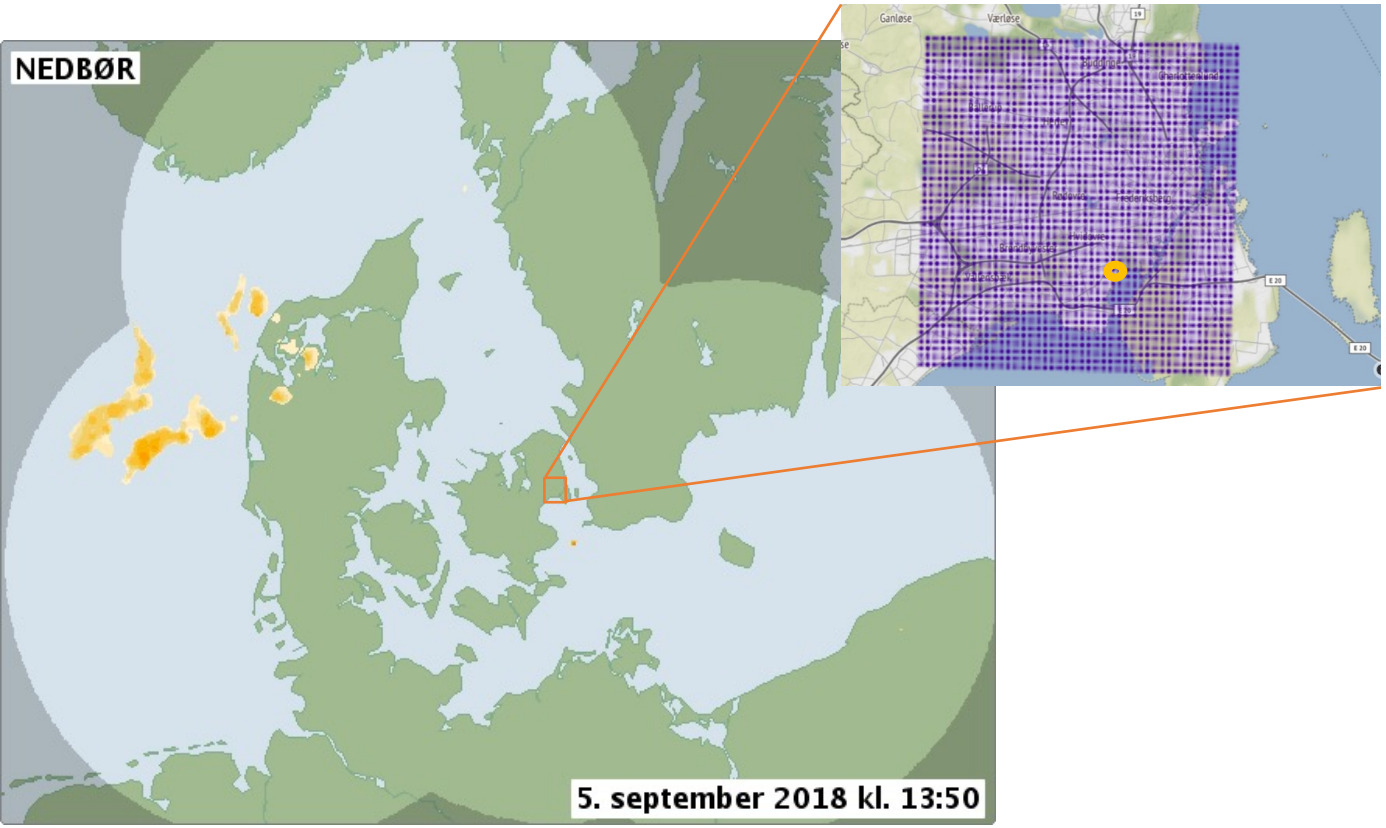


Case study

Time series data from rain gauges, level, flow, and volume sensors

