Artificial Intelligence in Quantitative Imaging of Chronic Lung Injury: Enabling Clinical and Genetic Discovery

Abstract: Chronic Obstructive Pulmonary Disease (COPD) is a chronic, inflammatory lung disease that arises from exposure to cigarette smoke and other inhaled toxins. It is the 3rd leading cause of death worldwide, affecting about 10% of the general population, but its prevalence among heavy smokers can reach 50%. The main clinical feature of COPD is a limitation of airflow that is not fully reversible. Despite the simplicity of the clinical definition, the heterogeneity of this disease makes the clinical assessment and treatment complex. In-vivo Quantitative Chest Computed Tomography provides high-resolution structural information of the lung that enables better characterization of patients suffering from COPD. In this talk, I will give an overview of the image-based biomarkers that are being developed to phenotype the different pathophysiological components of COPD: airway disease, emphysema, and pulmonary vascular disease. I will present the current paradigm to develop image-based biomarkers in lung diseases, and I will introduce some of the new deep learning approaches that are allowing us to perform end-to-end automatic imaging phenotyping in large populations. Finally, I will show some of the applications of these new approaches for clinical and genetic discovery.