TIM MULLEN

UNIVERSITY OF CALIFORNIA, SAN DIEGO
SWARTZ CENTER FOR COMPUTATIONAL NEUROSCIENCE,
INSTITUTE FOR NEURAL COMPUTATION and
DE SA LABORATORY

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EDUCATION

University of California, San Diego
Ph.D. Candidate, Dept. of Cognitive Science   **Sept 2008-2014**
Thesis Committee: Virginia de Sa (CogSci), Scott Makeig (INC), Terry Jernigan (CogSci), Jim Hollan (CogSci),
Kenneth Kreutz-Delgado (ECE), Wesley Thompson (Psychiatry/Biostatistics)

Areas of Concentration: Computational & Cognitive Neuroscience

University of California, San Diego
M.S. Cognitive Science   **2011**

Masters Thesis (2010): "The Source information Flow Toolbox (SIFT): An Electrophysiological Information Flow
Toolbox for EEGLAB"
Masters Committee: Scott Makeig, Ph.D, Virginia de Sa, Ph.D, Doug Nitz, Ph.D

Selected Courses: Computational Neurobiology (BGGN246A), Neurodynamics (BGGN260), Artificial Intelligence (CSE250 A-B),
Information visualization (COGS220), High-dimensional data analysis (CSE291), Systems Neuroscience (NEU200B, COGS201),
Adaptive Signal Processing (CSE291), Clinical and Cognitive Neuroscience (NEU200C), Diffusion Tensor Imaging (COGS260),
Music, Computation, and Cognition (COGS260), Computational models of cognition (COGS202).

University of California, Berkeley
B.A. Cognitive Science (Highest Honors) and Computer Science (High   **completed: 2007**
Honors)   **awarded: 2008**
Areas of Concentration: Cognitive Neuroscience, Artificial Intelligence, Human Computer Interaction

Honors Thesis (Cognitive Science): "Analysis of Information Flow in Language Processing: Evidence from
Electrocorticography"
Advisor: Robert T. Knight, M.D. (Director, Helen Wills Neuroscience Institute)

Foothill-DeAnza College, Los Altos, CA
General Education / Transfer (Honors)   **2004**

Area of Concentration: Computer Science
Member, Honors Institute – Transfer with Honors

AWARDS

- Glushko Fellowship, UCSD Dept. of Cognitive Science   **2010 – 2012**
  two-year graduate fellowship
- San Diego Fellowship, UC San Diego   **2008 – 2012**
  four-year graduate fellowship (full tuition + stipend)
- National Science Foundation Graduate Research Fellowship (Honorable Mention)   **2009**
- Highest Honors, UC Berkeley Department of Cognitive Science   **2008**

- High Honors, UC Berkeley Department of Computer Science **2008**
- Paid Research Internship at Palo Alto Research Center (fmr. Xerox PARC) **2006**

  One of 7 undergraduates selected from over 600 applicants from MIT, Stanford, Cornell, and Berkeley
- 1 of 3 UC Berkeley selected Nominees for Computing Research Association (CRA) Outstanding Undergraduate National Award **2006**
- Berkeley Undergraduate Scholarship **2004-2008**
- Certificates of Appreciation from Foothill College Tutorial Center and Pass the Torch Program *for exemplary student tutoring and mentoring services* **2003-2004**
- Foothill College Math Excellence Award **2004**
- Foothill College Honors Institute – Completion of Honors Program **2002-2004**
- Dean's List multiple semesters/quarters (FHC, UC Berkeley) **2002-2007**

GRANTS

NIH R01 NS047293-09A1 EEGLAB: Software for Analysis of Human Brain Dynamics	Role: *Key Personnel*
ONR BAA13-SN-0003: Functional Neuroimaging of Cognition in Hypoxic Adaptation and Injury	Role: *Consultant*
ONR - BUMED M94 - PH-TBI-WII: Dynamic Structural Neurophysiologic Imaging for Traumatic Brain Injury	Role: *Consultant*
Kavli Insitute: 2013-023CBAM: Taking the next step toward understanding computations by neural ensembles with high resolution neural recordings, generic data assimilation methods, and increased computational power	Role: *Scientific Team Member*
DARPA - Phase II SBIR (2014-2016) $1M	Role: Coinvestigator

