Brain Mapping 1 Midterm Exam

2021. 4. 13 (Tuesday)

* Due Apr 14 (Wed) at noon

* Submit your answers on iCampus

* Name your file as “Your Name_2021BrainMappingMidterm” (e.g., WonMok_2021BrainMappingMidterm)

1. To measure MRI signals, spins need to be excited to a transverse plane (xy). At 7T, how can you excite spins for maximal sensitivity?
2. In MRI, multi-slice 2-D images are obtained for covering the entire brain. Please describe principles of how to select slice position, thickness, and orientation. What are the limiting factors to obtain extremely thin slices?
3. Although MRI measures water protons, it can be used to measure brain structure, functional activity, diffusion, etc. In conventional brain mapping studies, anatomical images and BOLD fMRI are obtained. What are the underlying MR biophysical bases of a) anatomical contrast, and b) BOLD images?
4. Please 1) list all of the typical preprocessing steps, then describe what they do and why they are necessary. 2) What factors should you take into account when making decisions at each step? Under what conditions can you skip each step?
5. Won Mok is trying to design an experiment where subjects make gender judgments on common names. Specifically, she wants to know whether there are brain regions that will predict whether subjects will categorize ambiguous names like her as either male or female in comparison to when people judge names that are canonically male (e.g., Seong-Gi) or female (e.g., Minah). Help Won Mok design the study. What kind of design should she use? Why? How many different conditions should she use? What scan parameters (e.g., TR, voxel size, # of runs, run length, etc.) and task do you recommend? Provide a rationale for each of your choices.