

TIM MULLEN

Curriculum vitae

3400 RICHMOND PKWY
APT#3418
SAN PABLO, CA 94806
(510) 205 8871
mullen.tim@gmail.com
http://www.antillipsi.net

INTERESTS AND OBJECTIVES

Currently, I'm mainly interested in research-oriented jobs involving application of time-series statistical analysis, computer science theory and statistical machine learning to problems in the fields of one or more of computational neuroscience, ubiquitous/mobile computing, and human-computer interaction. I'm interested in developing computational tools and methods that will help us understand the mechanisms underlying conscious information processing in the brain. Additionally, I'm interested in general-purpose and specialized brain-computer interfacing, and I hope to contribute to a future in which neural information can be used to create pervasive, ubiquitous technology that is context-aware, adaptive, and, yes, even *brain-aware*.

WORK EXPERIENCE

2002-2003 Foothill College – Business & Soc. Sciences Dept. | Los Altos, CA

Teaching Assistant – History of California

Assisted Dr. Yaya De Luna in History of California hybrid (online/on-campus) course administration and other BSS Dept. duties. These included ETUDES online classroom administration, grading, creation of lecture presentations and course material and brochure development for cultural events. Developed course website (separate from ETUDES).

2002-2004 Foothill College / Self-employed | Los Altos, CA

Tutor/Mentor

Provided one-on-one and group support via FHC Tutorial Center and Pass the Torch program for struggling college students in Mathematics (through Calculus), Biology, and Astronomy. Concurrently self-employed as private tutor for college and high-school students.

April 2005-August 2007 UC Berkeley – Helen Wills Neuroscience Institute | Berkeley, CA

Research Assistantship in Dr. Robert T. Knight's Lab:

Worked on various research projects relating to cognitive neuroscience. Initial work primarily involved statistical analysis, graphics, scripting, experimental design, and other tasks relating to two preparatory attention and emotion studies. Co-authored SFN '05 poster [4] and contributed to journal publication [2]. Subsequent work (last 9 months or so) has been more computational/theoretical in nature, focusing primarily on exploring information-theoretic and multivariate statistical approaches to modeling information flow in cortical networks. I've also developed a custom package in MATLAB for analyzing and graphically visualizing interactions between brain regions (via electrocorticography) using bivariate statistics (e.g., mutual information, cross-correlation), and clustering algorithms. Additional work has focused on the use of Independent Component Analysis combined with granger causality (MVAR modeling) and coherence to identify patterns of task-related information flow. Contributed to journal paper [3]. Poster presented at Cognitive Neuroscience Society Conference '07 [6]

June, 2006 –March, 2007 Palo Alto Research Center (PARC) (formerly Xerox PARC) | Palo Alto, CA

Paid Research Internship / Visiting Researcher

One of 7 students selected from over 600 MIT, Cal, Stanford & Cornell applicants for summer internship position. Spearheaded research project in Embedded Collaborative Computing Area (ECCA) within the PARC Computer Science Lab. This project focuses on the intersection of Ubiquitous Computing and Brain-Computer/Machine Interfaces (BCI/BMI). We utilize inexpensive, wearable brain imaging technology along with statistical machine-learning algorithms with the goal of developing general-purpose BCIs that are suitable for human-computer interaction and context aware applications. We've preliminarily proposed a distributed-computing-based framework suitable for ubiquitous brain-aware computing and demonstrated the ability to discriminate between useful cognitive states (e.g., bored vs. interesting reading, listening to music, relaxing) with up to 100% accuracy using a battery-powered wearable electroencephalographic (EEG) recording device. Following initial poster [5], Conference paper [1] was submitted and two patents pending [8, 9].

August 2007-Present UC Berkeley – Helen Wills Neuroscience Institute | Berkeley, CA

Staff RA II (Dr. Robert T. Knight's Lab):

Aside from continuing prior work on information flow and causal modeling of cortex in ECoG data, I'm additionally exploring the use of neurofeedback to improve sustained attention ability in humans. Specifically, we record brain activity (via EEG) while the user is doing a specific sustained attention task, then identify features of the ongoing brain activity that are associated with the changes in the user's attention, and, finally, feed this information back to the user (through a sensory modality such as vision or audition). This process of providing a user conscious access to internal cognitive processes (neurofeedback) is thought to enhance the ability for the user to improve certain cognitive abilities such as focused attention. I've maintained a co-leading role in this project, involved in every aspect including development and piloting of the experimental paradigm, data collection, writing C++ code to interface with the electroencephalographic data acquisition hardware, and computational analysis of the data (including the use of machine-learning algorithms to classify user attentional states and identify features of interest). Our work thus far has demonstrated the ability to

classify spatial attention in a binary fashion with high accuracy (80-95%). We are currently extending our work to continuous measures of tracking and classifying degree of attention. Poster [7] accepted for Cognitive Neuroscience Society Conference (CNS '08).