POSITIONS AND EMPLOYMENT

Artistic Partner – Mainly Mozart, San Diego *Responsible for directing and curating the Mozart and the Mind Festival*	**Sept. 2012 - Present**
Trainee - National Science Foundation Temporal Dynamics of Learning Center, UC San Diego	**Aug. 2009-Present**
Graduate Teaching Assistant - UC San Diego, Dept. of Cognitive Science. Courses: COGS 107B *(Systems Neuroscience, Prof. D. Nitz),* COGS107C *(Cognitive Neuroscience, Prof. T. Jernigan)*	**Jan-Jun 2009;** **Jan-Mar 2010**
Graduate Student Researcher – Swartz Center for Computational Neuroscience, Institute for Neural Computation, UC San Diego Advisor: Scott Makeig, Ph.D; Director, SCCN	**Aug. 2008-Present**
Graduate Student Researcher – De Sa Laboratory, Dept. of Cognitive Science, UC San Diego Advisor: Virginia de Sa, Ph.D	**Aug. 2008-Present**
Staff Research Associate II / Junior Specialist – UC Berkeley, Helen Wills Neuroscience Institute, Lab: Robert T. Knight, M.D.	**Aug 2007-Jun 2008**
Undergraduate Research Assistant – UC Berkeley, Helen Wills Neuroscience Institute, Lab: Robert T. Knight, M.D.	**Apr. 2005 – Aug 2007**

Research Intern / Visiting Researcher – Palo Alto Research Center, Inc   **Jun 2006 –**
(formerly Xerox PARC). Palo Alto, CA   **Mar 2007**
One of 7 students selected from over 600 applicants from MIT, Stanford, Cornell, and Berkeley.

Tutor/Mentor – Foothill College Tutorial Center / Pass the Torch Program   **2002-2004**

Teaching Assistant – Foothill College, Dept. of Business and Social Sciences   **2002-2003**
Courses: HIST 17A (History of California, Prof. Yaya De Luna)

TEACHING EXPERIENCE

UC San Diego, La Jolla, CA

Graduate Teaching Assistant – COGS 107B (Systems Neuroscience). Prof D. Nitz.   **Winter, 2008**
                                                                                         Winter, 2009
Taught two weekly supplementary sections (90 undergrad and graduate students), held weekly office hours,
helped design and grade exams; created tutorial handouts and "slidecasts", and co-managed course website.

Graduate Teaching Assistant – COGS 107C (Cognitive Neuroscience). Prof. T.   **Spring, 2009**
Jernigan
Taught two weekly supplementary sections, weekly office hours, helped design and grade exams, maintained
WebCT site.

Lecturer – Cognitive Science Graduate Bootcamp   **Sep 2009**
Developed and taught tutorial on EEG fundamentals and signal processing using EEGLAB

Lecturer – Temporal Dynamics of Learning Center Summer Bootcamp   **Aug 2009**
Lectured on Matlab programming, EEG signal processing and Brain-Computer Interfaces (with live demonstration
of online, adaptive BCI for imagined motor movements)

UC Berkeley, Berkeley, CA
                                                                          2006-2007
Private Tutor
Tutored Computer Science undergraduates at UC Berkeley and Cornell (remotely)

Foothill College, Los Altos, CA

Teaching Assistant – HIST 17 (History of California). Prof Yaya deLuna   **2002-2003**
Assisted with online course management and technical support, grading, lecture presentation design

Tutor – Foothill College Tutorial Center   **2002-2004**
Tutored Math (through Calculus) and English Composition

International Workshops

Lecturer – Russian Postgraduate Training Network in Biotechnology of Neurosciences (BioN) Methodological
School 2013: Methods of data processing in EEG and MEG.   **April 17-30, 2013**
Lectures and hands-on practica on functional and effective connectivity analysis, linear dynamical systems and
vector autoregressive modeling, state-space representations and nonlinear models, multi-subject inference, and
the Source Information Flow Toolbox for EEGLAB.

