CNEL TIMES

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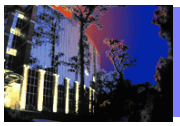


UNIVERSITY OF FLORIDA COMPUTATIONAL NEUROENGINEERING LABORATORY

Volume 2, Issue 1 **March 2008**

IEEE Signal Processing Society

MLSP 2008 to be held in Cancun, October 16-19, 2008

The 2008 IEEE International Workshop on Machine Learning for Signal Processing is being planned for October. Please join General Chair Jose Principe and an international group of experts at the Fiesta Americana Contesa Cancun Resort in Cancun, Mexico.

The workshop will feature keynote addresses, technical presentations, special sessions ad tutorials. The focus will be primarily on cognitive radio and kernel methods for nonlinear signal processing. Papers are solicited for, but not limited to, the major themes of Algorithms and Architectures, Applications, and Implementations. A data analysis and signal processing competition is also being held in conjunction with the workshop. The deadline for paper submission is May 5, 2008, and registration for authors will end on June 23. For more information, please see the call for papers at the end of CNEL Times, and visit our website: http://mlsp2008.conwiz.dk/

CNEL Seminars

- CNEL Seminars are scheduled every Wednesday, 2:00—3:30 PM in NEB 409.
- Seminars feature presentations from CNEL students, faculty members, and visitors.
- For more information, see our website, www.cnel.ufl.edu

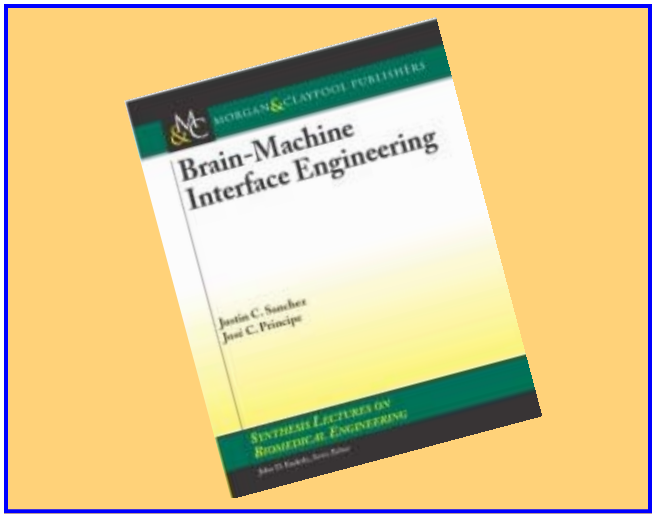
Sanchez, Principe publish new book, *Brain-Machine Interface Engineering*

Drs. Justin Sanchez and Jose Principe have completed a new book, *Brain-Machine Interface Engineering*. Published by Morgan and Claypool and edited by John D. Enderle as part of the "Synthesis Lectures on Biomedical Engineering" series, the book is now available at retail outlets.

According to Amazon.com:

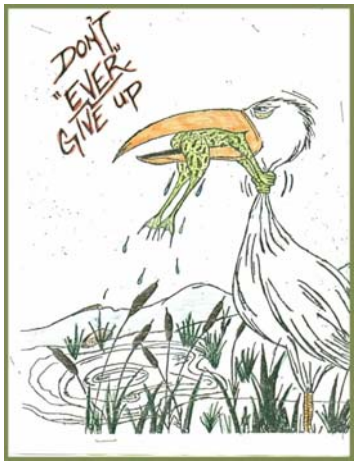
"Brain-Machine Interaction provides a unique framework for understanding the motivation and techniques of applying signal processing methodologies to brain-machine interaction (BMI) design and experimentation. Each chapter begins with a historical perspective and motivating example illustrating the need for this approach in BMI design. Included in each chapter is a list of assumptions associated with each methodological choice and the impact on BMI performance. To validate and advance the state-of-the-art of BMI modeling design, model performance is discussed and how the proposed model represents the neural-to-motor mappings. Finally, the feasibility of building BMIs (technical and practical aspects) is developed in the context of digital computational hardware. "

Dr. Principe is finalizing another book, *Information Theoretic Learning*, which will be published in 2008.



Inside this issue:

Where are they Now? Justin Sanchez	2-3
"Sempre gostei de perceber como funcionam as coisas"	3
CNELers Succeed at EFair	4
Upcoming Events	5
MSLP 08 Call for Papers	6



Good advice from Dr. Sanchez to present and future CNEL'ers!

Where are they now? Q&A with Justin Sanchez

Editor's note: Justin Sanchez is Assistant Professor in the departments of Pediatrics, Neuroscience, and Biomedical Engineering, and leads the Neuroprosthetics Research Group. Dr. Sanchez recently agreed to answer a few questions for CNEL Times.

What interested you in becoming a CNEL student?
I was taking this course called Experimentation and Uncertainty Analysis for Engineers - Peter Ifju was the UF professor - and the final project for the class involved writing a report on a application of the techniques. I was really interested in neural interfaces and wrote the report on that. In doing the background work, I found out that Dr. Principe was also interested in the topic...the rest is history!

What did you like most about being in CNEL?
The best part of the CNEL lab is the camaraderie that stems from the many students that have different backgrounds and expertise. I found that the interaction of the group and the surrounding environment naturally sparks growth among everyone involved. Dr. Principe always says, "go pick the brain of that person." The act of acquiring new knowledge from others as well as explaining yourself to others helps instill confidence in the development of ideas.