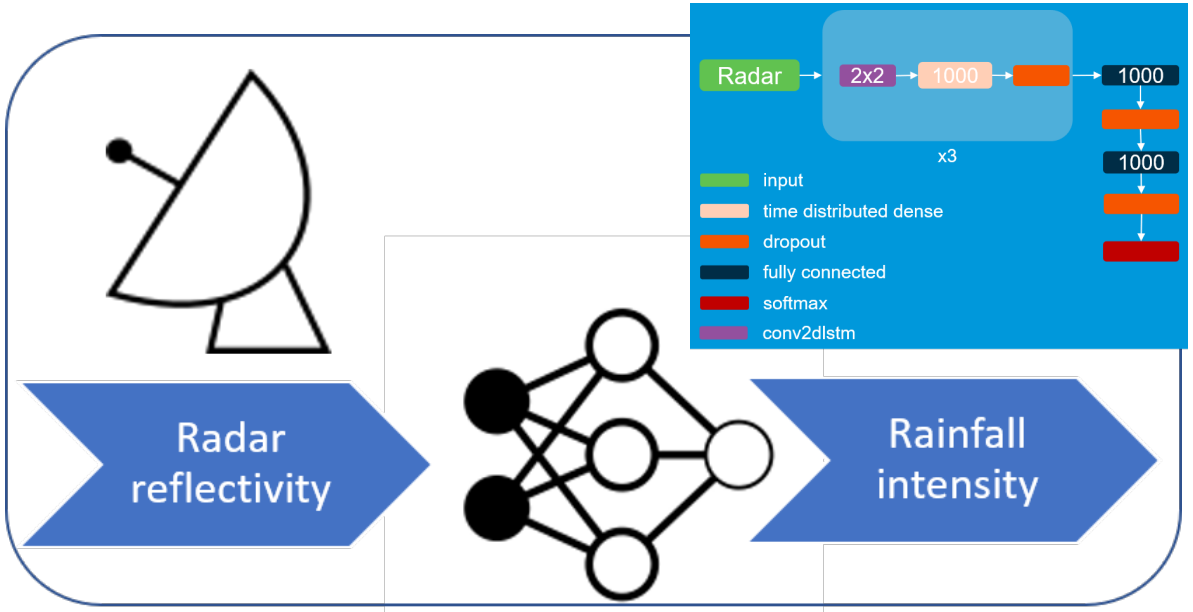


Weather radar data



Methods

Radar to rain model



