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Interferometric orbital angular momentum mode detection in turbulence with deep learning

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Orbital angular momentum (OAM) modes are topical due to their versatility, and they have been used in several applications including free-space optical communication systems. The classification of OAM modes is a common requirement, and there are several methods available for this. One such method makes use of deep learning, specifically convolutional neural networks, which distinguishes between modes using their intensities. However, OAM mode intensities are very similar if they have the same radius or if they have opposite topological charges, and as such, intensity-only approaches cannot be used exclusively for individual modes. Since the phase of each OAM mode is unique, deep learning can be used in conjugation with interferometry to distinguish between different modes. We demonstrate a very high classification accuracy of a range of OAM modes in turbulence using a shear interferometer, which crucially removes the requirement of a reference beam. For comparison, we show only marginally higher accuracy with a more conventional Mach–Zehnder interferometer, making the technique a promising candidate towards real-time, low-cost modal decomposition in turbulence.

Apply to be considered for a student ; award (Yes / No)?

no

Level for award;(Hons, MSc, PhD, N/A)?

n/a

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