Riku Klén

Short Biography:

Riku Klén, PhD, is Assistant Professor of Imaging Instrumentation and Detection Technologies at Turku PET Centre, University of Turku. He has completed his PhD in pure Mathematics and has over 20 years of experience in medical imaging. Dr. Klén visited Massey University, New Zealand, for one year as postdoc studying non-Euclidean geometries. For the past 7 years he has developed and applied analysis methods into biomedical data and medical imaging data. His research interests include medical imaging instrumentation, modelling and image analysis. Dr. Klén has published 69 scientific journal articles and 2 books (Web of Science).

Abstract:

In the last couple of years Positron Emission Tomography (PET) has been revolutionised by Total Body (TB) PET, which offers over 4 times longer Axial Field Of View (AFOV) than traditional PET scanners. This allows the human head and torso to be scanned simultaneously, producing images with over 10 times more data with higher temporal resolution. Analysing this data could lead to major breakthroughs in medical diagnostics, such as detecting smaller cancer tumours and understanding how different organs interact each other. However, these breakthroughs require novel image analysis methods, as the current methods are still based on short AFOV PET. In this presentation I will cover mathematical and Machine Learning (ML) approaches for analysis and modelling methods to unleash the full potential of TB-PET. My talk consists of three main topics: ML in TB-PET image segmentation, ML in PET modelling, and TB-PET image analysis pipeline.

Segmentation of PET images manually is laborious. Automation could speed up the process and make it more reproducible. I will discuss our research related to finding solutions for automated segmentation of dynamic TB-PET. We have compared unsupervised clustering methods for TB segmentation and I will share our experiences.

The traditional PET image modelling is based on single-organ approaches utilising e.g compartment models, Patlak and Logan plots. Motivation for these modelling methods has arisen from the traditional short AFOV PET. While TB-PET creates simultaneous multi-organ dynamic images, it could be beneficial to use another modelling method. However, it is not clear which alternative models will work, and we have started experimenting ML in PET modelling. I will discuss our preliminary results in this research.

At Turku PET Centre we have developed an openly available TB-PET analysis pipeline, which combines the segmentation and modelling methods. We have preliminary results from the pipeline with a TB perfusion cohort. It consists of 93 cardiac patients scanned with O-15-water PET. I will introduce outline of the pipeline and results from our study.