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Digital holographic microscopy[1] SOLOMON BARKLEY, THOMAS DIMIDUK, VINOTHAN MANOHARAN, Harvard University — Digital holographic microscopy is a 3D optical imaging technique with high temporal ($\approx$ ms) and spatial ($\approx$ 10 nm) precision. However, its adoption as a characterization technique has been limited due to the inherent difficulty of recovering 3D data from the holograms. Successful analysis has traditionally required substantial knowledge about the sample being imaged (for example, the approximate positions of particles in the field of view), as well as expertise in scattering theory. To overcome the obstacles to widespread adoption of holographic microscopy, we developed HoloPy – an open source python package for analysis of holograms and scattering data. HoloPy uses Bayesian statistical methods to determine the geometry and properties of discrete scatterers from raw holograms. We demonstrate the use of HoloPy to measure the dynamics of colloidal particles at interfaces, to ascertain the structures of self-assembled colloidal particles, and to track freely swimming bacteria. The HoloPy codebase is thoroughly tested and well-documented to facilitate use by the broader experimental community.

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