Lecturer/Organizer – 10th–15th International EEGLAB Workshops   **Aug 2010-Present**
Co-organizer and Lecturer in 10th – 15th International EEGLAB Workshops, including the first Advanced EEGLAB
Workshop.

Lecturer – Workshop on Novel Statistical Methods in NeuroImaging (Joint Statistical Meeting)   **July 26, 2012**
Lectures on EEG analysis: Basic EEG biophysics, forward and inverse methods for source identification, spectral
decompositions and methods for modeling functional and effective connectivity, Source Information Flow

Toolbox**.**

Lecturer/Organizer – Lecture series on advanced EEG signal processing **Nov 30 – Dec 2, 2011**
Basque Center for Cognition Brain and Language (BCBL). Organized and delivered three-day lecture series on advanced EEG signal processing (EEGLAB basics, ICA, time-frequency analysis, dynamical systems modeling) with hands-on application using the EEGLAB & SIFT software packages.

Student Advisorship/Mentorship

Student Mentor – 2013 Siemens Competition **June 20 – Sept 30, 2013**
Official mentor for two exceptional Troy High School students (Nicholas Trank and Nelson Liu) participating in the 2013 Siemens Competition on Math:Science:Technology. Student project was titled: *"Utilizing Non-invasive BCI Technology to Facilitate Two Dimensional Mouse Control"*

PUBLICATIONS AND RESEARCH PROJECTS

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* authors contributed equally

PAPERS

Peer-Reviewed:

Broccard, F**., Mullen, T.,** Chi, Y.M., Peterson, D., Iversen, F., Arnold, M., Kreutz-Delgado, K., Jung, T-P., Makeig, S., Poizner, H., Sejnowski, T., Cauwenberghs, G. (accepted, May 2014). Closed-loop Brain-Machine-Body Interfaces for Noninvasive Rehabilitation of Movement Disorders. *Annals of Biomedical Engineering.*

Zao, J. K., Gan, T-T; You, C-K, Méndez, S.J.R., Chung, C-E, Wang, Y-T, **Mullen, T,** Jung T-P. (accepted, May 2014) Augmented Brain Computer Interaction based on Fog Computing and Linked Data*. IEEE Intelligent Environment Conference* (IE'14). Shanghai, China

Velu, P., **Mullen, T.,** Noh, E., Valdivia, M., Poizner, H., Baram, Y., de Sa, V. (2014) Effect of visual feedback on the occipital-parietal-motor network in Parkinson's disease with freezing of gait*. Frontiers In Neurology* 4:209. eCollection 2014.

Mullen, T.*, Kothe, C.* Chi, Y.M., Ojeda, A., Kerth, T., Makeig, S., Cauwenberghs, G., Jung, T-P. (2013) Real-Time Modeling and 3D Visualization of Source Dynamics and Connectivity Using Wearable EEG. *35th Annual International Conference of the IEEE Engineering in Biology and Medicine Society (IEEE EMBC).*

Bigdely-Shamlo, N., **Mullen, T.,** Kreutz-Delgado, K., Makeig, S. (2013) Measure Projection: A Probabilistic Alternative to EEG Independent Component Clustering. *NeuroImage.* Vol. 72, 15 May 2013, pp. 287-303.

