

3rd International Summer School in Biomedical Engineering

## **Reconstruction of sources of electrophysiological signals**

Weimar / Ilmenau, September 4-17, 2008

### **Scientific Program**

#### **Overview**

Thursday, September 4 <sup>th</sup> p.m.	Introduction
Friday, September 5 <sup>th</sup>	Inverse problems in biomedical engineering
Tuesday, September 9 <sup>th</sup>	Low parametric sources
Wednesday, September 10 <sup>th</sup>	Reconstruction of distributed sources
Thursday, September 11 <sup>th</sup>	Scan methods
Friday, September 12 <sup>th</sup> a.m.	Advanced source models
Friday, September 12 <sup>th</sup> p.m.	Multimodal approaches
Saturday, September 13 <sup>th</sup> a.m.	Validation techniques
Sunday, September 14 <sup>th</sup> – Wednesday, September 17 <sup>th</sup>	OIPE 2008, Ilmenau

## Detailed Program

### *Introduction (Thursday, September 4<sup>th</sup> p.m.)*

13:00 – 13:05	Welcome speech	Jens Haueisen
13:05 – 13:20	Organizational issues and social program overview	Jens Haueisen
13:20 – 13:40	Scientific program overview	Thomas Knösche
13:40 – 14:40	Warm-up: Basic issues in the transition from cellular microrecordings to large-scale EEG/MEG signals	Gabriel Curio
14:40 – 15:10	<i>Coffee break</i>	
15:10 – 16:25	EEG-based Brain-Computer-Interfaces	Gabriel Curio
18:00 – ...	<i>Get Together BBQ</i>	

### *Inverse problems in biomedical engineering (Friday, September 5<sup>th</sup>)*

Organizer: Moritz Dannhauer  
Speakers: Burkhard Maess (MPI Leipzig)  
Jens Haueisen (TU Ilmenau)  
Carsten Wolters (University Münster)  
Thomas Knösche (MPI Leipzig)

09:00 – 09.15	General information and announcements	
09:15 – 10:00	Bioelectric and biomagnetic measurement techniques	Burkhard Maess
10:00 – 10:30	Source modelling	Jens Haueisen
10:30 – 10:45	<i>Coffee break</i>	
10:45 – 12:15	Forward modelling techniques in EEG and MEG source analysis	Carsten Wolters
12:15 – 14:00	<i>Lunch</i>	
14:00 – 14:45	Approaches to the inverse problem	Thomas Knösche
14:45 – 16:15	Panel discussion	

### *Low parametric sources (Tuesday, September 9<sup>th</sup>)*

Organizer: Roland Eichardt  
Speakers: Michael Scherg (MEGIS Software GmbH)  
Carsten Wolters (University Münster)  
Roland Eichardt (TU Ilmenau)  
Stephan Lau (TU Ilmenau & University of Melbourne)

09:00 – 10:30	Overview lecture: Multiple source analysis of EEG and MEG	Michael Scherg
10:30 – 10:45	<i>Coffee break</i>	
10:45 – 12:15	Comparing discrete and distributed source imaging methods using BESA	Michael Scherg
12:15 – 13:15	<i>Lunch</i>	
13:15 – 14:45	Low resolution conductivity fitting for an improved volume conductor modelling in EEG/MEG source analysis & spatio-temporal regularization approaches	Carsten Wolters
14:45 – 15:15	<i>Coffee break</i>	
15:15 – 16:10	Multi-level and hybrid optimization of multiple sources using evolution strategies	Roland Eichardt
16:10 – 17:00	Particle Swarm Optimization vs. Tabu Search	Stephan Lau
17:00 – 17:30	Panel discussion	

### ***Reconstruction of distributed sources (Wednesday, September 10<sup>th</sup>)***

Organizer: Daniel Baumgarten  
Speakers: Michael Wagner (Compumedics Germany GmbH)  
Daniel Baumgarten (TU Ilmenau & FSU Jena)  
Ernesto Palmero-Soler (eemagine Medical Imaging Solutions GmbH)  
Guido Nolte (Fraunhofer FIRST Berlin)  
Thomas Knösche & Moritz Dannhauer (MPI Leipzig)  
Frank Zanow (eemagine Medical Imaging Solutions GmbH)