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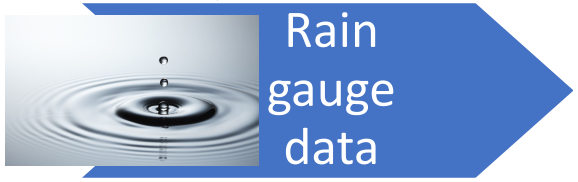
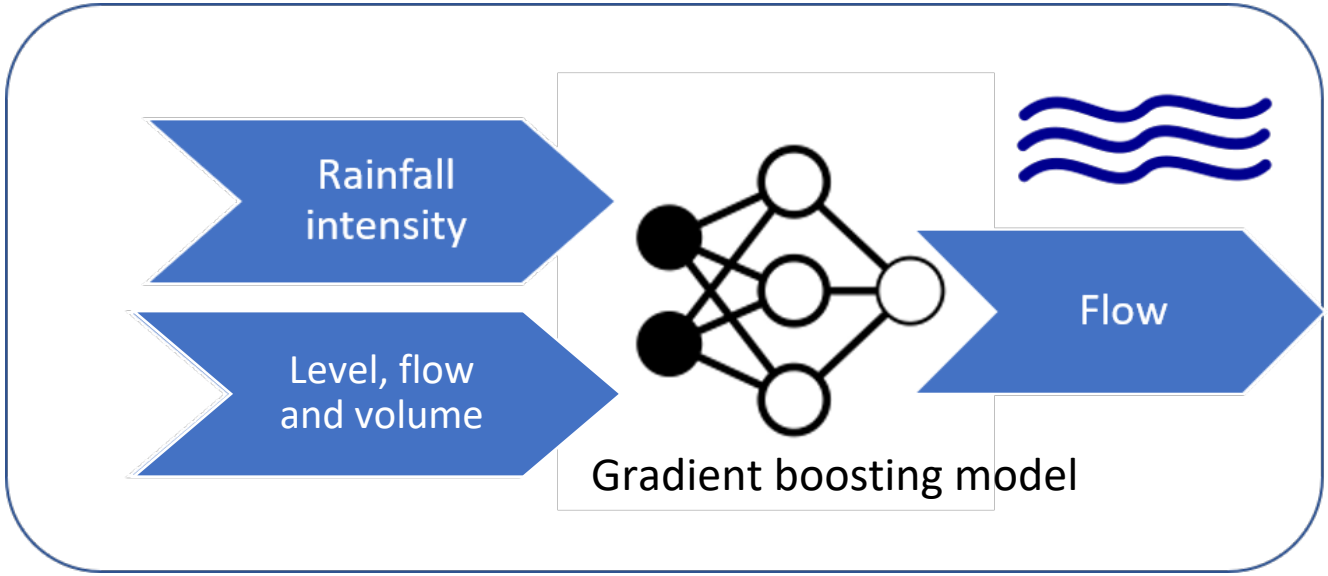
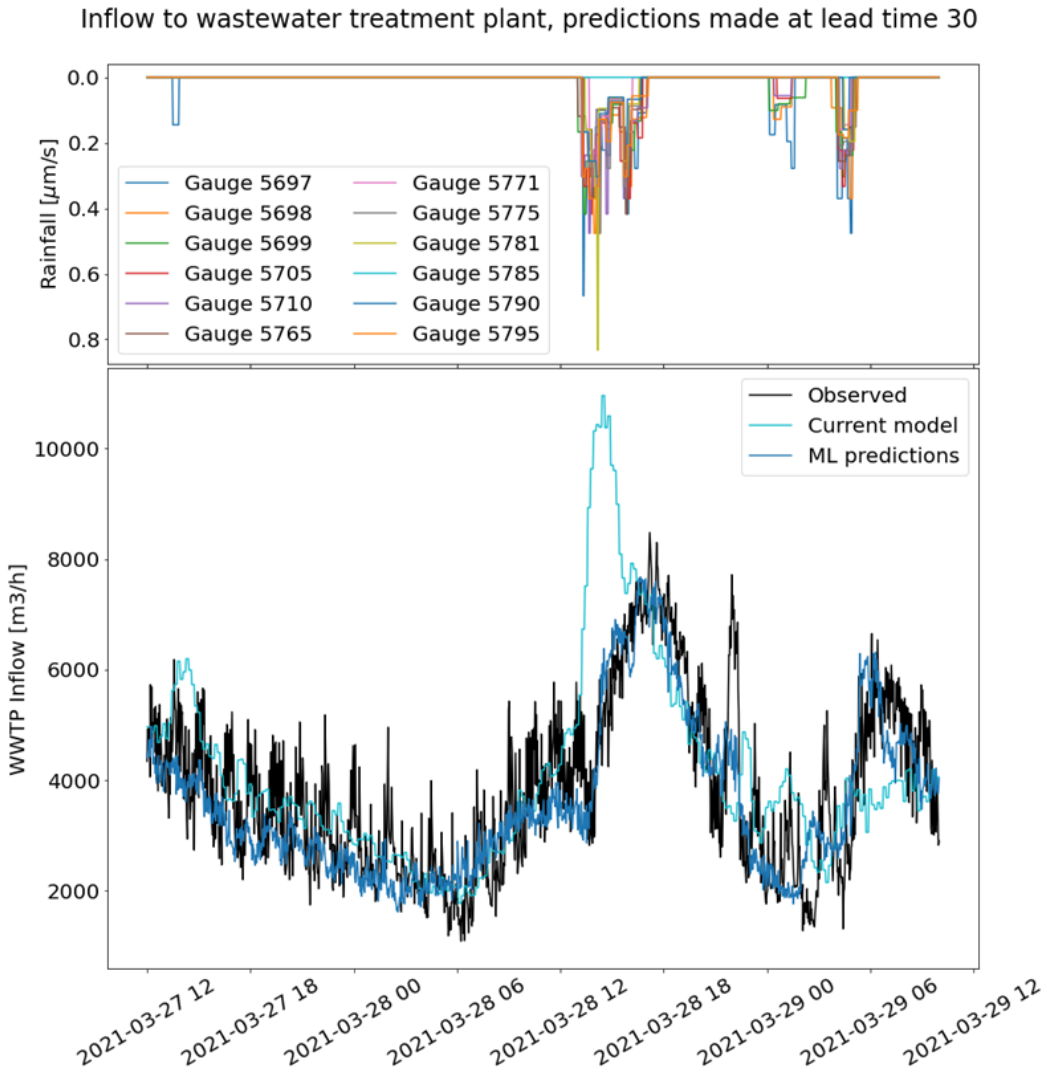
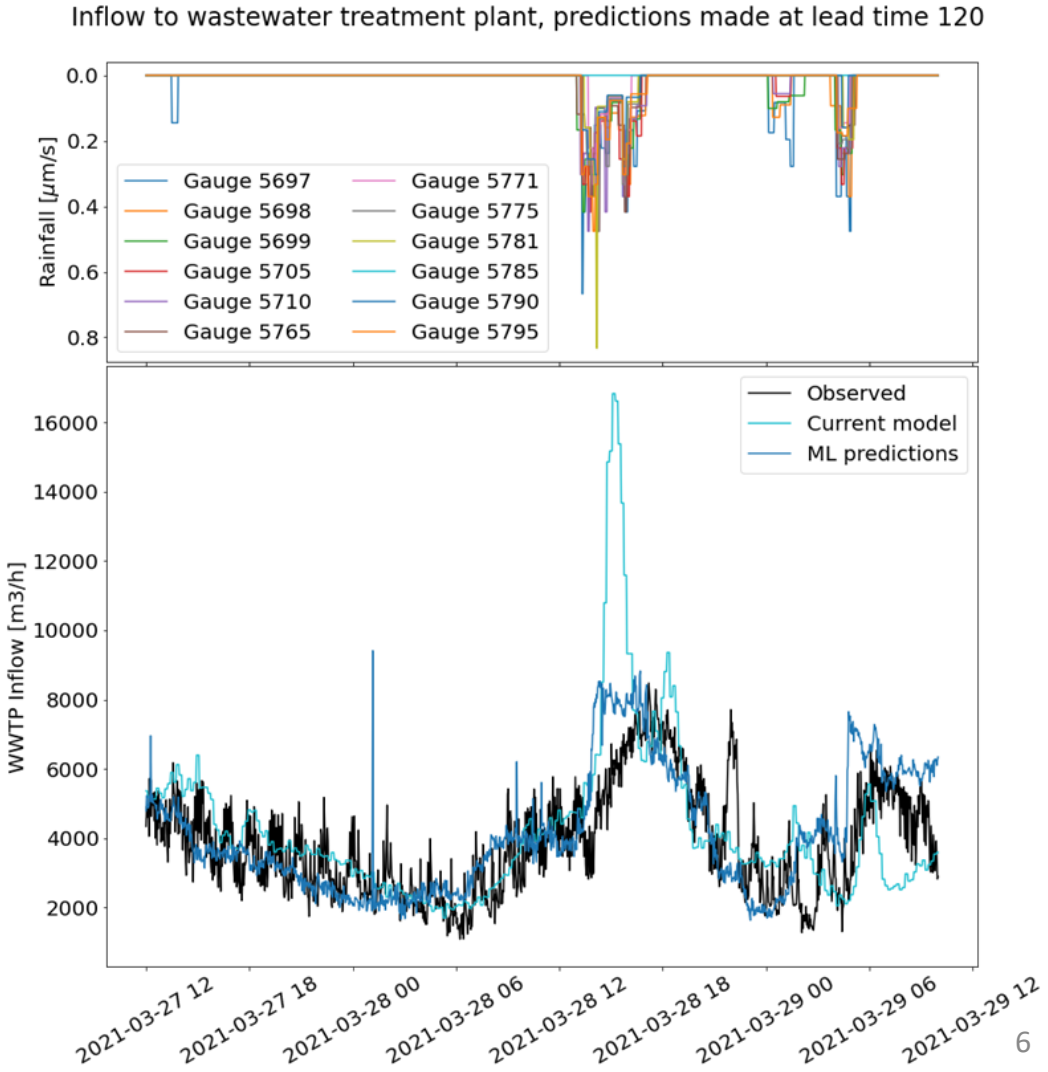


