Ranjbar, A. and Cherubini, C., 2020, Development of a robust ensemble meta-model for prediction of salinity time series under uncertainty (case study: Talar aquifer), *Heliyon,* Volume 6, Issue 12, December 2020, Article number e05758.

Abstract The aim of this study is to develop an accurate and reliable numerical model of the coastal Talar aquifer threatened by seawater intrusion by developing an ensemble meta-model (MM). In comparison with previous methodologies, the developed model has the following superiority: (1) Its performance is enhanced by developing ensemble MMs using four different meta-modelling frameworks, i.e., artificial neural network, support vector regression, radial basis function, genetic programing and evolutionary polynomial regression; (2) The accuracy of different MMs based on 16 integration of four meta-modeling frameworks is compared; and (3) the effect of aquifer heterogeneity on the MM. The performance of the proposed MM was assessed using an illustrative case aquifer subject to seawater intrusion. The obtained results indicate that the ensemble MM that combines all four meta-modeling frameworks outperformed the GP and ANN models, with a correlation coefficient of 0.98. Moreover, the proposed MM using nonlinear-learning ensemble of SVR-EPR achieves a better and robust forecasting performance. Therefore, it can be considered as an accurate and robust simulator to predict salinity levels under different abstraction patterns in variable density flow. The result of uncertainty analyses reveals that robustness value and pumping rate are inversely proportional and scenarios with a robustness measure of about 12% are more reliable.

Keywords Environmental science, Earth sciences, Hydrology, Seawater intrusion, Variable density flow, Ensemble meta-model, Nonlinear-learning ensemble, Info-gap theory, Robust prediction.