Mullen, T., Worrell, G., Makeig, S. (2012) Multivariate Principal Oscillation Pattern Analysis of ICA Sources During Seizure. *34th Annual International Conference of the IEEE Engineering in Biology and Medicine Society (IEEE EMBC).*

Makeig, S.,* Kothe, C.,* Mullen, T.,* Bigdely-Shamlo, N., Zhang, Z., Kreutz-Delgado, K. (2012) Evolving Signal Processing for Brain–Computer Interfaces. *Proceedings of the IEEE*, vol.100, no. *Special Centennial Issue*, pp.1567-1584

Makeig, S., Leslie, G., **Mullen**, **T.,** Sarma, D., Bigdely-Shamlo, N., and Kothe, C (2011) Brain Dynamics of Affective Engagement in a Musical Emotion BCI. *Affective Computing and Intelligent Interaction. Lecture Notes in Computer Science. Vol. 6975. pp. 487-496. Springer.*

Mullen, T., Akalin Acar, Z., Worrell, G., Makeig, S. (2011) Modeling Cortical Source Dynamics and Interactions During Seizure. *33rd Annual International Conference of the IEEE Engineering in Biology and Medicine Society.*

Last Updated: May 12, 2014

(IEEE EMBC).

Leslie, G.* and **Mullen, T.*** (2011) MoodMixer: EEG-based Collaborative Sonification. *Proceedings of the International Conference on New Interfaces for Musical Expression*. Ed. A.R. Jensenius, A. Tveit, R.I. Godøy, D. Overholt. ISBN: 978-82-991841-7-5

Mullen, T., Warp, R., Jansch, A (2011) Minding the (Transatlantic) Gap: An Internet-Enabled Acoustic Brain-Computer Music Interface. *Proceedings of the International Conference on New Interfaces for Musical Expression*. Ed. A.R. Jensenius, A. Tveit, R.I. Godøy, Dan Overholt. ISBN: 978-82-991841-7-5.

Delorme, A., **Mullen, T.**, Kothe C., Akalin Acar, Z., Bigdely Shamlo, N., Vankov, A., Makeig, S. (2011) EEGLAB, SIFT, NFT, BCILAB, and ERICA: New tools for advanced EEG/MEG processing. *Computational Intelligence and Neuroscience* vol. 2011, Article ID 130714, 12 pages.

Published Reports (not peer-reviewed):

Mullen, T.R., (2010) The Source Information Flow Toolbox (SIFT): An Electrophysiological Information Flow Toolbox for EEGLAB. Theoretical Handbook and User Manual. Masters Project.www.sccn.ucsd.edu/wiki/SIFT.

Mullen, T., Huang, Q., Reich, J. Towards Ubiquitous Brain-Aware Computing: A Preliminary EEG Study (2007). *PARC technical report*

SELECTED CONFERENCE ABSTRACTS

2013

Miyakoshi, M., Rissling, A.J., **Mullen, T.,** Bigdely-Shamlo, N., Langton, S., Braff, D.L., Light G.A., Makeig, S. (2013) Cortical EEG information flow in schizophrenics and controls during resting state. Program No. 253.18/EE10 2013 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience, 2013. Online.

Mullen, T.*, Kothe, C.* Chi, Y.M., Ojeda, A., Kerth, T., Makeig, S., Cauwenberghs, G., Jung, T-P. (accepted, 2013) Real-Time Estimation and 3D Visualization of Source Dynamics and Connectivity Using Wearable EEG. *Fifth International Brain-Computer Interface Meeting*. Asilomar Conference Center, Pacific Grove, CA.

2012

Chukoskie, L., **Mullen, T.,** Bodenhamer, J.R., Brockelhurst, W.T., Lam, C., Wedeen, M., Townsend, J., Westerfield, M.A. (2012) Characterizing network interactions in EEG sources during saccade tasks. *Society for Neuroscience Conference.* New Orleans, LA, USA

Mullen, T., Kothe, C., Chi, Y.M., Jung, T-P., Makeig, S (2012). Real Time Estimation and 3D Visualization of Sparse Multivariate Effective Connectivity Using Wearable EEG. IEEE EMB/CAS/SMC Workshop on Brain-Machine-Body Interfaces. *IEEE Engineering in Biology and Medicine, 2012* (Live demonstration, 1-page whitepaper). Runner up, Best Demo Award.

Mullen, T., Delorme. A., Makeig, S. (2012) The Source Information Flow Toolbox 1.0 for EEGLAB. *Human Brain Mapping Conference.* Beijing, China.

