Digital Positron Emission Tomography

6th Summer School on Intelligent Signal Processing for frontier research and industry

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UAM
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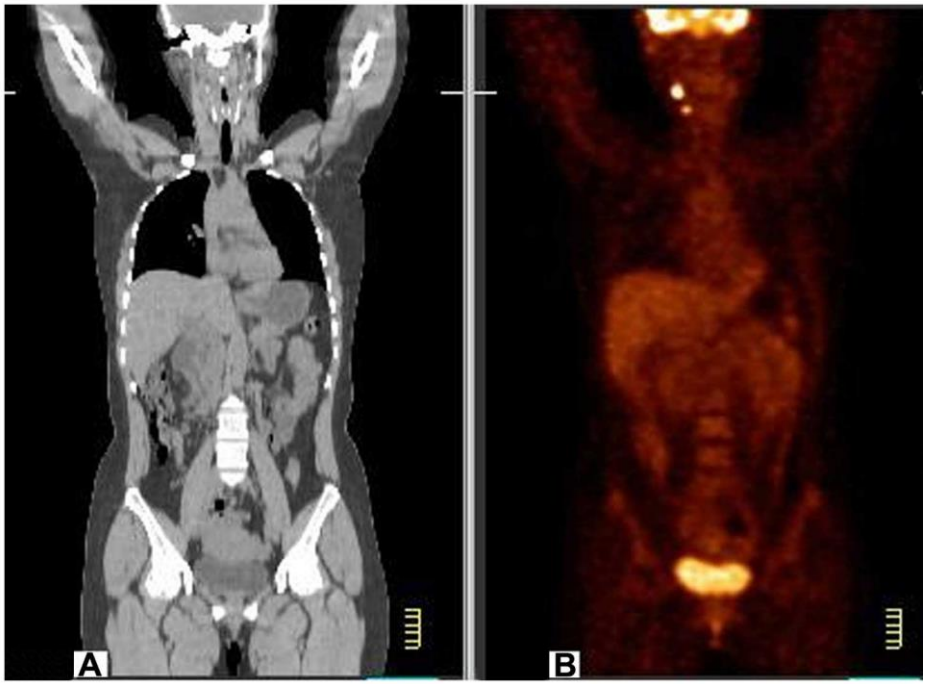
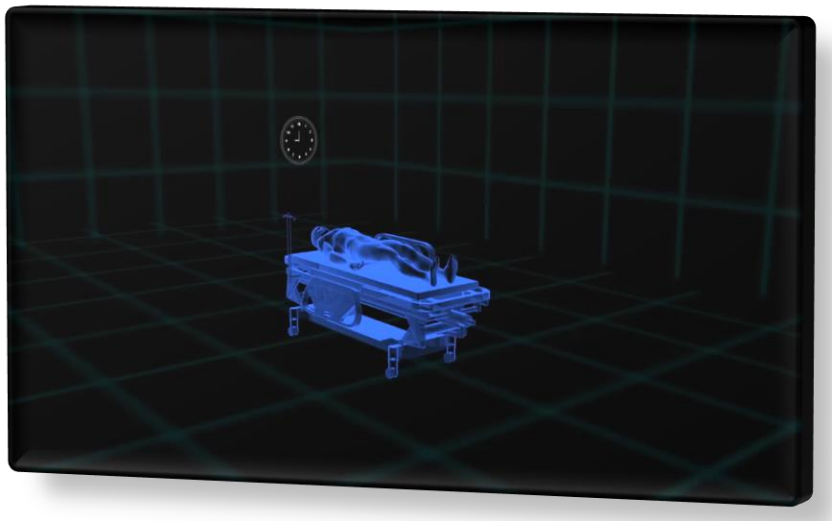
6th Summer School on INtelligent signal processing for FrotIEr Research and Industry

