Deep context pathology for precision medicine

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Tissue pathology slides contain enormous data that can be read from their digital images. Image processing and artificial intelligence tools are advancing rapidly to extract the data and transform into informative disease indicators. Most unique benefits of digital pathology assays can be expected from measurement of multiple disease biomarkers in the spatial context of tissue microenvironment. This often goes far beyond human visual capability to evaluate the pathology features. On the other hand, novel microscopy imaging techniques can provide new levels of signal-to-noise ratio to further increase robustness of deep-context pathology assays for clinical applications. In particular, microscopy with ultraviolet sectioning excitation and polychromatic polarization microscopy can be employed to extract invisible and affordable data for improved tissue segmentation and quantification. For tumour and non-tumour pathology, the quest for comprehensive deep context pathology assays has started. This will lead to multi-dimensional disease models of the disease, including measurements of intra-tissue heterogeneity of biomarker expression, immune response, metabolic properties, microvasculature and collagen architecture.

Figure 2: Analysis of the DOPE score profile of the model obtained from Modeller.

Biography

Arvydas Laurinavicius graduated from the Medical Faculty of Vilnius University (1981-1987). He completed his PhD Program at the Moscow Medical Academy (1989-1992), and Fellowship in Renal Pathology at the Brigham and Women's Hospital/Harvard Medical School (1996-1997). For over 25 years he is leading the National Center of Pathology and teaching pathology at Vilnius University. His is focusing on digital image analysis of tissue-based biomarkers and information management aspects, exploring new opportunities of multi-dimensional modelling of a disease. He has published more than 50 papers in reputed journals.

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Figure 1: The final considered model from Modeller output (Visualization by Chimera).