



Improvement in predictive modeling by combining imperfect models

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A supermodel is an interconnected ensemble of existing imperfect models of a real, observable system. The connections between the models can be learned from observational data using methods from machine learning. It has been shown that the supermodel outperforms the individual models in simulating the behavior of the real system since it has learned to combine the strengths of the individual models. The concept of supermodeling is based on a new combination of insights from climate science, nonlinear dynamical systems, and machine learning. Here we present new efficient, robust and scalable learning strategies to optimize supermodels for dynamical systems of low complexity. In particular, we address the case where the parameters to be estimated (connection coefficients or any other parameters) appear only in equations for variables that are not observed.