Learning the statistics of an ensemble forecast using neural networks

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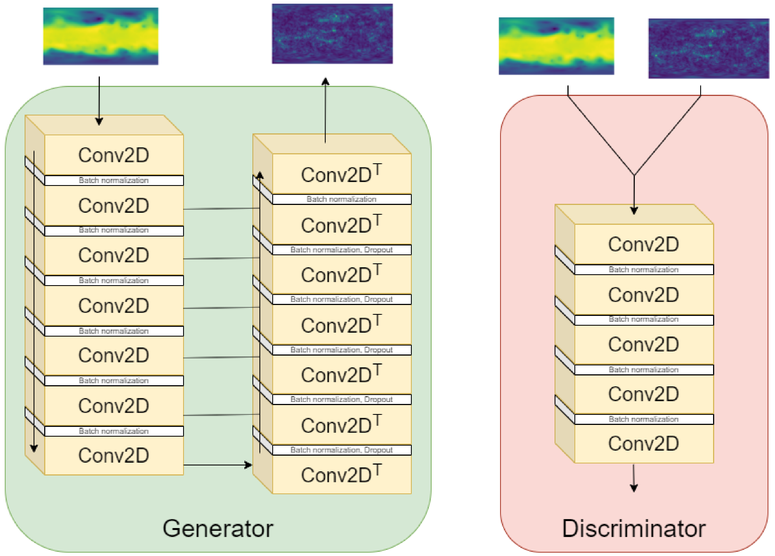
Motivation

Ensemble prediction systems are an invaluable tool for weather prediction. Practically, ensemble predictions are obtained by running several perturbed numerical simulations. However, these systems are associated with a high computational cost and often involve statistical post-processing steps to improve their qualities.

Here, we propose to use a deep-learning-based algorithm to learn the statistical properties of a given ensemble prediction system, such that this system will not be needed to simulate future ensemble forecasts. This way, the computational costs of the ensemble prediction system can be avoided while still obtaining the statistical properties from a single deterministic forecast.

Neural network overview



Input: ensemble mean geopotential at pressure level 500

Output: ensemble spread of geopotential at pressure level 500

Data obtained form the ERA5 dataset.

Results