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COMPUTATIONAL PATHOLOGY: MACHINES ARE COMING

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There is an urgent need for alternative methods to objectively diagnose and classify tumours and for identification of significant new tumour subtypes. Computational pathology offers an opportunity for consistent and automated evaluation and stratification of tumour phenotype. Although knowledge of the molecular basis of tumours is rapidly increasing, histomorphology based diagnostic subtyping and recognition of new subtypes remains dependent on the subjective and limited morphological diagnosis of expert pathologists. The limitations of this classical approach are demonstrated in the inter-observer reproducibility that generally shows acceptable-values only for typical tumour growth patterns and when expert opinion is obtained. Deep learning approaches in computational pathology have already shown excellent performance in a range of image classification challenges, and are set to revolutionize biomedical research, clinical practice, and the healthcare industry. Artificial Intelligence (AI) applications, for example using convolutional neural networks, can analyse and grade tumour tissue biopsies; a task currently performed by pathologists. Similarly, computational pathology and concurrent deep learning approaches are also creating novel tools to link mutational status and gene expression to phenotype. Deep learning in computational pathology has been shown to be able to identify prognostic factors and determine genotype-phenotype correlations in various types of cancer. Computational pathology and omics are part of an integrative approach that is set to accelerate our ability to interrogate biologically relevant pathways in cancer. This will require a multidisciplinary approach of pathology, computational science, mathematics, molecular biology and clinical data. Ultimately, computational pathology and it's applications in AI will lead to improved options for individualized therapy and accelerate the future development of new treatment pathways.

Biography

Jan Lukas Robertus has received his MD at the University of Utrecht and completed his PhD and Registrar program in Pathology at the University of Groningen, the Netherlands. He was appointed as a Consultant Cardiothoracic Pathologist at The Royal Brompton and Harefield NHS Foundation Trust in February 2015. He has previously worked as a Consultant Cardiothoracic Pathologist at the Erasmus Medical Centre, Rotterdam, The Netherlands. He is the Lead Pathologist for computational pathology. He is also Co-lead for the Royal Brompton Cardiac Morphology Unit and is Member of the Brompton Cardiac Morphology Steering Committee. He is Honorary Senior Clinical Lecturer at the National Heart and Lung Institute, Imperial College London. His main research interests are Computational Pathology, Specifically in the Areas of Thoracic Oncology, Cardiomyopathies, Aortopathies, Cardiac and Pulmonary Transplantation.

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