Tentamen / examination

Brain Imaging 2010/2011

20/06/2011

Second opportunity

NAAM:

STUDENTNUMMER:

Here are 6 'open' questions and 30 multiple choice questions. They will be weighted 50% + 50% to calculate the final degree.

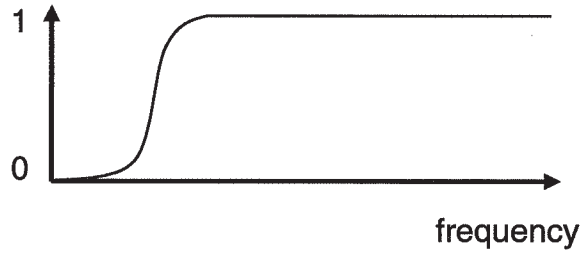
Exam has been checked by dr Jaap Munneke

A. Open questions:

Maximum number of points for this part is 50, each correct answer is 50/6 points.

1) Describe similarities and differences between MEG and MRI in terms of equipment needed, signals measured, spatial sensitivity, temporal sensitivity.

2) What kind of filter is this? Describe what you see here, how this filter works, and for which type of artifact is it used.



3) We need preprocessing in order to compute clean ERP's. Describe the preprocessing steps applied to EEG data, explain briefly what they do, and in which order you would apply them to the data.

4) Describe in terms of TR and TE how to acquire a T2* weighted MRI scan. Explain why these values are needed.

5) Draw a typical fMRI BOLD response. Include units on x- and y-axes. Explain why we see these changes in fMRI data over time.

6) We need statistics in order to interpret fMRI data. Describe in your own words the properties of and differences between a GLM analysis and a correlation analysis for fMRI data. What do they do, which is more sensitive, and why?

B. Multiple choice questions:

Maximum number of points for this part is 50, each correct answer is 50/30 points.
Only one answer is correct, make sure you indicate your choice clearly.

1. MEG is sensitive to
□ electrical currents
□ localized potentials
□ action potentials
□ post-synaptic potentials

2. EEG is sensitive to
□ electrical currents
□ localized potentials
□ action potentials
□ post-synaptic potentials

3. Monopolar recordings are
□ used for MEG
□ used for MRI
□ used for EOG
□ used for EEG

4. A common reference is
□ used for MEG
□ used for MRI
□ used for EOG
□ used for EEG

5. A radial dipole gives
□ no EEG signal
□ no MEG signal
□ no MRI signal
□ no PET signal

6. High-pass filtering in the frequency domain is
□ fast
□ slow
□ expensive
□ real time

7. The inverse problem implies that we cannot localize
□ single cell recordings
□ MEG activity
□ PET activity
□ MRI activity

8. A notch filter is
□ a low-pass filter
□ a high-stop filter
□ a band-stop filter
□ a band-pass filter

9. In order to measure MEG, we need
□ neurons in inverse orientation
□ neurons in radial orientation
□ neurons in orthogonal orientation
□ neurons in tangential orientation

10. EOG propagation factors are
□ smallest at occipital sites
□ smallest at central sites
□ smallest at parietal sites
□ smallest at frontal sites

11. Gradient coils are needed for
□ magnetic field homogeneity
□ magnetic field excitation
□ magnetic field relaxation
□ magnetic field changes

12. RF coils are needed for
□ tissue homogeneity
□ tissue excitation
□ tissue relaxation
□ tissue changes

13. ECG in the scanner is
□ dangerous
□ easy to measure
□ requires copper wires
□ uses monopolar recordings

14. T1 is longer than
□ TR
□ TE
□ TI
□ T2

15. TR refers to
□ pulse relaxation
□ pulse repetition
□ refocusing time
□ radiofrequency time

16. PET requires
□ radioactivity
□ detection coils
□ X-rays
□ radiofrequencies

17. The static magnetic field
□ brings protons into phase
□ brings protons into transverse plane
□ aligns precession axes of protons
□ aligns dephasing axes of protons

18. Maxwell coils are used
□ in MEG
□ in MRI
□ for spin dephasing
□ for spin excitation

19. Net magnetization vector is
□ difference between high and low energy protons
□ difference between high and low energy neutrons
□ difference between left and right spinning protons
□ difference between up and down spinning neutrons

20. The Larmor equation is
□ nonsense
□ needed for filtering
□ describes sine and cosine waves
□ determines precession frequencies

21. The large part of the BOLD response is characterized by
□ more dephased protons
□ less dephased protons
□ more dephased neutrons
□ less dephased neutrons

22. Field of View is the dimension of a scan
□ in terms of slice thickness
□ in the z-direction
□ in millimeters
□ in voxels

23. Thicker slices have
□ less partial volume averaging
□ more partial volume averaging
□ less spatial coverage
□ less signal to noise

24. Slice time correction is needed because
□ slice scanning is ascending
□ slice scanning is interleaved
□ slice scanning is time consuming
□ slice scanning is space consuming

25. ERA's are
□ MRI time series
□ MRI activation maps
□ MRI activation regions
□ MRI excitation regions

26. A linear correlation analysis needs
□ one predictor
□ two predictors
□ three predictors
□ four predictors

27. A GLM produces
□ a design matrix
□ many predictors
□ Type I errors
□ a statistical threshold

28. A GLM assumes
□ linear responses
□ refractory responses
□ collinearity
□ regions of interest

29. A voxel-wise analysis needs
□ correction for motion artifacts
□ correction for multiple comparisons
□ correction for large field of view
□ correction for field inhomogeneity

30. A Talairach transformation requires
□ sufficient number of trials
□ homogenous magnetic field
□ slice scan time correction
□ a structural scan