Rain to flow prediction



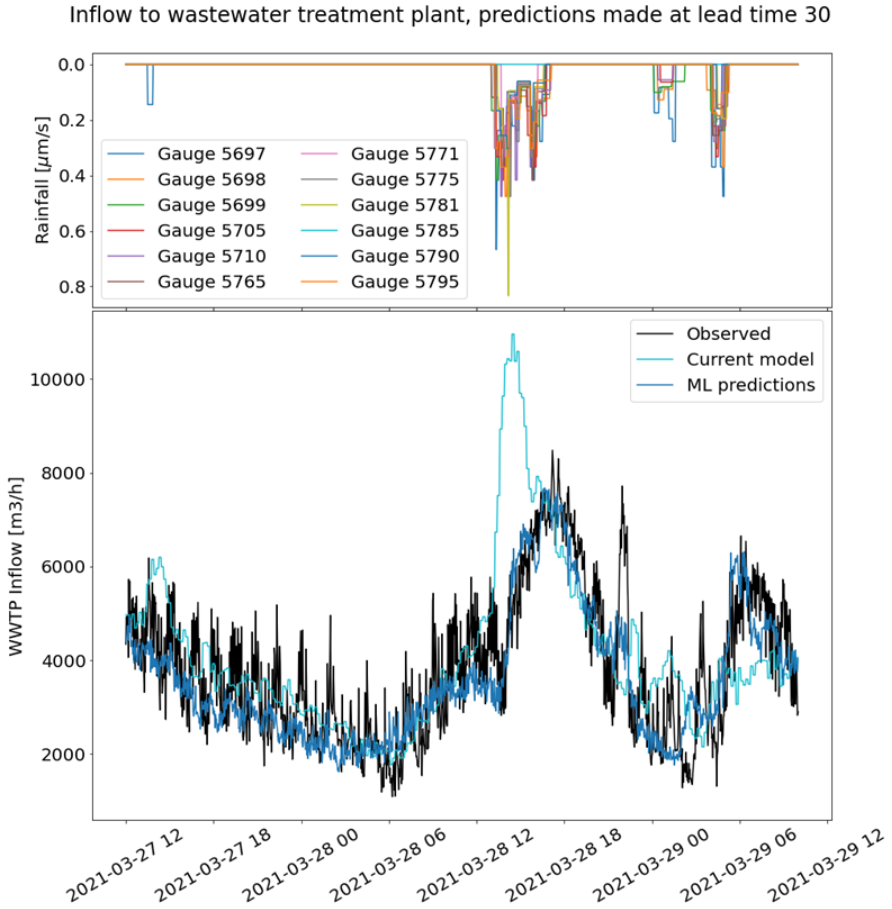
Flow predictions from rain gauge-based model





Value creation for BIOFOS

- Proof of concept- is ML a reliable tool for real- time control?
- If it is- integrate the ML tools as a decision support system within BIOFOS' control system.
- Leveraging on existing data.
- Improve integrated control between the WWTP and the catchment, achieving better operation and environmental benefits.



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