

# ROI Analysis: Extracting time-series data

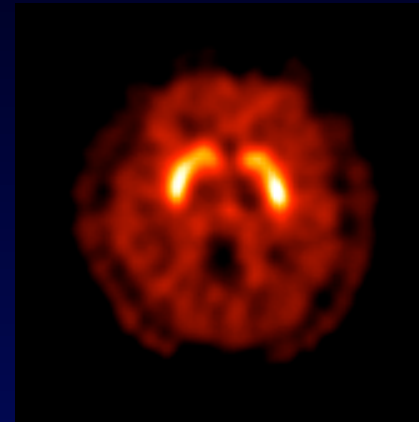
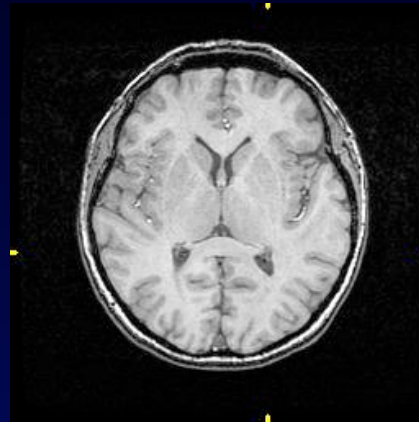
Terry Oakes  
troakes@wisc.edu

# What is a Functional Image?

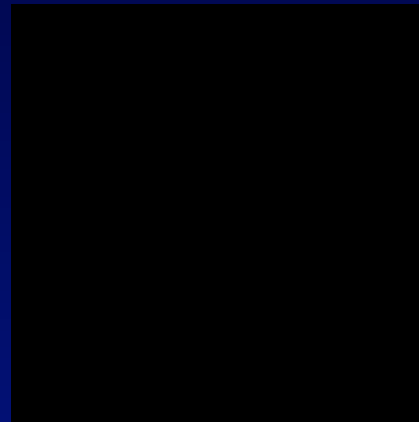
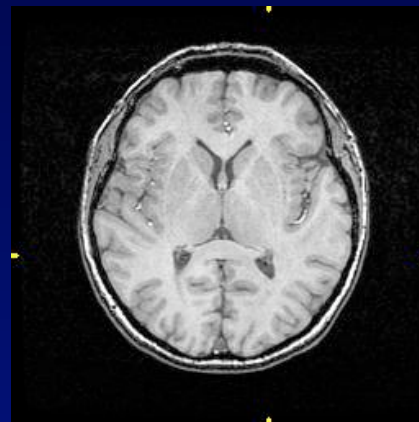
Anatomic Image