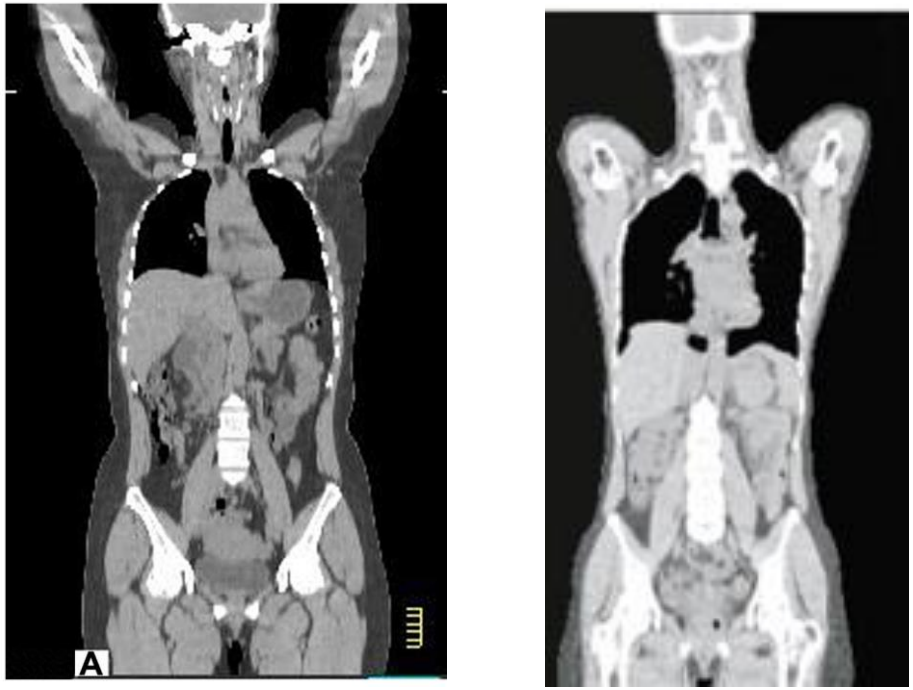
The concept of «functional imaging»





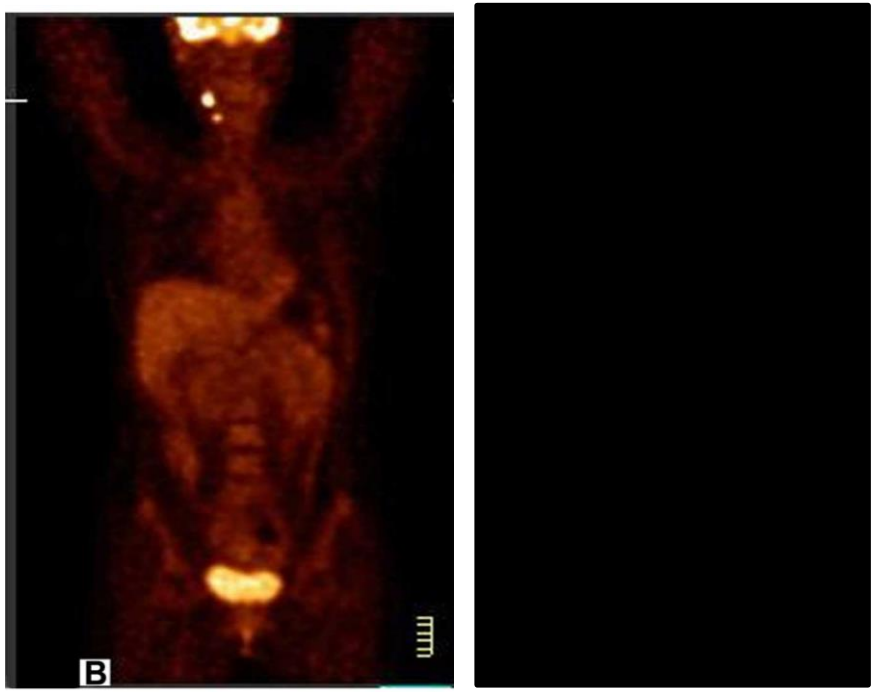
The figure A is from CT. It is showing only the morphological structure of the patient.
The figure B is showing the glucose metabolism of the cells in the patient.

