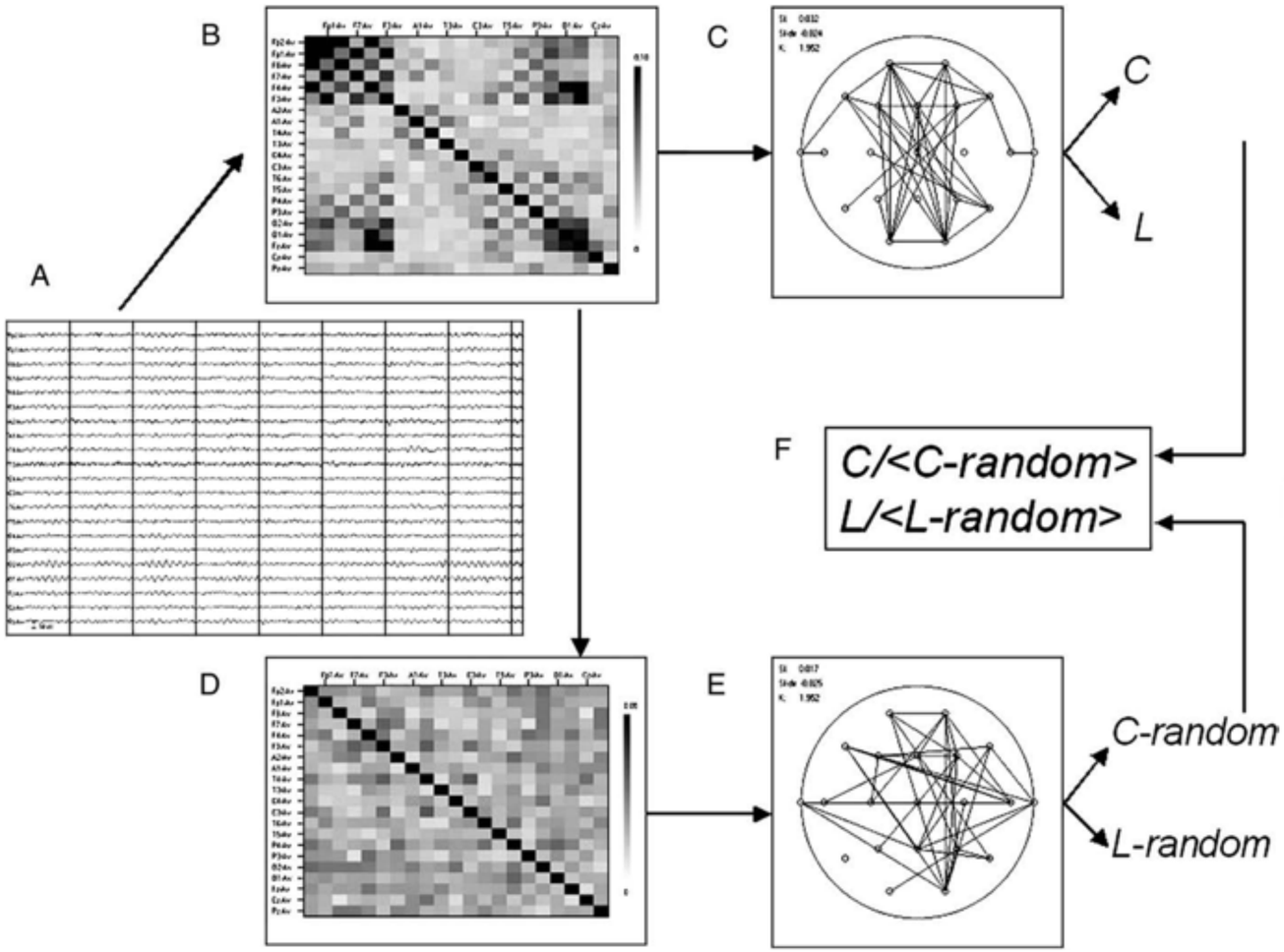
Network / Graph topology

How to get the matrices



Adjacency matrix and weighted graph can be extracted from resting state recordings:

5 min. eyes closed

find 4096 samples without artefacts

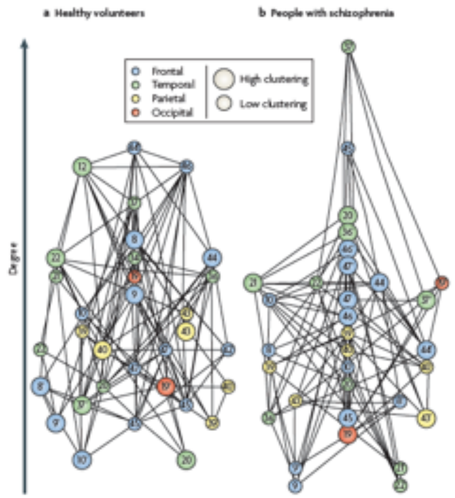
That's about 6-7 seconds!

