Performance analysis on wavefront prediction based on artificial neural networks.

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Abstract

The use of Adaptive Optics in large ground-based telescopes is necessary to improve the quality of the received images. Being able to correct the atmospheric disturbances in real time will allow us to reduce the uncertainties in the observations. In this work, we continue the studies in the application of Artificial Neural Networks to the prediction of atmospheric turbulences. Through the use of past information obtained by a Shack-Hartmann wavefront sensor, it is possible to predict the next frame captured by such sensor so the deformable mirrors in telescopes can be prepared beforehand to receive and correct the wavefront of the light coming from celestial sources. Nevertheless, in order to be ready to apply this technique in real telescopes, wavefront correction must work in small time intervals. Using the SOAPY simulation tool, we aim to improve the inference time of ANNs from previous studies over realistic simulations, reducing the possible quality loss. To achieve that goal, we will study the effects of different changes in the structure of the ANN, along with the performance of different machine learning libraries to help us to get the prediction as fast as possible.

Keywords: Neural Networks, Long Short, Term Memory, predictions

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