The concept of «functional imaging»



One of these two patients is dead. Can you tell who?

The concept of «functional imaging»



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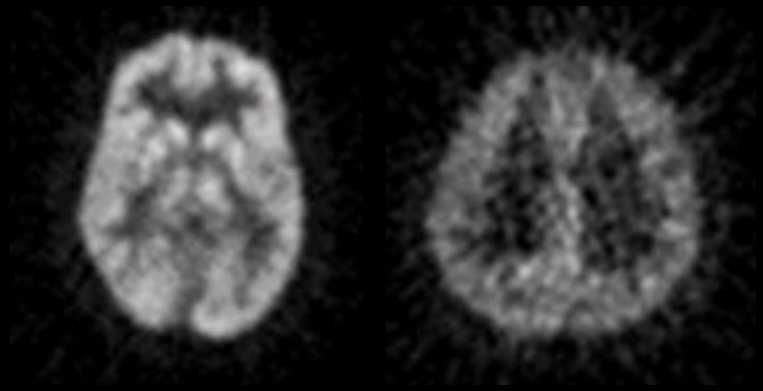
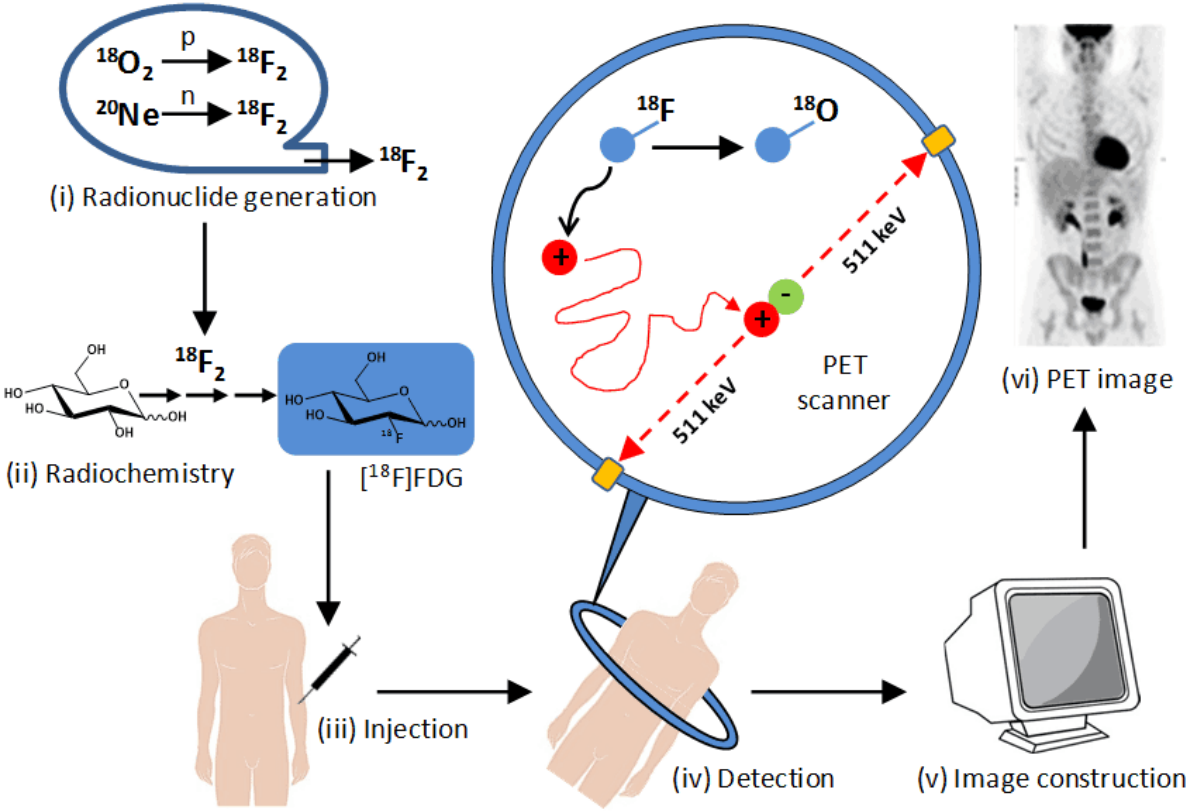
“Functional imaging” is a measurement of the functions of biological systems