2011

Mullen, T., Akalin Acar, Z., Palmer, J., Worrell, G, Makeig, S (2011). Analysis of neuronal source dynamics and connectivity during seizure using adaptive vector autoregressive models, sparse bayesian learning, independent component analysis, and electrocorticography. *Front. Hum. Neurosci. Conference Abstract: XI International*

Conference on Cognitive Neuroscience (ICON XI). doi: 10.3389/conf.fnhum.2011.207.00069

Thompson, W.*, Mullen, T.*, Makeig, S., (2011) A Bayesian spatiotemporal model for multi-subject EEG source dynamics and effective connectivity. *Front. Hum. Neurosci. Conference Abstract: XI International Conference on Cognitive Neuroscience (ICON XI).* doi: 10.3389/conf.fnhum.2011.207.00074

2010

Mullen, T., Makeig, S. (2010) An electrophysiological information flow toolbox for EEGLAB. *Society for Neuroscience Conference*, San Diego, CA

Thompson, W., Ombao H., **Mullen, T.**, Onton., J., Makeig, S. (2010) A Bayesian model for EEG frequency-domain functional connectivity. *Human Brain Mapping*. Barcelona, Spain

Thompson, WK, **Mullen, T.**, Motta, G., Ombao, H., (2010) Spatiotemporal Factor Analysis of EEG Evolutionary Latent Sources. *Human Brain Mapping*, Barcelona, Spain.

Mullen, T., Onton, J., Delorme, A., Thompson, W., Makeig, S. (2010) Analysis and visualization of theta-band information flow dynamics in an ERN-producing task. *Human Brain Mapping*. Barcelona, Spain.

2009

Mullen T,* Swann N,* Tandon N, Ellmore T, DiSano M, Dreyer S, Aron AR. (2009) Using Granger-causal techniques and intracranial EEG to examine directed information flow in a cortical network for stopping action. Poster. *Society for Neuroscience Conference.* Chicago, IL.

Velu, P., Hammon, P., **Mullen, T.**, de Sa, V. (2009) Dissociating visual response and motor preparation for reach prediction from EEG. Poster. *Society for Neuroscience Conference.* Chicago, IL.

2008

Bastos, A.,* Mullen, T.,* Canolty, R., Pasley, B., Knight, R., Freeman, R. (2008)
SSVEP-based Single-Trial Classification of Attention. Poster. *Cognitive Neuroscience Society Conference*, San Francisco, CA.

2007

Fuhrmann, G.,* Mullen T.,* Suppiah, S., Soltani, M., Edwards E., Canolty, R., Sarang, D., Kirsch, H., Barbaro, N., Knight, R.T. (2007) Functional Connectivity and Information Flow in the Human Brain during Language Processing: Evidence from ECoG data. Poster. *Cognitive Neuroscience Society Conference*, New York, N.Y.

2006

Mullen, T., Huang, Q., Reich, J. (2006) Project Halo: Enabling Ubiquitous Brain-Aware Computing. Poster. *PARC Annual Poster Session.* Palo Alto, CA.

Mullen, T., Bolton, J., Jian, S., Martinez , A. (2006) NEEDster: Need-based Exchange Enhancement Device. *Prototype Exhibition, Talk, and Poster. UC Berkeley HCI Poster Session*

2005

Padilla, M.L., **Mullen T.R.**, & Knight R.T. (2005) Differential contributions of lateral and orbitofrontal cortex to preparatory attention and action monitoring. Symposium Talk & Poster. *Society for Neuroscience Conference*, Washington D.C.

