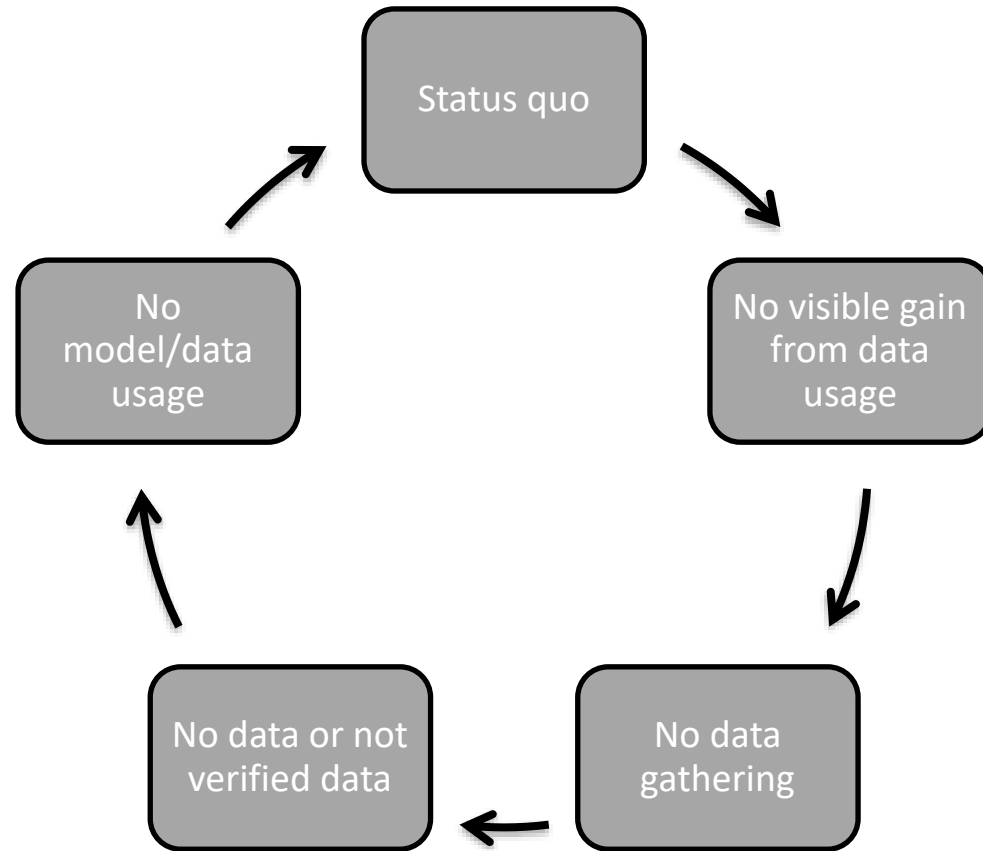


# Management of measurement data in sewers

Franz  
Tscheikner-Gratl

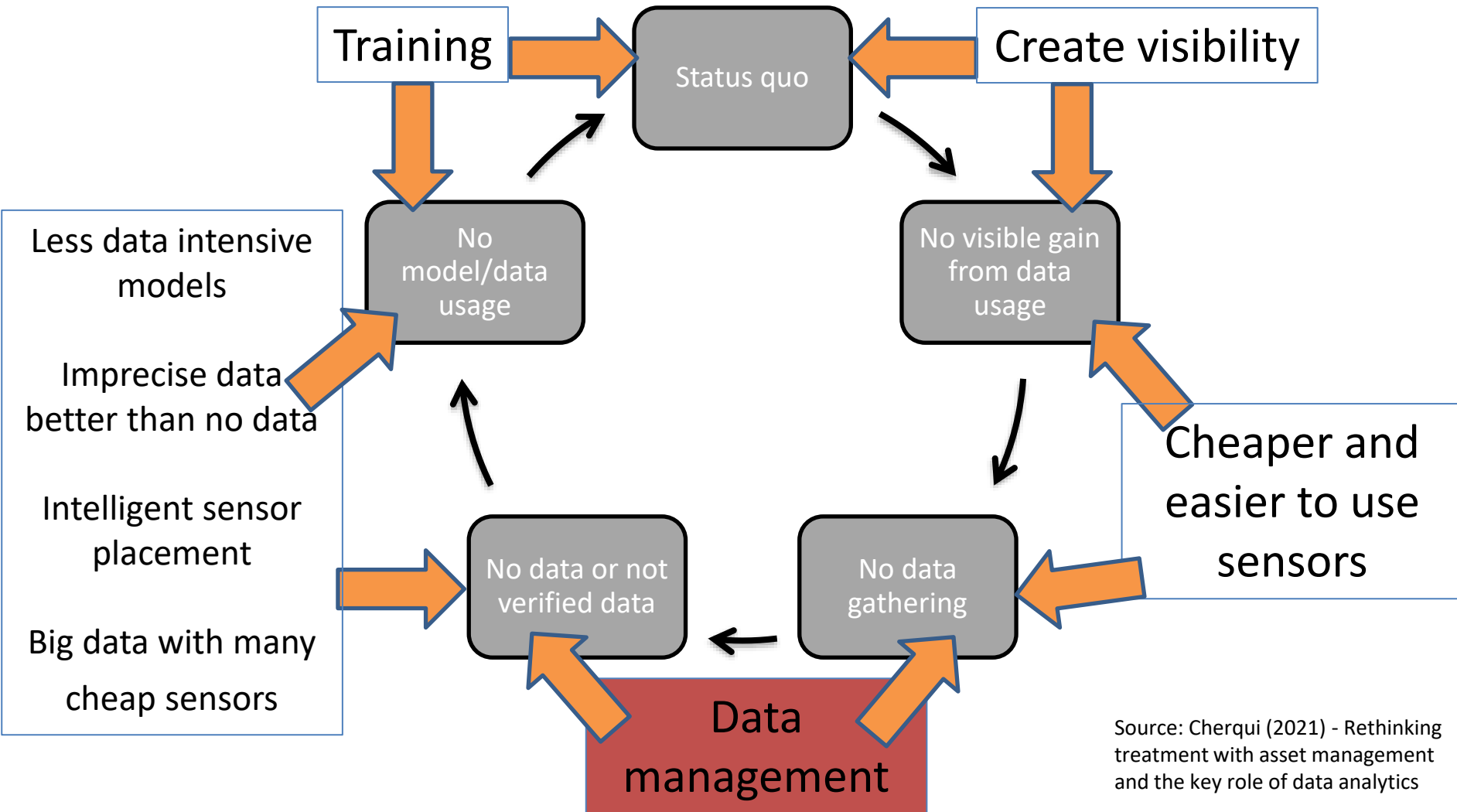


# The “data loop” problem



Source: Cherqui (2021) - Rethinking treatment with asset management and the key role of data analytics

# Overcoming the “data loop” problem



Source: Cherqui (2021) - Rethinking treatment with asset management and the key role of data analytics

# Data quality assessment

Key messages from a current book\*:

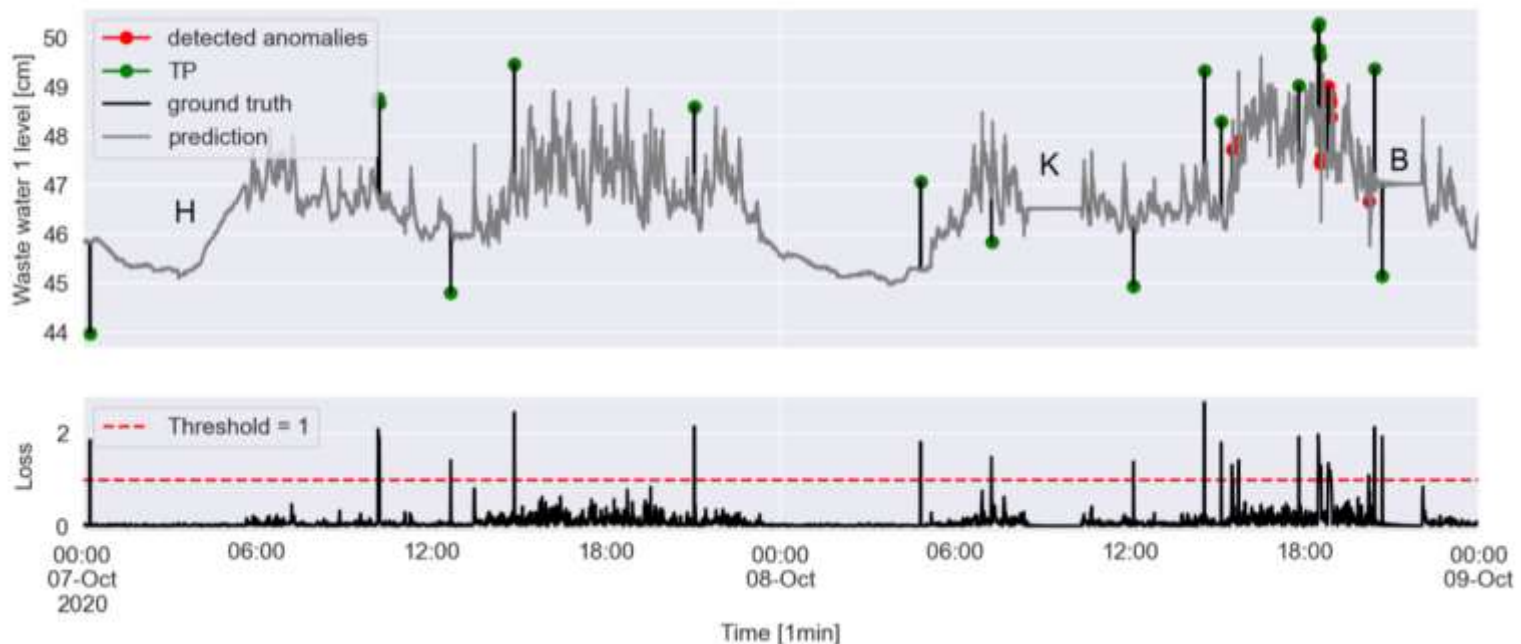
- Data validation is mandatory – never use the data without a careful check.
- Data validation based on the separation of concerns: two steps – (i) pre-validation (unified basic checks), (ii) goal-driven validation.
- Purpose dependency: the results of the data validation depends on the anticipated use of the data.
- Subjectivity and reproducibility: despite there being numerous methods and protocols, data validation remains a subjective process. Keep track of tasks performed.

