Absolute Beginner's Guide to Functional MRI

fMRI past, present, and possible future

Peter Bandettini, Ph.D.

The intended audience for this lecture is the graduate student, post doc, neuroscientist, or clinician who has either no or very little functional MRI (fMRI) experience. In fifty minutes, without going into too much technical detail, but including enough detail to get you started or at least more effective in your experimental approach, I will attempt to establish a perspective of fMRI. I will discuss the origins of fMRI and work into basic descriptions of the major fMRI contrast mechanisms and techniques. From here I will discuss some of the limits of fMRI in terms of spatial resolution, temporal resolution, sensitivity, and interpretability of the signal, as well as practical issues such as tolerable time in the scanner and acoustic noise. The lecture will then include a discussion of some of the major recent advances in fMRI-relevant technology, including high field strength, phased array coils, and parallel imaging methods. Processing methods have also been rapidly evolving. While not going into any major detail with regard to the established statistical methods or processing packages, I will be discussing some of the more exciting recent advances in processing, such as multivariate analysis, decoding, connectivity analysis from resting state fluctuations, and real time fMRI in a basic manner. Lastly, I will describe some of the latest issues of contention and opportunity in the field.