Glucose uptake

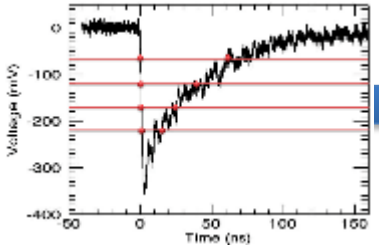
Water perfusion

Positron Emission Tomography



The classical concept of PET

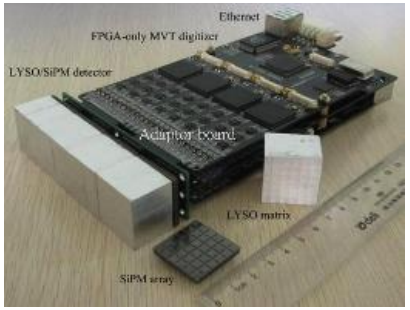
The concept of modern digital PET

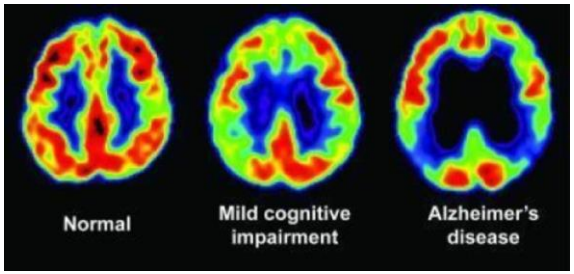


Sampling → Arificial Intelligence algorithms → Imaging Risk calculation

Patient's information

CT,MRI Other images



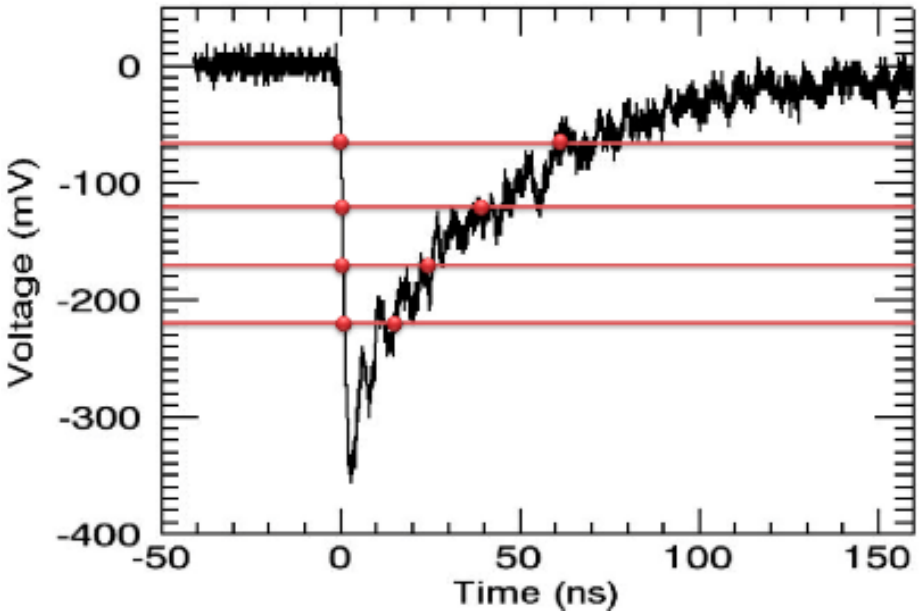


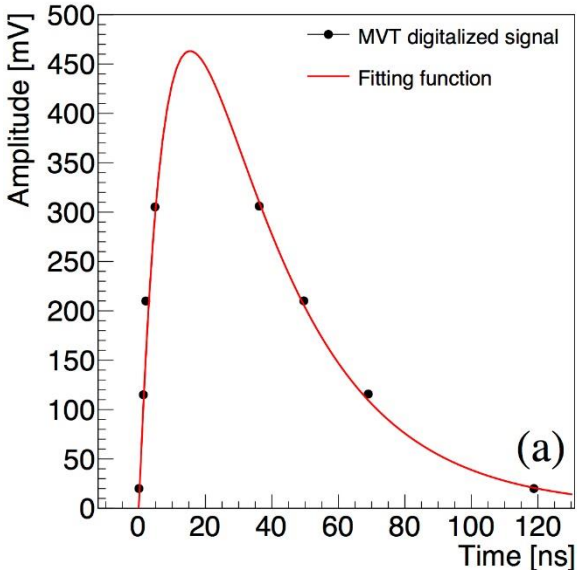
- Single crystal readout: hardware corresponding to single pixel
- Digitalization of the pulse: analysis and reconstruction performed offline
