# MMM SEMINAR SERIES

## *Training of supermodels - in the context of weather and climate forecasting.*

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Given a set of imperfect weather or climate models, predictions can be improved by combining the models dynamically into a so called 'supermodel'. In a supermodel, the models exchange information during the simulation. This is different from the standard multi-model ensemble approach (MME) where the model output is statistically combined after the simulations. Instead, the supermodel creates a trajectory closer to observations than any of the imperfect models.

In our simplified context of models living in the same phase space, we can either define a connected or a weighted supermodel. To obtain optimal connection coefficients or weights a training method is needed. My PhD thesis focused on developing new methods to efficiently train supermodels. The first method is based on an idea called Cross Pollination in Time, where models exchange states during the training. The second method updates the weights during training such that the supermodel synchronizes with the truth. The techniques are applied to different versions of the global coupled atmosphere-ocean-land model SPEEDO. The observations necessary for training come from the same model, but have been perturbed in order to make the training also suitable for real-world observations which are noisy and incomplete. Both training methods result in supermodels that outperform the individual models and the MME in short term as well as long term simulations. Furthermore, we find evidence that negative weights can improve predictions in cases where model errors do not cancel (for instance, all models are warm with respect to the truth). A key advantage of the proposed training schemes is that in the present context relatively short training periods suffice to find good solutions. Although the validity of the conclusions in the context of real observations and model scenarios has yet to be proved, the results are very encouraging. In principle, the methods are suitable to train supermodels constructed using state-of-the art weather and climate models.

## *Thursday, 21 October 2021, 3:30 pm*

***For Zoom information, please contact***
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***Seminar will also be live webcast***
***https://operations.ucar.edu/live-mmm***