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Optimizing Fourier ptychographic reconstruction for illumination wavelength and noise reduction

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Microscopy is an important field that has seen significant improvements over the last decades to overcome unique inherent limitations. Some times the physical limitations could be overcome by using computational imaging. Fourier Ptychography is a powerful computational imaging technique that overcomes the resolution limitations of traditional microscopy by combining multiple low-resolution images captured under varied illumination angles. It overcomes the limitations of the traditional microscopes numerical aperture and reconstruct high-resolution image. The essence of this method lies in the reconstruction of images that go up to gigapixels using series of low-quality images. The traditional microscopic technique involves illumination by white light of the samples that are fixed on uniform glass slides. Here we test whether the Fourier Ptychography implemented on microscopic images acquired from a microfluidic chamber system depends on the wavelength of the illumination. We conclude that a shorter wavelength leads to a higher resolution of the images that are reconstructed. Results are combined with careful noise removal techniques involving different wavelets.

References

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Primary author: Prof. UKA, Arban (Epoka University)

Co-authors: Mr IMERAJ, Gent (Department of Applied Informatics, Hosei University, Tokyo, Japan); ALUSHLLARI, Griselda (Epoka University); Mr HAXHI, Kevin (Epoka University)

Presenter: Prof. UKA, Arban (Epoka University)

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