

Diffraction neural network for wavefront shaping

Theme / Problem definition:

Diffraction neural networks (DNN) is an innovative approach at the intersection between deep learning and optics. In this emerging field, neural networks are designed to control complex wavefronts, manipulating the phase and amplitude of light. The layers of the neural network are composed of diffractive optical elements followed by free space propagation.

Tasks / Aim:

We are looking for a motivated and self-driven candidate who will work in the area of diffractive neural network for wavefront shaping. The aim of the project is to design multi plane light converters using DNN to achieve full control on propagation of light.

- Learn the fundamentals of machine learning in photonics.
- Train a DNN to predict desired output by obtaining optimum configuration of the phase elements.
- Knowledge in fundamental optics and familiarity with angular spectrum method.
- Knowledge in Python is desirable.

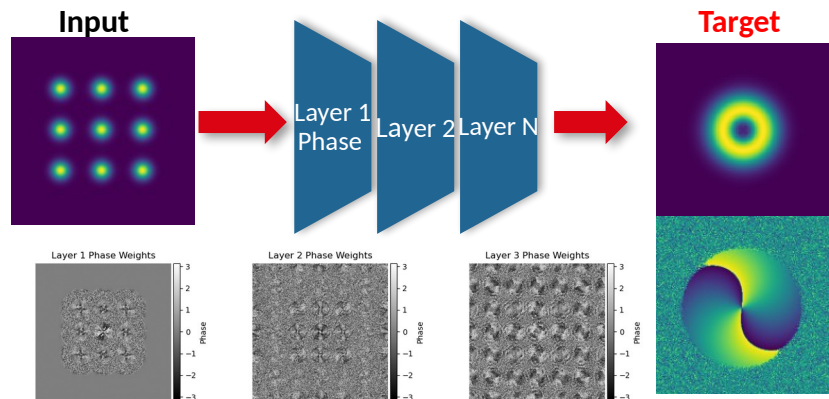
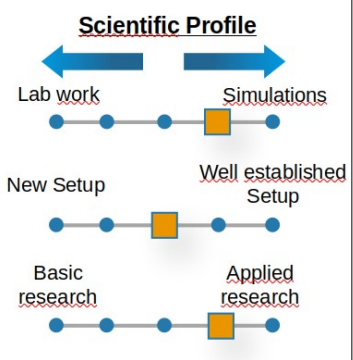


Illustration of a diffractive neural network and the associated phases of each layer.



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Literature:

- Lin, Xing, et al. "All-optical machine learning using diffractive deep neural networks." *Science* 361.6406 (2018): 1004-1008.
- Yan, Tao, et al. "Fourier-space diffractive deep neural network." *Physical review letters* 123.2 (2019): 023901.