SELECTED SYMPOSIUM and other invited TALKS

INVITED WITH ALL EXPENSES PAID

Mullen, T. (April, 2013) The Dynamic Brain: Modeling Neural Dynamics and Interactions from M/EEG. Invited Keynote Lecturer. Russian Postgraduate Training Network in Biotechnology of Neurosciences (BioN). *Methodological School 2013: Methods of data processing in EEG and MEG. Applied aspects of magneto- and electroencephalographic neuroimaging.* Moscow, Russia

Mullen, T., (July 26, 2012) Lectures on EEG analysis: Basic EEG biophysics, forward and inverse methods for source identification, spectral decompositions and methods for modeling functional and effective connectivity. *Workshop on Developing Novel Statistical Methods in NeuroImaging. Joint Statistical Meeting 2012.* San Diego, CA. (honorarium awarded)

Mullen, T., (June 16-18) Lectures on Time-Frequency Analysis and Connectivity Analysis. *Fifteenth EEGLAB Workshop*, Tsinghua University. Beijing, China.

Mullen, T.R. (April, 2012). Vector autoregressive and state-space representations of electrophysiological dynamics and information transfer: theory and applications in the Source Information Flow Toolbox for EEGLAB. *NeFF Symposium on Non-linear and Model-free Interdependence Measures in Neuroscience.* Max Planck Institute / Goethe University. Frankfurt, Germany.

Mullen, T. (Nov 30 - Dec 2, 2011) Lecture series on Advanced EEG Signal Processing. Basque Center for Cognition Brain and Language (BCBL). Donostia/San Sebastian, Basque Autonomous Community.

Mullen, T.R., Akalin Acar, Z., Palmer, J. (2011) Spatiotemporal Dynamics and Interactions in Intracranial EEG. *2011 Sloan-Swartz Annual Meeting.* HHMI Janelia Farm Research Campus. Ashburn, VA, USA.

Mullen, T.R. (2011) Modeling multivariate EEG source information flow using adaptive vector autoregressive models. Symposium Talk. *Symposium on EEG advanced signal processing.* Aspet, France

Mullen, T.R. (2011) Analyzing oscillatory EEG/ECoG source dynamics and interactions using the Source Information Flow Toolbox (SIFT). *Fourteenth International EEGLAB workshop.* ICON XI. Mallorca, Spain.

Mullen, T.R. (2011) Time-Frequency Analysis, Information Flow, and Granger-Causality. Lecture. *Thirteenth International EEGLAB workshop.* Aspet, France.

Mullen, T.R**.** (2010) Modeling Distributed Brain Network Dynamics. Lecture. *Twelfth International EEGLAB workshop.* UC San Diego, La Jolla, CA, USA

Mullen, T.R. (2010) Modeling effective connectivity by measuring EEG information flow. Lecture. *Tenth International EEGLAB worksho*p. Jyvaskyla, Finland.

OTHER INVITED TALKS

Mullen, T., Kothe, C., Konings, O., Gazzaley, A. (March 26, 2014). Real-Time Functional Brain Imaging: How GPU Acceleration Redefines Each Stage. GPU Technology Conference. GTC 2014 - ID S4633.

Mullen, T. (Feb 21, 2014) Into the wild: Towards real-time mobile brain imaging, dynamical modeling, and cognitive state prediction. *Guest Lecture. COGS 200.* UC San Diego.

Mullen, T., Kothe, C. Chi, Y.M., Ojeda, A., Kerth, T., Makeig, S., Cauwenberghs, G., Jung, T-P. (2013) Modeling Source Dynamics and Connectivity Using Wearable EEG. Invited minisymposium talk and 1-page paper. *35th Annual International Conference of the IEEE Engineering in Biology and Medicine Society (IEEE EMBC).* Osaka, Japan.

Mullen, T. (August, 2012) The Source Information Flow Toolbox for EEGLAB. Invited Symposium Talk in

"Studying the brain as a network using MEG: practical considerations." *18th International Conference on Biomagnetism*. Paris, France.

Akalin Acar, Z., Mullen, T., Worrell, G., Makeig, S (August, 2012). Modeling electrocortical source dynamics in epilepsy. *Minisymposium paper. IEEE EMBS Conference.* San Diego, CA, USA.

Mullen, T., Akalin Acar, Z., Worrell, G., Makeig, S. (March, 2012) Spatiotemporal Modeling of Cortical Source Dynamics and Interactions in Epileptic Seizure. *Institute for Neural Computation Chalk Talk Series*. UC San Diego, CA.

