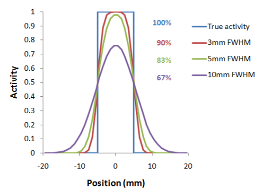
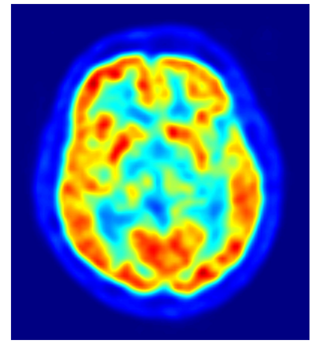
Project for BME MSc students

Reversing the partial volume effect on PET images

Contacts:
Francesca Zanderigo, PhD
New York State Psychiatric Institute &Columbia University
fz2173@cumc.columbia.edu

Todd Ogden, PhD
Biostatistics
Mailman School of Public Health
to166@columbia.edu





Overview:

Positron Emission Tomography (PET) is a medical imaging modality that enables visualization and quantification of several neurotransmission systems in the living human being. PET is today frequently used in clinical neuroscience and drug development, and has to date provided valuable knowledge in both neurological diseases such as Alzheimer's and Parkinson's disease, as well in psychiatric disorders such as schizophrenia and depression(1).

The accuracy of PET in measuring regional radiotracer concentrations in the human brain is limited by the finite resolution capability of the PET scanner. The spatial resolution-related effects, usually referred to as **partial volume effect**, depend on a number of different factors, such as target brain region size, type of scanner, activity distribution, as well as motion and other temporal effects, and can affect the quantification of the PET radiotracer signal (2).

Reversing the partial volume effect by **partial volume correction** (PVC) can be achieved using two main strategies: during reconstruction of the PET images with resolution modeling and/or introduction of anatomical priors, and post-reconstruction with image restoration.

The goal of this project is to assess and compare the performance of PVC methods, using available PET scans, human brain phantom data, and simulated data. The project can involve implementing both **reconstruction-based** algorithms (3-5) and **post-reconstruction** approaches (6,7) using available software packages (PVELab, http://nru.dk/publications/pveout) and in-house routines developed in Matlab or Python (https://www.python.org/).

References:

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