

# **Focus prediction in time-lapse digital holographic microscopy using deep convolutional neural networks**

## Abstract:

Deep artificial neural network learning, or deep learning, is an emerging tool in image analysis. We demonstrate its potential in the field of digital holographic microscopy by addressing the challenging problem of determining the in-focus reconstruction depth of time-lapse imaged human prostate cell clusters encoded in digital holograms. A deep convolutional neural network learns the in-focus depths from a labelled set of hologram amplitude images. The trained network correctly determines the in-focus depth of new holograms with high probability, without performing numerical propagation.