



# Application of machine learning algorithms for nitrogen prediction in urban catchment

## Introduction

- ▶ Dissolved organic nitrogen (DON) is often the dominant form of total nitrogen in coastal rivers and streams.
- ▶ To fully understand the nitrogen dynamics and environmental impact, DON should be taken into consideration.
- ▶ Data-driven models may be more suitable to nonlinear environmental prediction or when the outcomes are the main focus of modelling.

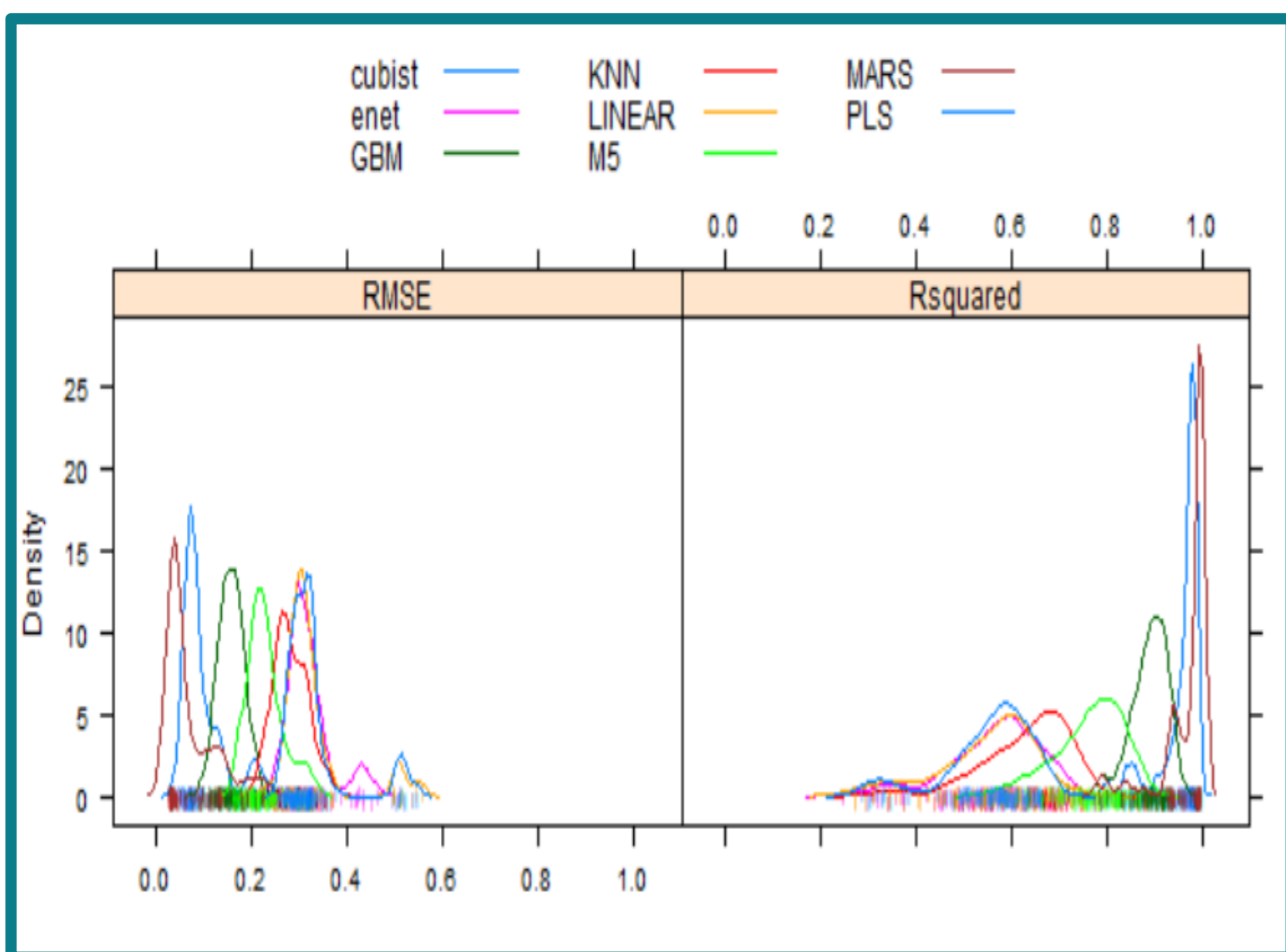


Fig 1: Comparison of RMSE and R squared of different models

## Select and utilise accurate data-driven models for DON prediction

- ▶ Machine learning (ML) algorithms have been used in water resource and catchment research
- ▶ Rapid expansion in the number and operation of various algorithms making it difficult to identify the best approach
- ▶ Despite their high prediction efficiency, different model strategies are suitable to varied datasets and modelling purposes