Functional Image

Live  
volunteer

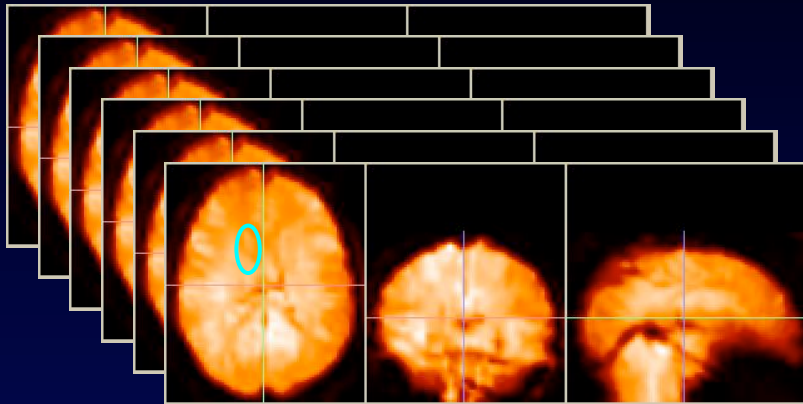


Dead  
volunteer

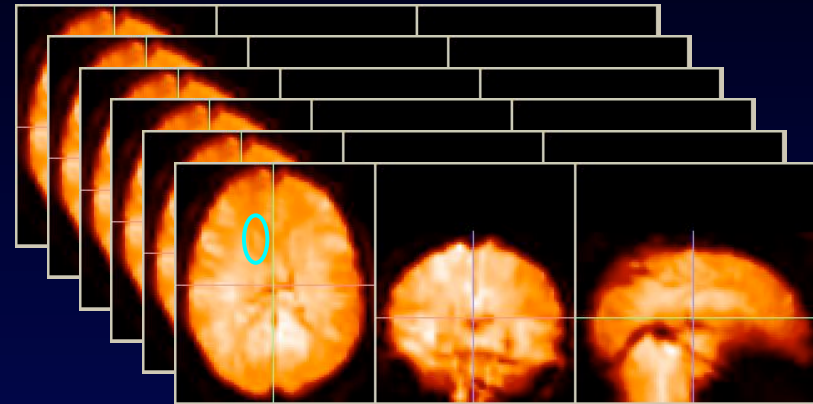


# Region of Interest (ROI) Analysis

Depressed

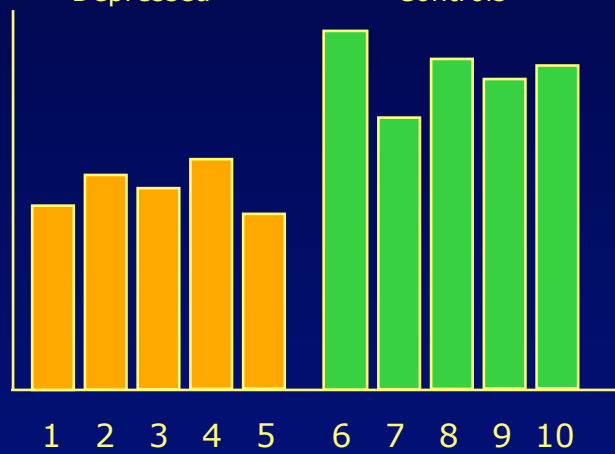


Controls



Depressed

Controls



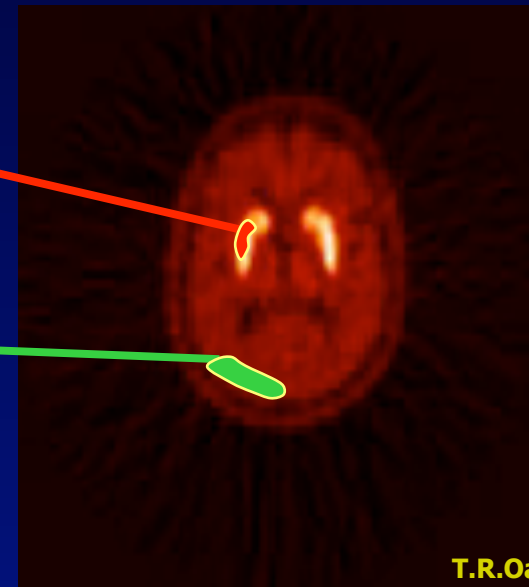
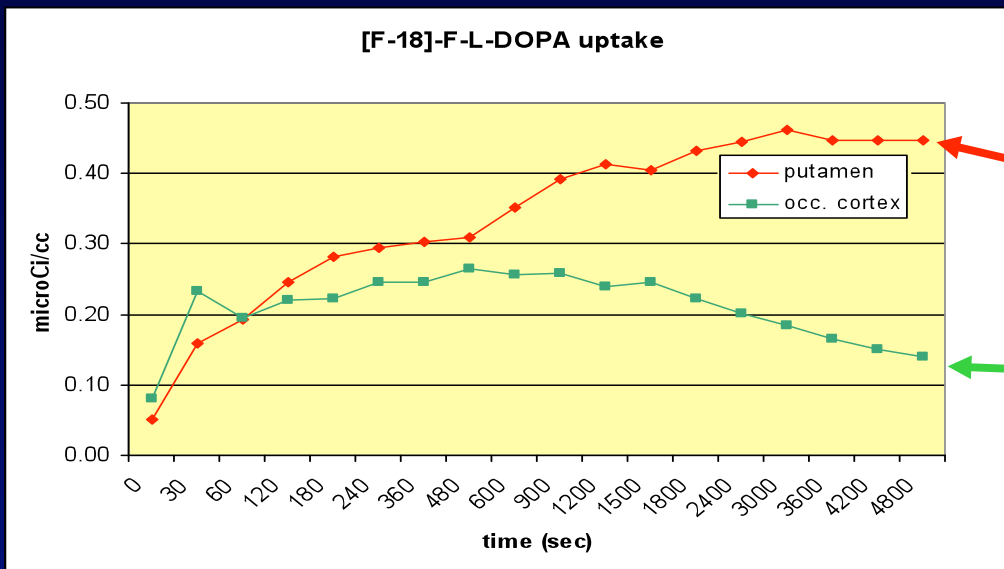