Stam, C. J. (2010). Characterization of anatomical and functional connectivity in the brain: A complex networks perspective. International journal of psychophysiology : official journal of the International Organization of Psychophysiology, 77(3), 186-194. Elsevier B.V. doi: 10.1016/j.ijpsycho.2010.06.024.

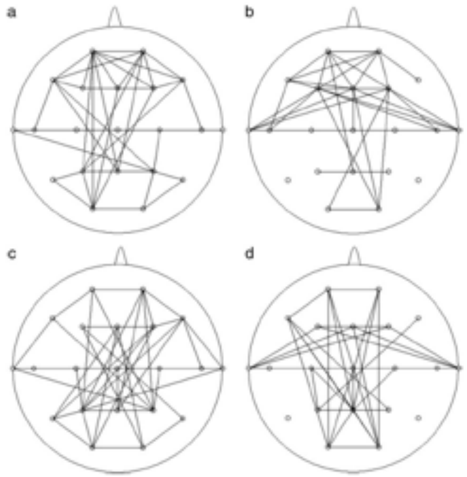
Network / Graph topology

Pathology studies

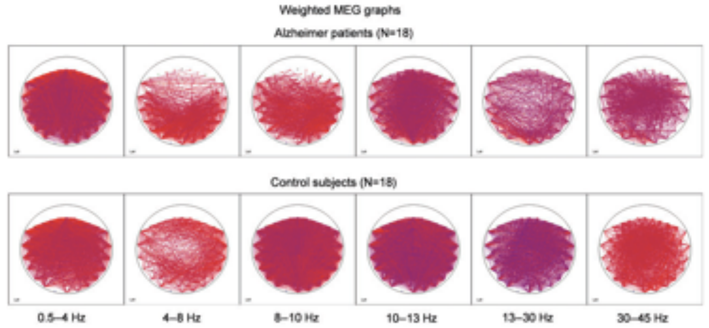
Based on a few samples we can distinguish healthy subjects from patients:



Schizophrenia



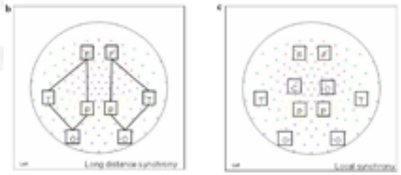
Absence seizure



Alzheimer's disease: Targeted attack on hubs!

Parkinson's

Major depressive disorder



Epilepsy

brain tumor patients

Bartolomei, F., Bosma, I., Klein, M., Baayen, J. C., Reijneveld, J. C., Postma, T. J., et al. (2006). Disturbed functional connectivity in brain tumour patients: evaluation by graph analysis of synchronization matrices. Clinical neurophysiology, 117(9), 2039-49. doi: 10.1016/j.clinph.2006.05.018.

Ponten, S. C., Douw, L., Bartolomei, F., Reijneveld, J. C., & Stam, C. J. (2009). Indications for network regularization during absence seizures: weighted and unweighted graph theoretical analyses. Experimental neurology, 217(1), 197-204. Elsevier Inc. doi: 10.1016/j.expneurol.2009.02.001.

Stam, C. J., Haan, W. de, Daffertshofer, a, Jones, B. F., Manshanden, I., Cappellen van Walsum, a M. van, et al. (2009). Graph theoretical analysis of magnetoencephalographic functional connectivity in Alzheimer's disease. Brain : a journal of neurology, 132(Pt 1), 213-24. doi: 10.1093/brain/awn262.

Stam, C. J. (2010). Use of magnetoencephalography (MEG) to study functional brain networks in neurodegenerative disorders. Journal of the neurological sciences, 289(1-2), 128-34. Elsevier B.V. doi: 10.1016/j.jns.2009.08.028.