Contribution ID: **137** Type: **Oral Presentation**

Resolution enhancement in quantum ghost imaging by machine intelligence

Monday, 4 July 2022 16:00 (15 minutes)

Quantum ghost imaging is an alternative imaging technique which utilises pairs of entangled photons to reconstruct an image. Information from either one of the photons alone does not allow for image reconstruction, rather the image is reconstructed by using the correlations that exist between the photon pair. Interestingly, these photon pairs can be either degenerate or non-degenerate in nature. Due to the scanning nature of spatially resolving detectors, necessary to detect one of the photon pair, and the inherent low light levels of quantum experiments - imaging speeds are inefficient and scale quadratically with the required resolution. To overcome these limitations, we implemented a series of deep learning and machine learning algorithms to achieve early object recognition and to super-resolve the reconstructed image. In applications where object discrimination is important, we achieved a 5x reduction in image acquisition times, recognising the object and stopping the experiment early while maintaining all necessary object information. While in applications that require a high-resolution image, we super-resolved the images to a resolution 4x greater than the measured resolution, without the lossy aspects that occur with image resampling. This, therefore, leads to faster and more efficient image acquisition times without losing fine details of the image. Our techniques were tested on both degenerate and non-degenerate imaging systems but can extend to many systems that are of quantum nature. We believe that these intelligent algorithms, implemented in ghost imaging, will prove valuable to the community who are focusing their efforts on time-efficient ghost imaging.

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

Yes

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

PhD

Primary authors: MOODLEY, Chané Simone (University of the Witwatersrand); Prof. FORBES, Andrew (University of the Witwatersrand)

Presenter: MOODLEY, Chané Simone (University of the Witwatersrand)

Session Classification: Photonics

Track Classification: Track C - Photonics