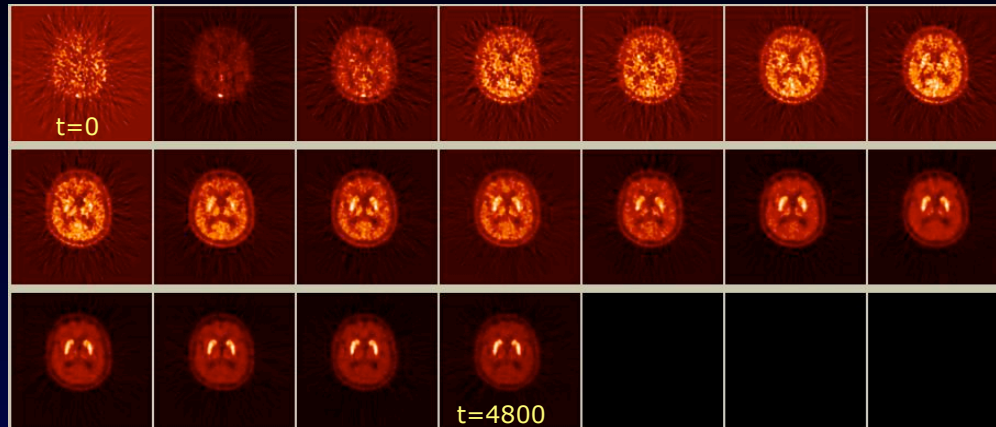
Where to draw ROIs?

How to assign variance?



# ROI time series

Data in a ROI changes over time.



# Voxelwise parameter map

teeny tiny ROIs:  
Everyone is special!

Goal: Find brain regions that are activated by a tone.

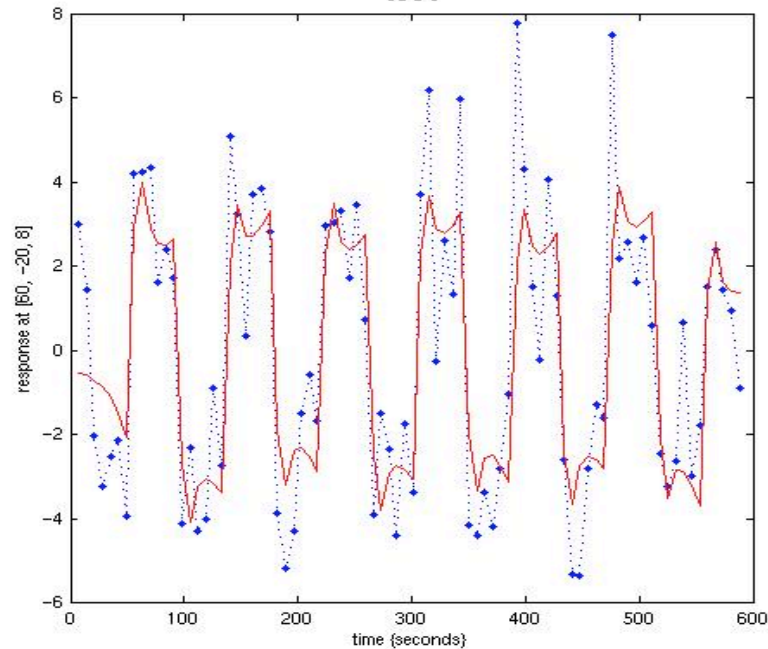


Model for  
Listening task:

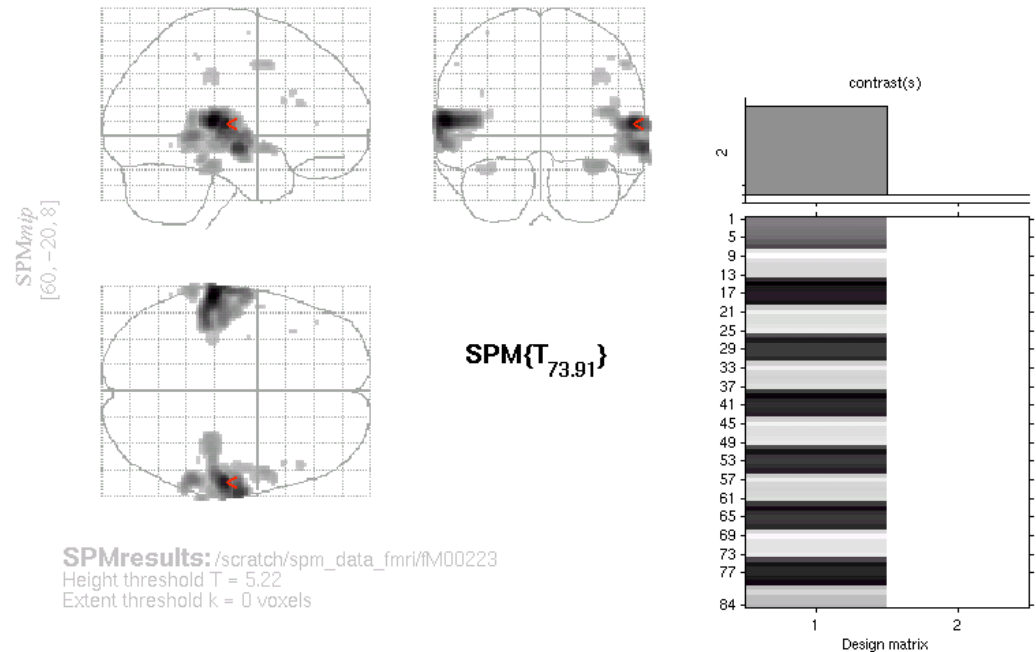


tone is: off on off on off on off on off on off on

Fitted and adjusted responses  
test



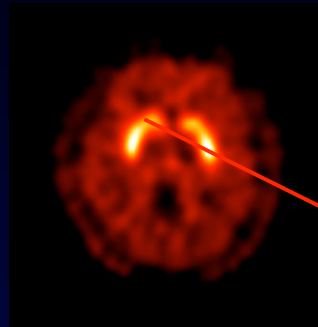
test



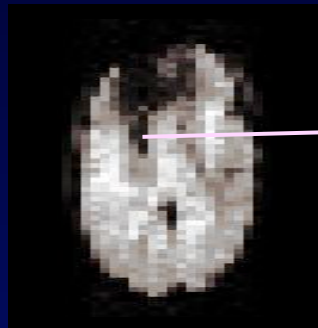
# Tissue Homogeneity

A ROI should include pixels from the same tissue type.

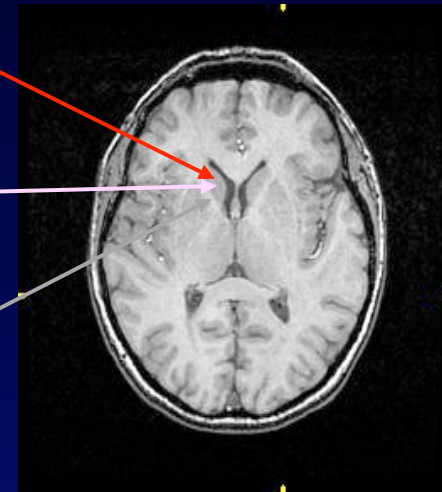
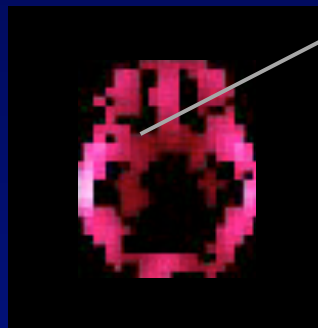
**PET:** concentration of radioactivity (mCi/cc brain tissue)