Mullen, T., Akalin Acar, Z., Worrell, G., Makeig, S. (2011) Modeling Cortical Source Dynamics and Interactions During Seizure. Oral Presentation. *IEEE Engineering in Biology and Medicine.* Boston, MA.

Mullen, T.R. (2010) Information Flow Analysis in EEG. Invited Symposium Talk. *Society for Psychophysiological Research*. Portland, OR, USA.

PATENTS

Mullen, T. and Huang, Q. (2007) Brainwave-Facilitated Presenter Feedback Mechanism. USPTO Patent Application 20090143695 *(patent pending)*

Mullen, T. and Huang, Q. (2007) Brainwave-Aware Sleep Management. United States Patent 7689274

EDITORIAL ACTIVITIES

I have reviewed one or more (typically several) papers for each of the following scientific journals:

- Journal of Computational Neuroscience
- Neural Computation
- Journal of Neuroscience
- NeuroImage
- Brain Connectivity
- IEEE Transactions in Biomedical Engineering
- Frontiers in Neuroinformatics (Neuroscience)

I have reviewed papers for the following conferences:

- IEEE Biomedical Circuits and Systems Conference 2012

I have reviewed chapters for the following books:

- Toward Practical BCIs: Bridging the Gap from Research to Real-World Applications (2012,Springer)

COMMITTEE AND ADVISORY BOARD SERVICE

Advisory Board Member for the Future Brain/Neuronal Computer Interaction (FBNCI) research initiative (http://future-bnci.org/) developed under the Seventh Framework Programme [FP7/2007-2013] of the European Union

ACADEMIC MEMBERSHIPS

- International Electrical Engineering Society (IEEE) Student Member
- Phi Theta Kappa Honour Society (former)
- Foothill College chapter of Circle K Honour Society (former)

- Golden Key International Honour Society (former)

- Member, Society for Neuroscience

- Member, Cognitive Neuroscience Society

- Member, Organization for Human Brain Mapping

- (2005-2007) Officer, UC Berkeley Cognitive Science Student Association (CSSA)

SELECTED RELEVANT ART INSTALLATIONS/EXPOSTIONS AND OUTSIDE WORK

See http://www.antillipsi.net/art-1/bioart for details on these and other installations.

Mozart and the Mind Festival   **May 2012-Present**
Artistic Partner / Director / Artist
[San Diego, USA]

This annual series, produced by Mainly Mozart (San Diego), aims to bring together prominent musicians, composers, researchers, and scientists in live events exploring intersections between music and neuroscience, psychology, and health. I am responsible for curating and directing the series.

MoodMixer   **June 2011**
Grace Leslie and Tim Mullen
[NIME, Oslo, Norway; Mozart and the Mind 2012, San Diego, USA]

MoodMixer is an interactive brain-computer music interface (BCMI) installation in which participants collaboratively navigate a two-dimensional music space by manipulating their cognitive state and conveying this state via wearable electroencephalography (EEG) technology. The participants can choose to actively manipulate or passively convey their cognitive state depending on their desired approach and experience level. The music composition continually conveys the participants' expressed cognitive states while a colored visualization of their locations on a two-dimensional projection of cognitive state attributes aids their navigation through the space. MoodMixer is a collaborative experience that incorporates aspects of both passive and active EEG sonification and performance art. For a detailed discussion of the technical design of the installation and its place in collaborative sonification aesthetic design within the context of existing EEG-based music and art see [Leslie and Mullen, 2011, *NIME*].

