"A year of experiences in University College London – from proton imaging for lung cancer to applying artificial intelligence in digital pathology for sarcomas"

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Abstract

I will present the latest results of two ongoing projects of our group in the Biomedical Engineering & Medical Physics department at University College London.

Proton therapy is expected to improve treatment outcomes of various cancers such as non-small cell lung cancer. To reach its potential, image guidance (real-time imaging) is mandatory; we propose that image guidance can be achieved by alternating the proton treatment source between treatment and imaging modes, the latter with a higher energy. This talk will focus on presenting (1) the principles of fast integrated mode proton imaging, (2) the design of the fast scintillation detector, (3) the image reconstruction framework, (4) experimental results illustrating the currently achievable image quality, and (5) an outlook on potential uses of the proton imaging device for other clinical purposes.

Our group is also engaging with clinical pathologists working in sarcomas to tackle practical issues related to their daily tasks using artificial intelligence. In the sarcoma diagnosis workflow, the pathologist receives a specimen; after visual inspection under a microscope, they identify potential diagnoses, and order a large array of biomarker tests to confirm a diagnosis. This procedure is lengthy, costly, and challenging due to the overlapping morphological similarities between sarcoma subtypes. This can result in delayed treatment, unnecessary costs, and sometimes a depletion of biopsy tissue, requiring a second biopsy. In this work, we will show the development of a platform that combines digital pathology and AI to predict a sarcoma diagnosis from a digitised biopsy. We will also present the performance of the platform to differentiate between 10 soft tissue tumours with data coming from multiple institutions.