Interpolating the Image-Derived Input Function in PET/MRI: a statistical maximization approach

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In the context of dynamic PET model fitting, Image-Derived Input Function (IDIF) is an elegant and noninvasive way to estimate tracer uptake at arterial level, which can replace direct arterial sampling. This approach is usually considered stable for many tracers [4], and particularly for graphical methods as Patlak [3] or Logan [2] methods. In some PET/MRI studies the IDIF is sampled over Volumes Of Interest (VOIs) which are physically distant from the region of the body in analysis. Different PET/MRI scans are thereby needed, and IDIF and tissue curves are sampled at different time points. This implies that an interpolation method is needed in order to fit the chosen method. Since no ground truth is available, the choice of a measure of accuracy for one interpolation method is nontrivial.
In this presentation a statistical R^2-maximization is proposed and applied to ^{18}F-FDG PET/MRI Multiple Sclerosis patients' data, using the aorta VOI as reference [5, 1] for the IDIF and the total brain mask as tissue.
The 'best' interpolation method is then used to compute a voxelwise map of absolute glucose rate for each subject.

References

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