Improved Fourier-plane wavefront sensors for neural network reconstruction

Esteban Vera*[1], Jorge Tapia[2], Hernandez Nicolas[2], Munoz Rodrigo[2], Gonzalez Benjamin[2], and Romero Bastian[2]

[1]Pontificia Universidad Católica de Valparaíso (PUCV) – avenida Brasil 2950, Valparaiso, Chile
[2]PUCV – Chile

Abstract

We are designing a new class of Fourier-plane wavefront sensors by combining optical and digital computing. By starting from a known wavefront sensor such as the 4-sided pyramid, we use an End-to-End model to joinyly design an optical layer that acts as a preconditioner and a state-of.the-art neural network that acts as the recosntructor. Through simulations, we demonstrate that our approach allow the design of Fourier-plane wavefront sensors that do not require modulation for a large range of turbulence conditions. In the search for the optimal wavefront sensor, we presenta a comparison of different starting points such as the 3 or 4 sided pyramid as well as the axicon, analyzing the combined effect of the initial phase mask with the optical preconditioner. We are working on the realtime implementation to pursue the experimental and on-sky demonstration using our recently acquired 50cm telescope.

Keywords: wavefront sensors, neural networks

*Speaker