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The original paper presented a novel, simple, practical, and accurate method to estimate the advection-dispersion of dissolved pollutants in rivers.

The main argument of the discussion is that the original paper's model suffers from overfitting of the training data with respect to the squared correlation coefficient (R^2). Therefore, the discusser proposes adding a regularization term to the model to increase its accuracy with respect to the testing data set. Overfitting is caused when a model memorizes relations between data instead of interpreting and understanding them. It is the understanding of relations among data that improves model performance as a result of improved model calibration (training). The analytical equation of pollution propagation in streams with constant decay coefficients and hydraulic conditions predicts the pollutants' concentration accurately in a river, provided that the assumed conditions are compatible with actual field conditions (Farhadian et al. 2015). In most instances, however, and the original paper is a case in point, the dispersion and decay coefficients and the hydraulic conditions along a river are variable. This requires a model for the advection and dispersion of dissolved pollutants in streams that allows variable coefficients and hydraulic conditions.

The advection-dispersion model proposed in the original paper has three parameters, which were optimally calibrated yielding an advection-dispersion model that was shown to have accurate predictive skill. Adding a regularization term to the proposed model to avoid overfitting and increase its accuracy, as suggested by the discusser, would render it unnecessarily more complex and would require determining the value of the regularization coefficient (λ), which is a nontrivial task (Bishop 2006). The estimation function of the discussion's example is a sinusoidal function whose trend is quite predictable. In addition, the discusser used 11 data for model training and four data for model testing. Hastie et al. (2009) suggest a typical split of 50% for training, and 25% each for validation and testing. The original paper applied data from two stations for training and data from four stations for testing, leading to an efficient evaluation of the proposed method. The discusser acknowledged that having two objective functions for model training and testing as done in the original paper might be a proper alternative to adding a regularization term. In the original paper, the two objectives were the R^2 and the RMS error. The original paper' case study illustrated the successful application of an advection-dispersion model in which the river was long and the flow rate, the size and shape of the river bed, and the river flow are variable.

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