\*Source: Francois H. L. R. Clemens-Meyer, Mathieu Lepot, Frank Blumensaat, Dominik Leutnant, Guenter Gruber, 2021. "Data validation and data quality assessment", Metrology in Urban Drainage and Stormwater Management: Plug and Pray, Jean-Luc Bertrand-Krajewski, Francois Clemens-Meyer, Mathieu Lepot

# Data driven Anomaly detection

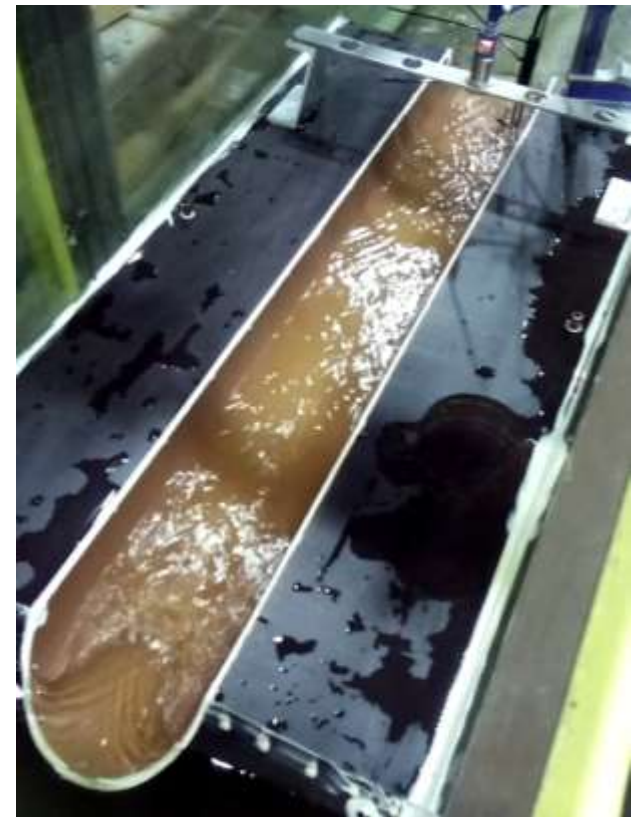
- Lots of possibilities
- Black box methods?
- Need for research
- Example – LSTM:

Source: Peitan (2021) - Time series forecasting for Anomaly Detection based on Recurrent Neural Networks. Bachelor Thesis – NTNU/TU Berlin