09:00 – 10:30	Reconstruction of distributed sources - overview of methods	Michael Wagner
10:30 – 10:45	<i>Coffee Break</i>	
10:45 – 12:15	Reconstruction of distributed sources - hands-on	Michael Wagner
12:15 – 13:15	<i>Lunch</i>	
13:15 – 14:15	sLORETA: A new approach for source localization	Ernesto Palmero-Soler
14:15 – 15:15	Combining rotational invariance with focal minimum norm solutions in EEG inverse calculation	Guido Nolte
15:15 – 15:45	<i>Coffee Break</i>	
15:45 – 16:15	Magnetic nanoparticle imaging using Minimum Norm Methods	Daniel Baumgarten
16:15 – 16:45	Matlab demo of Minimum Norm Algorithms	Thomas Knösche & Moritz Dannhauer
16:45 – 17:15	swLORETA demo	Frank Zanow
17:15 – 17:45	Panel discussion	

### ***Scan methods (Thursday, September 11<sup>th</sup>)***

Organizer: Sebastian Biller  
Speakers: Kensuke Sekihara (Tokyo Metropolitan University, Japan)  
John Mosher (Cleveland Clinic, USA)  
Ceon Ramon (University of Washington, USA)

09:00 – 10:30	Principles of adaptive spatial filters	Kensuke Sekihara
10:30 – 10:45	<i>Coffee break</i>	
10:45 – 12:15	Adaptive spatial filters: recent advances and future directions	Kensuke Sekihara
12:15 – 13:15	<i>Lunch</i>	
13:15 – 14:45	MUSIC algorithms	John Mosher
14:45 – 15:00	<i>Coffee break</i>	
15:00 – 16:00	TBA	John Mosher
16:00 – 17:00	TBA	Ceon Ramon
17:00 – 17:15	<i>Coffee break</i>	
17:15 – 17:45	Panel discussion	

### ***Advanced source models (Friday, September 12<sup>th</sup> a.m.)***

Organizer: Andreas Spiegler  
Speakers: Stefan Kiebel (University College London)  
Andreas Spiegler (TU Ilmenau & MPI Leipzig)

09:00 – 10:30	Dynamic Causal Modelling (DCM)	Stefan Kiebel
10:30 – 11:00	<i>Coffee break</i>	
11:00 – 12:00	Bifurcation analysis of Neural Mass Models	Andreas Spiegler
12:00 – 13:00	<i>Lunch</i>	

### ***Multimodal approaches (Friday, September 12<sup>th</sup> p.m.)***

Organizer: Stephan Lau  
Speakers: Michael Wagner (Compumedics Germany GmbH)  
Daniel Güllmar (University Jena)  
Stephan Lau (TU Ilmenau & University of Melbourne)  
Tilman Sander-Thömmes (PTB Berlin)

13:00 – 13:20	Functional and structural modality framework	Stephan Lau
13:20 – 15:00	Multimodal coregistration and integration of EEG, MEG, fMRI, PET, SPECT and anatomy	Michael Wagner
15:00 – 15:15	<i>Coffee break</i>	

15:15 – 15:45	Anisotropic EEG/MEG volume conductor modelling based on Diffusion Tensor Imaging	Daniel Güllmar
15:45 – 16:15	Combining near-infrared spectroscopy (NIRS) and magnetoencephalography to study the temporal characteristics of neurovascular coupling	Tilmann Sander-Thömmes

***Validation techniques (Saturday, September 13<sup>th</sup> a.m.)***

Organizer: Mario Liehr  
Speakers: Mario Liehr (University Jena)  
Luca Di Rienzo (University Milano)  
Jens Haueisen (TU Ilmenau)  
Thomas Knösche (MPI Leipzig)

09:00 – 09:45	Validation techniques overview and phantom experiments	Mario Liehr
09:45 – 10:30	Comparative evaluation and optimization of sensor arrays for magnetocardiography	Luca Di Rienzo
10:30 – 11:00	Experimental validation of source reconstruction procedures	Jens Haueisen
11:00 – 11:15	<i>Coffee break</i>	
11:15 – 12:15	General panel discussion	
12:15 – 12:30	Summary talk	Thomas Knösche & Jens Haueisen

***OIPE - 10th Workshop on Optimization and Inverse Problems in Electromagnetism (September 14<sup>th</sup> - September 17<sup>th</sup>)***

**Venue:** Campus of the Ilmenau University of Technology, Ilmenau