POLITÉCNICA "Ingeniamos el futuro" | CAMPUS DE EXCELENCIA INTERNACIONAL

CTB centro de tecnología biomédica

SESIONES CIENTIFICAS DEL CTB
VIERNES 23 DE ENERO DE 2015

PONENTE: Dr. Bob W van Dijk

Education:
Experimental Physics and Applied Mathematics.
University of Amsterdam, Doctoral degree obtained (cum laude) in November 1980

Ph. D. at faculty of Science, University of Amsterdam, in May 1985.
Promotores: prof. dr. F. Muller and prof. dr. ir. H. Spekreijse.

Affiliations in past:
1976 University of Amsterdam; assistant registrar.
1977-1980 Universiteit of Amsterdam; teaching sassistant Medical Physics
1980-1984 Ph D at the Laboratory of Medical Physics of the University of Amsterdam.
1985 Visiting Scientist at the National Institute for Physiological Sciences, dept. of Visual Information Processing, headed by prof. Kaneko, in Okazaki (Japan)
1985 Scientist at the Netherlands Ophthalmic Research Institute, department of Visual Systems Analysis, in Amsterdam.
1986-1991 C.&C. Huygensfellow; at the Netherlands Ophthalmic Research Institute in Amsterdam
1987-1988 Visiting assistant professor, the Rockefeller University, the Biophysics Laboratory, headed by prof Knight, in New York, USA
1991-1996 Senior Scientist at the Netherlands Ophthalmic Research Institute , in Amsterdam (Coordinating the facilities for Experiemntal Animals).
1993-1997 Assistant professor laboratory for Medical Physics and Informatics of the Academic Medical Center, in Amsterdam.
1996-2001 Director MEG Centre of the Royal Academy for Arts and Sciences, in Amsterdam.
2001-2005 Coördinator van het MEG centre VU University medical centre in Amsterdam.
2005-present Physics specialist at the department of Physics and Medical Technology of the VU University medical centre in Amsterdam.
2009-present Associate professor faculty of movement sciences at VU University, Amsterdam.

Expertise:
- Elektrophysiological recordings of brain activity. Neurodynamica
- Neural modelling
- Magnetoencephalografy and high – resolution electroencephalografy

- Non-linear dynamics and synchronization
- GRID and high-perfomance computing applications in medical imaging.

Teaching:
Present:
"Physics of Sensory Organs". masters Medical Natural Sciences and Physics, of both VU University and University of Amsterdam.
"functional Brain Imaging". masters neuroscience VU University.
"neurosciences". Research masters t faculty for movement sciences VU Unirsity
Quantitative scintific methods. Bachelors Medicine VU University.
Past:
Neural networks. Masters Physics UvA.
Neural Networks and Neural Modeling. Post-graduate course UvA.
"Principles of neuroscience". Post-graduate course UvA.
Introduction to Statitstical Signal Analysis, Masters Physics UvA.
Recently Received funding (highlights)

- Program: "COSMOS" (Grant from Horizon2020) Developing methods to derive connectivity from observable signal (program leader Pikovski, Potsdam). 400k€ for two Ph D students in Amsterdam
- Program: "NCAcluster" (Grant from Neuroscience Campus Amsterdam). Implementing centralised brain imaging computing facilities. June 2013 – june 2017. 150k€
- Campus Challenge project (Grant from SURFNET). Developing a research IT infrastructure for brain imaging. December 2012 – december 2013. 475k€. N4U (FP7 subsidie) vervolg op NEUGRID, loopt van 2012 tot 2015. In opeenvolgende jaren wordt een aantal data-challenges uitgeveord (2013: AD ; 2014: white matter diseases; 2015: psychiatrische beelden)
- Program: "NEUgrid" (Grant from FP7). 2007 - 2011. seting up grid infrastructure for MR images from Alzheimer Disease patients. 200k€ (PI Frisoni, Brescia

TÍTULO: Support vector machines and mutiplex networks, a means to integrate multimodality recordings in AD

Electrophysiological, functional and structural recordings from patients with Alzheimer's Disease (AD) all show differences with recordings from healthy aged controls at group level.
The clinical diagnosis, however, cannot be based on any of these methods alone, nor on the basis of clinical observations, psychological tests, patient interviews, etc. In practice the diagnosis is based on a consensus in a multi-disciplinary meeting.

Much effort has been put into describing the changes in the network properties in AD. However the changes, that have been reported, strongly depend on recording modality, and analysis methods used.
Even within a single modality the observed changes may vary. For instance MEG recordings from AD patients show very different results in the different frequency bands; either pointing to increased randomness, or to targeted attack.
Arguably at least part of these seemingly contradictory findings stem from the lack of an integrated statistic over all available recorded data.
In my talk I will present two possible methods that allow to integrate multi-modal data.For network analysis at group level I propose to use multiplex networks. These are networks where the connections between the nodes in the network can have multiple flavors, e.g. based on MEG in different frequency bands, and/or based on functional, or structural MR data.
I will show some example networks based on MEG data from multiple frequency bands.
For decisions at individual level, similar to the clinical consensus meeting, I propose to use techniques from machine learning. More specifically I will show, how Support Vector Machines can be used objectify decisions, and will show results from a few preliminary attempts to classify MEG and EEG data.