SESIONES CIENTIFICAS DEL CTB
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PONENTE: Dr. MARIO CHÁVEZ
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Education and Professional Activities
Since 2005 **CNRS Researcher (CR1)**
2004-2005 **Post-Doctoral Position** at the Istituto Nazionale di Ottica Applicatta, Florence, Italy.
2001-2004 **Post-Doctoral Position** at the Laboratory of Cognitive Sciences and Cerebral Imaging (LENA), Hôpital de la Salpêtrière, Paris.
1997-2001 **PhD in Signals Processing**, France.

Selected publications (peer-reviewed journals)
1. F. De Vico Fallani, M. Corazzol, J. Sternberg, K. Fidelin, C. Wyart and **M. Chavez**. Hierarchy of neural organisation in the zebra fish spinal cord: causality analysis of in-vivo calcium imaging data. IEEE Trans. Neural Syst. Rehabil. Eng. In press
2. F. De Vico Fallani, J. Richiardi, **M. Chavez** and S. Achard, (2014). Graph analysis of functional brain networks: practical issues in translational neurosciences. Philos. Trans. R. Soc. B-Biol. Sci. 369 (1653) 20130521.
3. **Chavez M**, Valencia Ust́arroz M, De Vico Fallani F, Artieda J, Mattia D, Latora V, and Babiloni F (2013) Node accessibility in cortical networks during motor tasks. Neuroinformatics 11:355 (2013)
4. Nicosia V, Valencia M, **Chavez M**, Diaz-Guilera A, Latora V (2013) Remote Synchronization Reveals Network Symmetries and Functional Modules. Phys Rev Lett, 110: 174102 (2013).
5. **M. Chavez**, M. Valencia, V. Latora, and J. Martinerie Functional modularity of background activities in normal and epileptic brain networks. Phys Rev Lett, 104:118701 (2010).
6. M. Valencia, M. A. Pastor, M.A. Fernandez-Seara, J. Artieda, J. Martinerie and **M. Chavez**. Complex modular structure of large-scale brain networks. Chaos. 19(2):02311 (2009).
7. M. Valencia, S. Dupont, J. Martinerie and **M. Chavez**. Dynamic small-world behavior in functional brain networks unveiled by an eventrelated networks approach. Phys Rev E, 77 : 050905-R (2008).
8. **M. Chavez**, D.-U. Hwang, A. Amann, and S. Boccaletti. Synchronizing weighted complex networks. Chaos, 16 (1):015106 (2006).
9. S. Boccaletti, V. Latora, Y. Moreno, **M. Chavez** and D.-U. Hwang. Complex Networks: Structure and Dynamics. Physics Reports, 424 (4- 5):175 (2006).
10. **M. Chavez**, M. Besserve, C. Adam and J. Martinerie. Towards a proper estimation of phase synchronization from time series. J. Neurosci Methods, 154 (1-2):149 (2006).
11. **M. Chavez**, D.-U. Hwang, A. Amann, H.G.E. Hentschel, and S. Boccaletti. Synchronization is enhanced in weighted complex networks. Phys Rev Lett, 94: 218701 (2005).
12. D.-U. Hwang, **M. Chavez**, A. Amann, and S. Boccaletti. Synchronization in complex networks with age ordering. Phys Rev Lett, 94: 138701 (2005).
13. **M. Chavez**, M. Le Van Quyen, V. Navarro, M. Baulac and J. Martinerie. Spatio-Temporal Dynamics prior to Neocortical Seizures: Amplitude and Phase Couplings. IEEE Trans Biomed Eng, 50 (5): 571 (2003).
14. **M. Chavez**, J. Martinerie and M. Le Van Quyen. Statistical Assessment of Nonlinear Causality: application to epileptic EEG signals. J. Neurosci Methods, 124: 113 (2003).

Patent
T. Similowski, M. Raux, P. Pouget, J. Martinerie, et **M. Chavez**. "Procédé de caractérisation de l`état physiologique d`un patient à partir de l`analyse de son activité électrique cérébrale, et dispositif

ANALYSIS OF MULTIMODAL BRAIN NETWORKS

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Understanding brain connectivity has become one of the most important issues in neuroscience. But connectivity data can reflect either the functional relationships of the brain activities or the anatomical properties between brain areas. Although one should expect a clear relationship between both representations, this is not straightforward. In this talk I'll discuss this relationship between anatomical and functional connectivity. In previous studies, the correspondence of these networks has been often assessed by the difference in an Euclidean space of vectors containing connectivity measures such as the clustering coefficient, shortest path length, degree distribution, etc. Nevertheless radically different framework have been recently proposed for studying brain connectivity differences. Instead of extracting a vector of features for each network (anatomical or functional), one can embed all of them in a common metric space that allows straightforward comparisons. This methodologies can be used not only to compare multimodal networks but also to extract statistically significant aggregated networks of a set of subjects. I'll illustrate one this procedures to aggregate a set of functional networks from different subjects in an aggregated network that is compared with the structural connectivity. The comparison of the aggregated network reveals some features that are not observed when the comparison is done with the classical averaged network.