# Data quality assessment

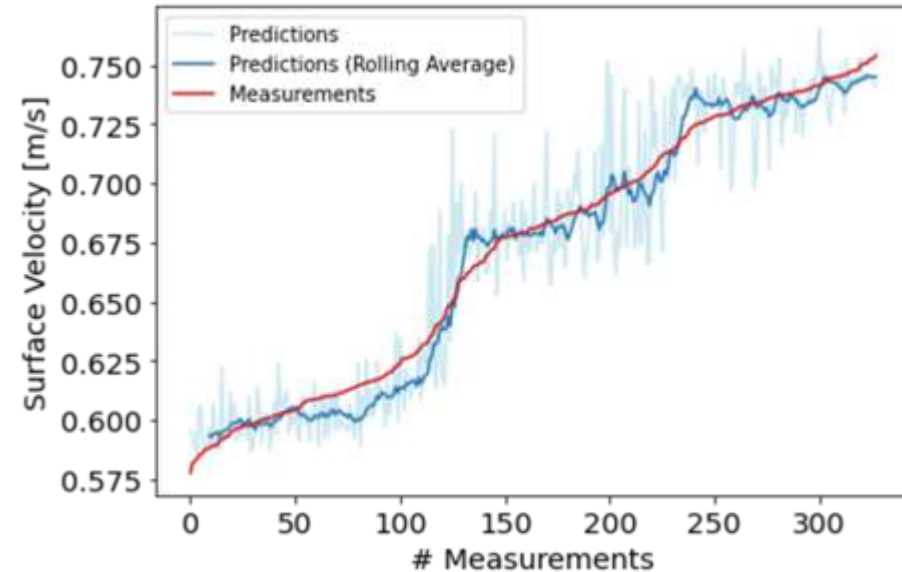
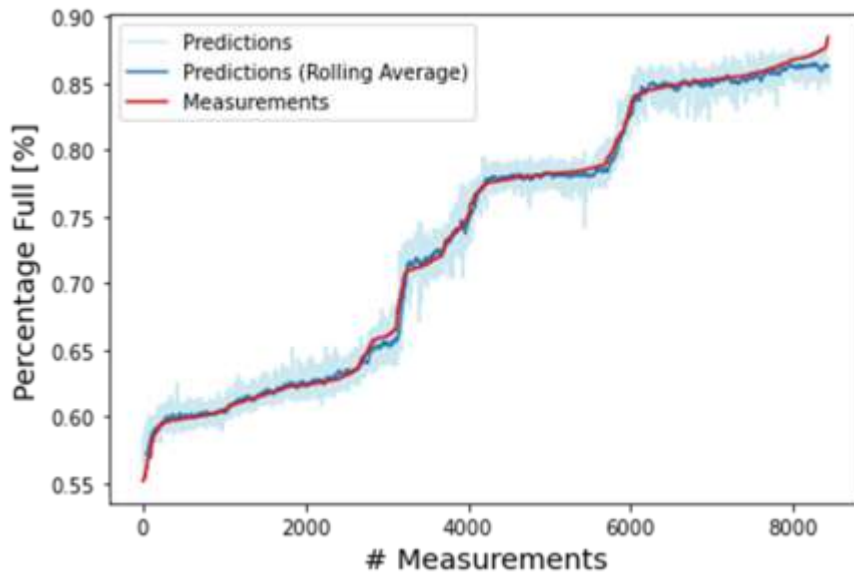
- Using cheap sensors e.g. cameras for quality assessment (Redundancy)
- Plastic Box (18x13x6cm)
  - Raspberry Pi + camera
  - Hard drive
  - Costs <100 Euro
- Power supply needed
- Machine learning algorithm interprets camera footage to measure
  - Water level
  - Flow velocity
- Needs calibration



Source: Meier, Robert; Tscheikner-Gratl, Franz; Makropoulos, Christos (2021): Spending Less Than 100\$ on Real-Time Sewer Flow Measurements. EGU General Assembly.

# Data quality assessment

- After calibration



Source: Meier, Robert; Tschekner-Gratl, Franz; Makropoulos, Christos (2021): Spending Less Than 100\$ on Real-Time Sewer Flow Measurements. EGU General Assembly.

# Data accessibility and visibility

If data should be used it has to be easily accessible, downloadable and usable.

- Example Risvollan measurement Station - Trondheim
  - Easy access to measurements by website
  - Customize which sensors are of interest
  - Automatic access to measurements possible by using the Risvollan webservice





# Data accessibility and visibility

If data should be used it has to be easily accessible, downloadable and usable.

- B-WaterSmart Dashboard Bodø

Source: Nordkontakt (2021): B-WaterSmart Bodøs Miljødashboard.

# Final remarks

- Lots of tailor-made solutions for data management in urban drainage exist → question of applicability and generalizability
- Possibilities and limitations of AI for surrogate modelling, cheap sensing and data validation is not fully mapped yet
- The human component of data acquisition, management and usage