**fMRI:** paramagnetic signal from deoxygenated hemoglobin (~volts)



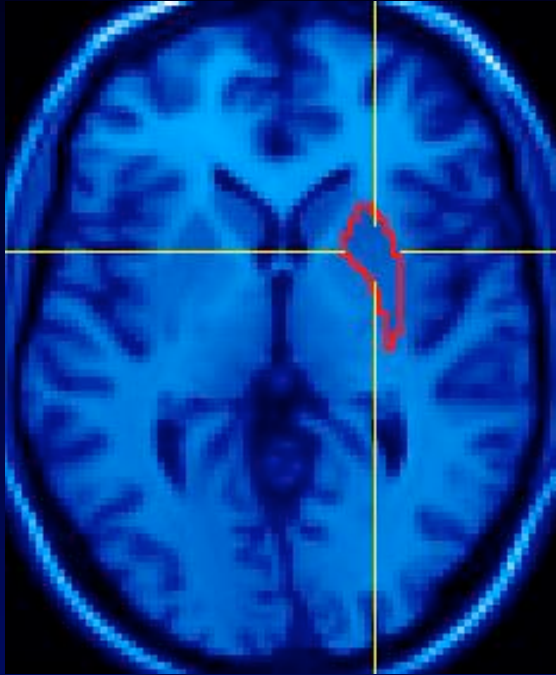
**EEG:** electrical signal strength (volts)



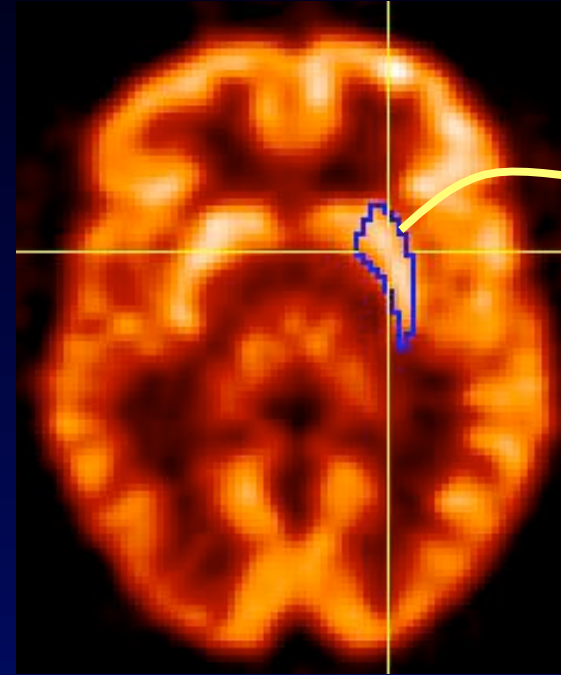
**MRI:** T1-weighted paramagnetic spin realignment (~volts)

# Extracting Data from Images

ROI Analysis: Extracting the average value for all voxels within a Region-of-Interest.



ROI is drawn on MRI image.



