

Digital Microscopy Supported by Artificial Intelligence for Improved Access to Diagnostics

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Digital microscopy enables analysis of biological samples with computer vision and supports the human expert in image-based diagnostics. The paradigm shift from human expert based visual interpretations to computerized readout and quantification has huge implications for pathology, microbiology and biomedical research in general. Substantial improvements in speed, throughput and consistency of image-based analytics are expected, largely due to recent advances in artificial intelligence (AI) and machine learning. Deep learning and artificial neural networks allow for development of a large number of analytical tools in the form of algorithms for personalized medicine, drug development and point-of-care diagnostics.

Our research group has developed prototypes for cloud-connected, miniaturized microscope scanners that enable digital microscopy at the point-of-care and can be coupled with computer vision diagnostic support (i.e. diagnosis of cancer, malaria and neglected tropical diseases). To evaluate the feasibility of the novel diagnostic platform, studies are currently ongoing in Finland, Sweden and Tanzania where the novel AI-supported methods are compared with conventional microscopy diagnostics. The methods will aid diagnostics of infectious diseases and cancer at the point-of-care and allow task shifting. The platform will also function as a surveillance instrument for disease outbreaks and epidemiological studies in a global setting.