- Artificial intelligence algorithms for the combination with other digital information

Modern digital PET: a risk prediction diagnostic concept

In this lab we will explore the concept of modern digital PET as a risk prediction imaging technology

Part 1 – Analysis of the digital signal

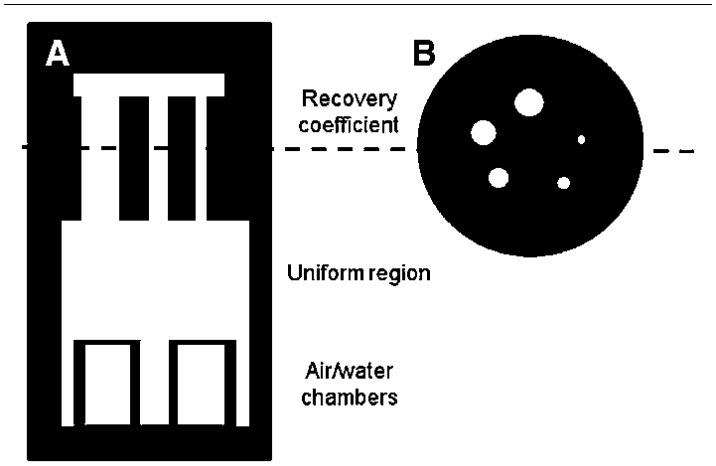


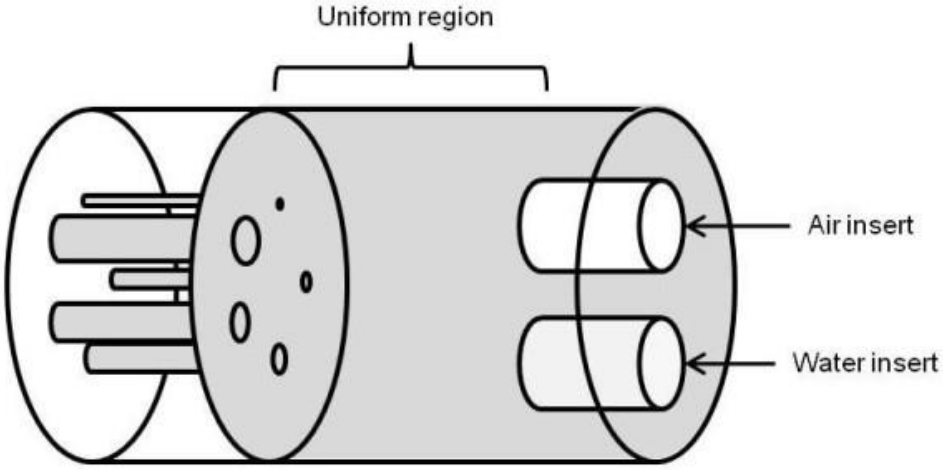


$$S(t) = a\exp(-bt)(1-\exp(-ct))$$

Evaluation of the energy resolution and spatial resolution of a digital PET system
Analysis of raw experimental data collected with a digital PET system