### Expected result

- ▶ Comparison of ML techniques for DON prediction in urban waters

## Develop hybrid models to simulate DON dynamics

- ▶ Boundary data are expensive, complex and time consuming to acquire
- ▶ The accuracy and speed of these data-driven models can be improved through combine with hydrological theory
- ▶ Hybrid models can exploit the advantages of any existing knowledge of the system and different modelling techniques

### Expected result

- ▶ A hybrid model for predicting DON dynamics in urban wetlands

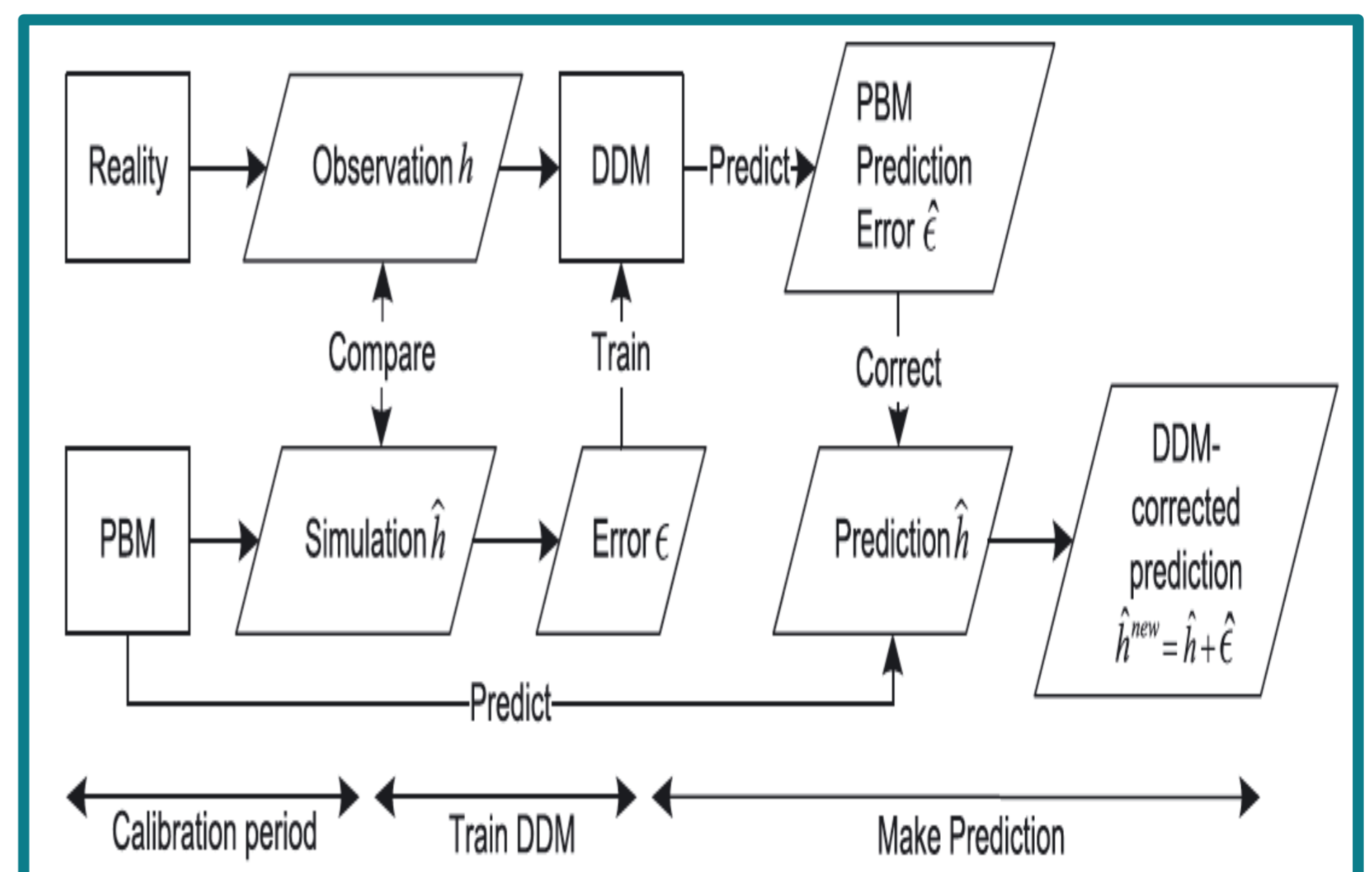


Fig 2: The framework of using complementary data-driven models (DDMs) to improve head prediction of a physically-based model (PBM) (Xu et al., 2014)

Reference: Xu, T., Valocchi, A.J., Choi, J., Amir, E., 2014. Use of Machine Learning Methods to Reduce Predictive Error of Groundwater Models. Groundwater 52, 448–460.