Just: A Suite for Violin, Cello, Flute, and Brain   **June 2010**
Scott Makeig, Grace Leslie, Tim Mullen, Alex Khalil, Christian Kothe
[IBCI IV, Pacific Grove, USA; Sonic Diasporas Music Festival, UCSD, San Diego, USA]

Just explores the central question *"Is it possible to interpret EEG dynamics to learn what a subject is feeling? And if so, could we use EEG to communicate our feelings to others?"* The piece utilized a novel affective brain-computer interface to interpret EEG signals associated with emotions evoked by 'just' tuned intervals (integer ratio intervals). During the performance, evocation of each of these emotions by the 'brainist' (Mullen) led to playback of the respective associated interval, cueing musicians to play a short accompanying piece composed for each interval/emotion, thereby conveying the brainist's emotional state to the audience in musical form. *Just* was composed by Scott Makeig and first performed by Grace Leslie, Alex Khalil, Scott Makeig and Tim Mullen on June 2nd, 2010 for all attendees of the Fourth International Brain-Computer Interface meeting at the Asilomar Conference Center in Pacific Grove, California. A second reprisal was performed at the Sonic Diasporas Music Festival at UCSD on Jan 22, 2011. The demonstration is further described in [Makeig et al, 2011, *ACII*]

In Tones O/R/T/I: Music for Online Performer   **Jan 2010**
Tim Mullen, Richard Warp, Adam Jansch
[Huddersfield, UK; San Diego/San Francisco, USA]

As part of Adam Jansch and Richard Glover's *In Tones* series (U. Huddersfield, United Kingdom) composer Richard Warp and I created a transatlantic performance in which I controlled a quartet of robotic acoustic instruments in Huddersfield in real-time from San Diego, using my mind (technically, I manipulated four mental

processes quantified via high-density EEG and source-level signal processing). Compositional instructions were delivered from Warp in San Francisco. Audience members watched the performance in a concert hall in England, while hundreds more participated from around the world, interacting with Warp and directing the composition via simultaneous LiveStream audio-video streams from all three global locations. The installation is described in [Mullen et al, 2011 *NIME*] and a short documentary is available at http://tinyurl.com/InTonesMFOP.

EEG Ocean   Nov 2008
Nima Bigdely-Shamlo and Tim Mullen

[CalIT2, UCSD; Mozart and the Mind, San Diego, USA]

EEG Ocean borrows from the metaphor of mind-as-ocean in an effort to visualize complex brain dynamics in a manner that is at once scientifically informative, intuitive, and artistically engaging. Sources of EEG activity are algorithmically reconstructed from scalp EEG data using Independent Component Analysis (ICA), and each source represented as an "island" in a blue ocean. The estimated electrical activities of these sources over time are represented as waves "rippling" out from their respective source-islands. A single frame of an ongoing EEG Ocean movie can represent the collective activity of a large number of sources over a long period of time, allowing a viewer to identify and appreciate complex patterns of neural activity emerging on a local or global spatiotemporal scales.

Mindchill 2.0   Jun 2008
Tim Mullen, Gautam Agarwal, Richard Warp

[Fluxpoint, San Francisco, USA]

Arousal levels (measured by GSR) were mapped to transformation in time-lapse photography of engaging natural processes and fractal evolution. Relax, immerse in the moment, and plants grow on screen. GSR was also mapped to 5-instrument MIDI ensemble sonifying the psycho-physiological state of audience members and performing musicians.

Mindchill 1.0   Apr 2008
Gautam Agarwal and Tim Mullen

[Yuri's Night Bay Area, NASA Ames Research Center, Mountain View, CA]

Invited installation for 8000-participant expo/party at NASA to celebrate space exploration and the legacy of legendary cosmonaut Yuri Gagarin! Theme: *Radical technology for a sustainable future.* User's arousal levels (measured by GSR) control solid-liquid-gas transformations of physical materials as well as transformations (via time-lapse photography) of natural ecological and global processes. Relax and keep the polar ice-caps from melting!

Volunteer Work

UC Berkeley, Cognitive Science Student Association   **2004-2007**
Officer & Webmaster
Organized academic/social/educational events such as *Professors Eat Too, Feel Dead Brains,* Museum field trips, Distinguished professor lectures, and more. In faculty hires, represented cognitive science undergrads in evaluating faculty candidates.

Foothill College Pass the Torch Program   **2003-2004**
Tutor and Mentor
Volunteer program tutoring/mentoring underprivileged community college students