Part 2 – Imaging performances

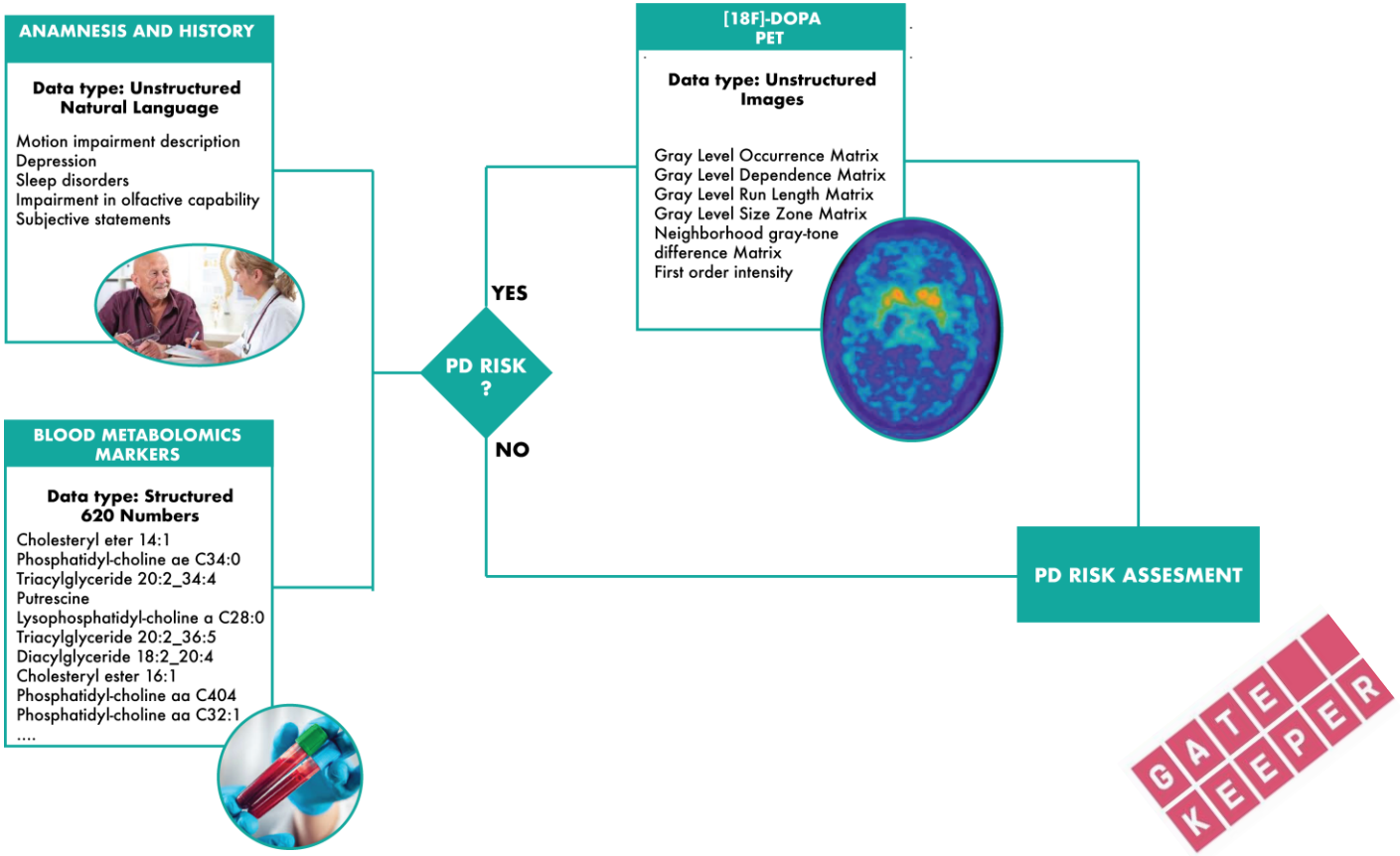




Evaluation of the image quality of a digital PET system
Analysis of reconstructed experimentl data collected with a digital PET system