PUBLICATIONS

CONFERENCE PAPERS

- [1] Mullen, T., Huang, Q., Reich, J. (2007)
Towards Ubiquitous Brain-Aware Computing: A Preliminary EEG Study. (*under review*), MOBISYS '08, Breckenridge, Colorado

JOURNAL PAPERS

Acknowledged in:

- [2] Padilla, M., Hale, L., Wood, R., & Knight, R. T. (2006).
Lapses in a prefrontal-extrastriate preparatory attention network predict mistakes. *Journal of Cognitive Neuroscience.*
- [3] Fuhrmann Alpert, G., Sun, F. T., D'Esposito, M., & Knight, R. T. (2006).
Information Analysis of Event-Related BOLD Responses: Exploring Spatiotemporal Patterns of Brain Activations. *NeuroImage.*

INVITED TALKS and POSTERS

- [4] 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.
- [5] Mullen, T., Huang, Q., Reich, J. (2007)
Project Halo: Enabling Ubiquitous Brain-Aware Computing. *Poster.* PARC Annual Poster Session. Palo Alto, CA.
- [6] 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 Annual Conference, New York, N.Y.
- [7] Bastos, A.,* Mullen, T.,* Canolty, R., Pasley, B., Knight, R., Freeman, R. (2008)
SSVEP-based Single-Trial Classification of Attention. *Poster (accepted).* Cognitive Neuroscience Society Annual Conference, San Francisco, CA.

* These authors contributed equally to this work

PATENTS

- [8] Mullen, T. and Huang, Q. (2007). Brainwave-Facilitated Presenter Feedback Mechanism. (*patent pending*)
- [9] Mullen, T. and Huang, Q. (2007). Brainwave-Aware Sleep Management. (*patent pending*)

SELECTED TERM PROJECTS

CS160 : User Interface Design. Mullen, T., Bolton, J., Jian, S., Martinez, A. (2006) NEEDster: Need-based Exchange Enhancement Device. *Prototype Exhibition, Talk, and Poster.*

CS182: Neural Basis of Thought and Language. (2006). Dynamic Identification of Focal Cluster ROIs Using Time-lagged Mutual Information.

VS298: Theoretical Neuroscience (grad course) (2006). ICA-based Identification of Overlapping Spatial Clusters in ECoG Data.

STAT153: Time-Series Analysis (2007). Functional Connectivity and Information Flow in ECoG Data: A Linear Approach.

EDUCATION

B.A. Computer Science (2007)

B.A. Cognitive Science (neuroscience emphasis) (2007)

2001 (full year) Lake Superior College | Duluth, MN

General Education

- Deans List for Spring and Fall semesters (3.98 GPA)

2002-2004 Foothill College/DeAnza College | Los Altos, CA

General Education / Transfer preparation for UC Berkeley

- Training in Mathematics and Computer Science
- Dean's List multiple semesters
- Graduation (transfer) with Honors, 2004 (3.728 GPA)

2004-2007 UC Berkeley | Berkeley, CA

B.A.s in Computer Science and Cognitive Neuroscience

- 3.837 Cumulative GPA; Honors through 2007.
- Dean's List multiple semesters

Summer, 2005 Beoga.net statistics course (online)

AWARDS and acknowledgements

- Foothill, DeAnza, LSC, and UC Berkeley Dean's List, numerous semesters/quarters
- *2002-2003:* National Dean's List Award.
- *June 2004:* Member of Foothill College Honors Institute and completion of Honors program (official transcript notation)
- *June 2004:* Foothill College Math Excellence Award
- *2003-2004:* Various certificates of appreciation from FH Tutorial Center and Pass the Torch program for exemplary tutoring service.
- *Spring 2006.* Ranked in top 15% of Cal students by Golden Key International Honour Society.
- *Fall 2006.* 1 of 3 UC Berkeley Nominees for Computing Research Association (CRA) Outstanding Undergraduate Award (national competition)
- *Aug 2007.* Invited member of International Scholar Laureate Program (ISLP) Delegation on Technology to China (May, '08)

Academic affiliations

- Member of Phi Theta Kappa Honour Society
- Former member of Circle K Honour Society (Foothill College Chapter)

- Member of Golden Key International Honour Society
- (2005-2007) Webmaster/Officer of UC Berkeley Cognitive Science Student Association (CSSA)

REFERENCES

Robert T. Knight, M.D.

Evan Rauch Professor of
Neuroscience
Director, Helen Wills
Neuroscience Institute
Department of Psychology
132 Barker Hall
University of California at
Berkeley
Berkeley, CA 94720-3190
rtknight@berkeley.edu

Galit Fuhrmann Alpert, Ph.D

Knight Lab
Helen Wills Neuroscience
Institute
210A Barker Hall, MC #3190
University of California,
Berkeley
Berkeley, CA 94720-3190
galit@berkeley.edu

Qingfeng Huang, Ph.D

PARC CSL
3333 Coyote Hill Rd.
Palo Alto, CA 94304
qhuang@parc.com
voice: (650)-812-4301

Srini Narayanan, Ph.D

Group Leader, Artificial
Intelligence Group,
International Computer Science
Institute and
Adjunct Associate Professor
University of California,
Berkeley
ICSI, 1947 Center Street,
Berkeley CA 94704
Phone: 510-666-2953
snarayan@icsi.berkeley.edu