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Learning-based screening of hematologic disorders using quantitative phase imaging of individual red blood cells

Yixiang Deng

We present a rapid and label-free method for hematologic screening for diseases and syndromes, utilizing quantitative phase imaging (QPI) and machine learning. We aim to establish an efficient blood examination framework that does not suffer from the drawbacks of conventional blood assays, which are incapable of profiling single cells or require labeling procedures. Our method involves the synergistic employment of QPI and machine learning. The high-dimensional [refractive index](#) information arising from the QPI-based profiling of single red blood cells is processed to screen for diseases and syndromes using machine learning, which can utilize high-dimensional data beyond the human level. Accurate screening for [iron-deficiency anemia](#), [reticulocytosis](#), hereditary [spherocytosis](#), and [diabetes mellitus](#) is demonstrated (>98% accuracy) using the proposed method. Furthermore, we highlight the [synergy](#) between QPI and machine learning in the proposed method by analyzing the performance of the method.