Abstract

The traditional optical microscopy system is a common tool for observing microscopic structures. However, in recent times, more advanced phase imaging techniques have emerged, such as ptychography and Coherent Diffraction Imaging (CDI). These techniques discard the lenses required by traditional optical microscopy systems and instead utilize computational methods for imaging microscopic objects. Therefore, they can be categorized into the field of computational imaging.

Using coherent X-rays to shot the specimen through aperture, it will generate Diffraction images on a detector receiver. X-rays possess excellent penetration capabilities, allowing them to effectively pass through specimen. The coherence of the X-rays ensures that the diffraction image contains the Fourier transform result of the specimen. Based on this principle, image reconstruction requires phase retrieval. In this paper, we employ a code-simulated optical diffraction system and data to practice phase imaging. We utilize traditional iterative methods for phase retrieval to reconstruct images. Due to the high cost of generating coherent light in real systems, this paper also explores the optimization of a classic iterative algorithm using data science methods under conditions of limited data.