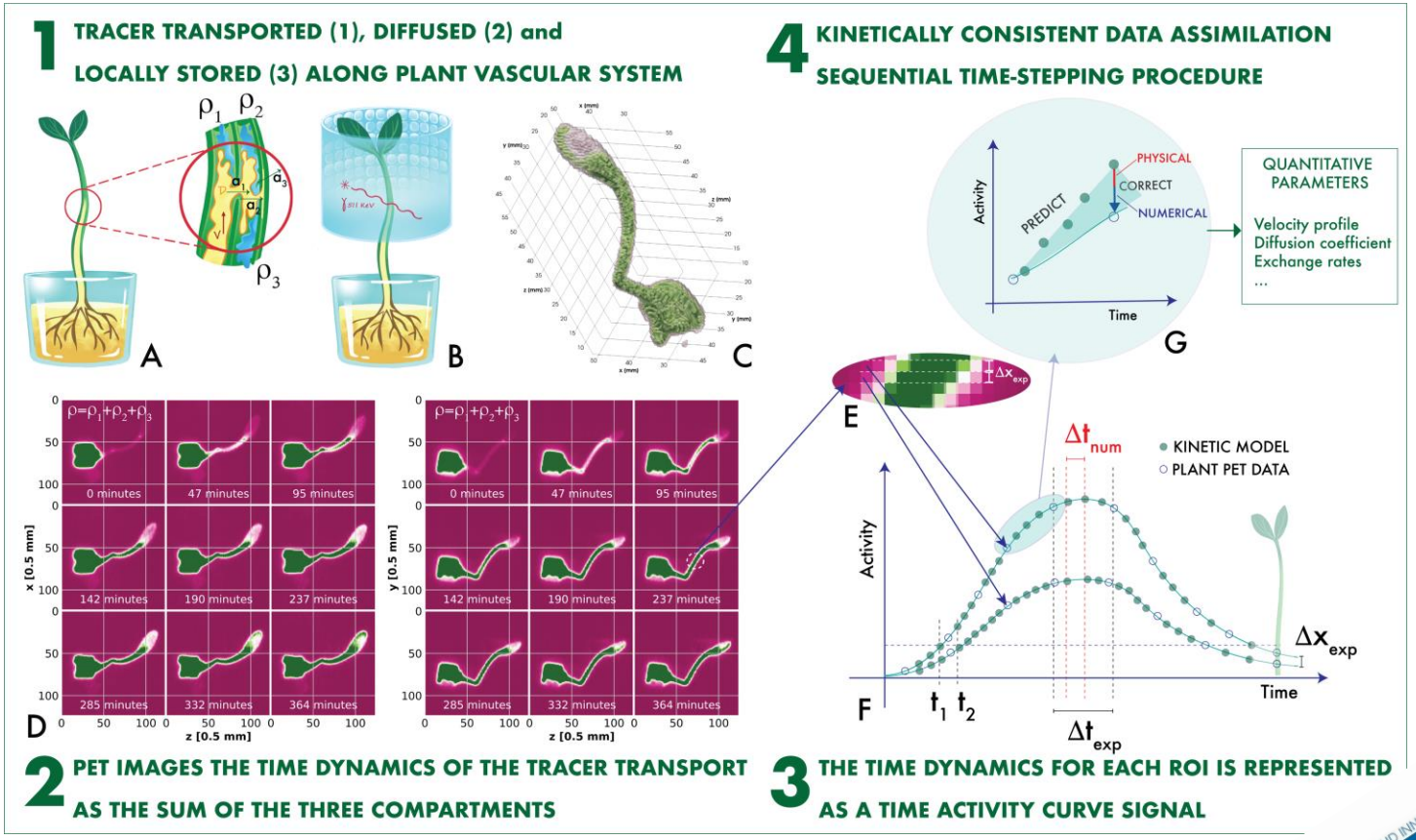
After part 1 and 2, students can select an application

Part 3.1 – Parkinson's Disease



Analysis of a PD patient PET image and correlation with blood metabolomics

Part 3.2 – Plant stress



Analysis of Plant PET imaging of a stressed plant

The lab will start on Monday August 30th

Bring your laptop!

Online ZOOM