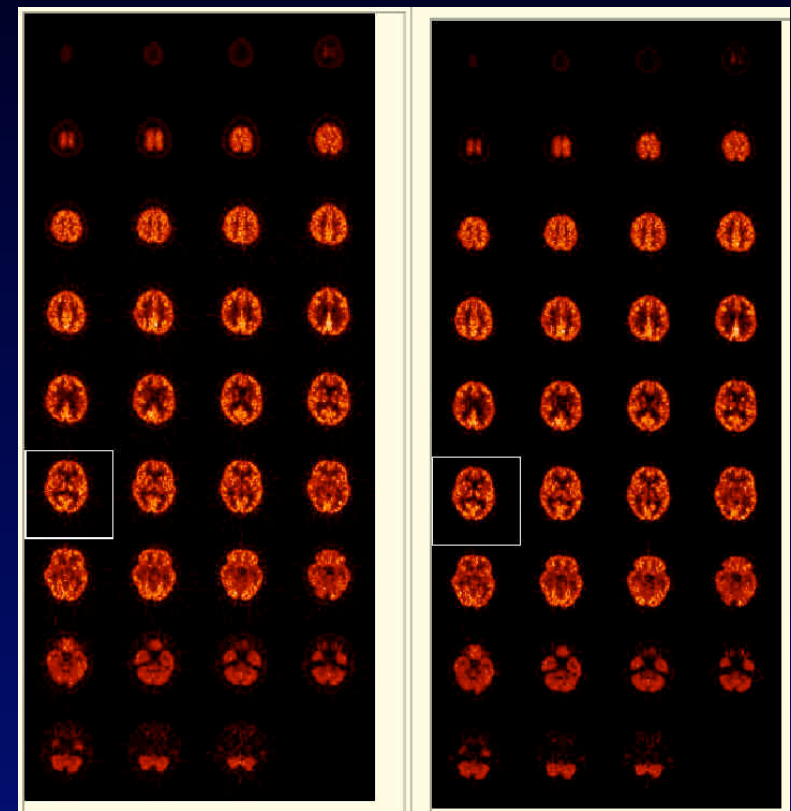
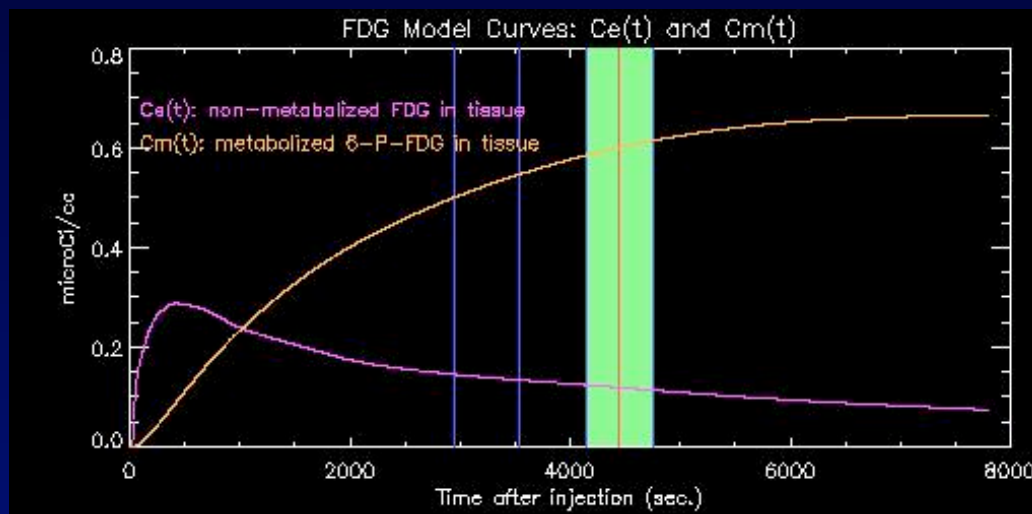
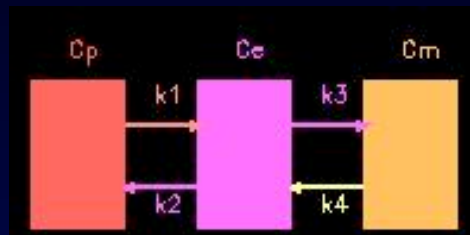
Average value  
of voxels  
inside ROI is  
6.7 microCi/cc

ROI value is extracted from  
functional image.

# Quantitative Images

Images which represent an underlying physiological process are (usually) more interesting than images of the "raw" measured data.

There may be little visual difference between raw and quantitated images, but it is the underlying values that are important.



Raw FDG  
(microCi/cc)

Quantitated FDG  
(1/sec)



# Drawing ROIs

- Hunt through individual pixels
- ROI drawing tool
- embedded in a dedicated tool