How did your educational and professional background, especially your time in CNEL, prepare you for your current position?
I have been very fortunate to be surrounded by individuals who "thought big" and who have strived to go above and beyond their capabilities. Without these people I would definitely not be the same person today. Before starting my undergraduate education I was trained by Jesuit priests who instilled in me a unique work ethic of knowledge and innovation. As an undergraduate, I worked as a volunteer researcher for Sem Lampotang in the Department of Anesthesiology. He completely broke me down, built me back up, and transformed me from passively accepting knowledge to actively pursuing it. In the CNEL lab, I learned to "think!" This means to become deeply ingrained in a problem and synthesize information to uncover new aspects of it. This leads to developing expertise in an area and true understanding of scientific theory and application.

What does your current position entail? What do you like most about it? What is most challenging?
My current position entails developing the theory and application of neuroprosthetics (direct neural interfaces) for communication and control in vivo. We seek to develop engineered systems that bypass damaged tissue in the nervous system and replace the communication channel with a prosthetic interface. This enables one to express their intent directly from their brain with bi-directional interaction back from the interface. One of my greatest goals is to translate the technologies that we develop in the lab into clinical treatments for human patients.

Given your history with CNEL, are there particular challenges or benefits to being the close collaborator that you are? Given your success so far in your career, have you had any difficulty making a name for yourself, or was it easy to sort of leave the nest while remaining connected?
I have always felt that I brought a complementary perspective to the CNEL lab. Coming from a more biomedical background, I tend to view engineering with the perspective of "how would nature solve the problem?" I have always aspired to take this perspective to help build a "culture of research" at UF that blends neural engineering, computational and systems neuroscience, and translational research. To build such a program involves a vested interest from a TEAM of researchers that share common goals; here it is the realization of neural interface technology on a large scale. I would love to put UF on the map for neurotechnology like some of the other great research centers like Research Triangle Park in North Carolina. To do this will require a team effort among the leaders of the College of Engineering, Shands Hospital, and the McKnight Brain Institute. We have the rare opportunity to have all of these places in such close proximity and they should be seamlessly working together in this endeavor. So I don't really worry about making a name for myself because I know in the end that if I do great work it will come out in the wash. However, I DO worry about what it will take to bring neural interface programs to the next level at UF. For this, close collaboration is the key!

Justin Sanchez, continued...

Do you have any special memories of being a CNEL student?
Dr. Principe invited us to attend a conference called Signal Processing for the 21st Century. It was organized by Simon Haykin and had all the best international researchers there. It was an amazing experience to interact with "legends" in the field. To get to the conference location, Lake Louise, Canada, we drove from Seattle. The whole experience really connected all of the students, including Deniz Erdogmus, Ken Hild, Yadu Rao - all CNEL grads (see photo). I will never forget it!

What advice would you give current or future CNEL students? Collaborators?
Students:
Be creative in your approach to tech innovation and seek out unconventional solutions. Be inspired by humanitarian problems they are often the most interesting and rewarding. Dig deep into the concepts of your research and don't give up at the slightest bump in the road!
Collaborators:
Now more than ever the problems that we are trying to overcome require multidisciplinary research and experimentation. Get out of your comfort zone and embrace other areas of expertise. Find a means to communicate from different perspectives on problems with a common goal.

In many ways good research is like a marriage. To make it work, you have to invest every aspect of your heart and mind into it. You have to seek out the deep secrets. You have to find ways to resolve tough experiences to strengthen the bond. Basically, it has to become a part of your life.

- Justin Sanchez, Ph.D. 2004

NRG NEUROPROSTHETICS RESEARCH GROUP

http://nrg.mbi.ufl.edu

From the Portuguese publication, Expresso, an interview with CNEL Director Jose Principe

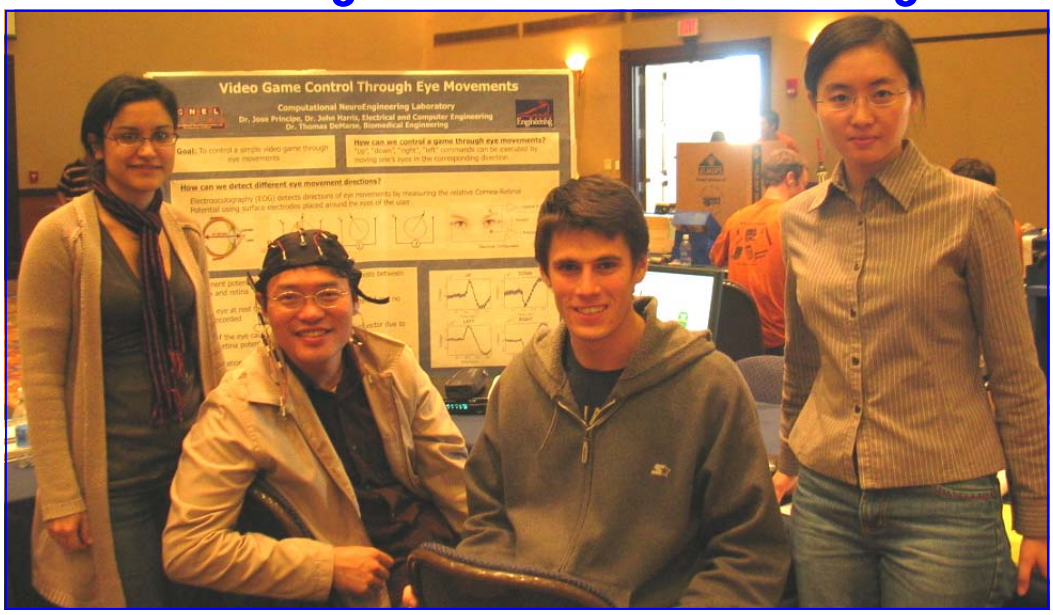
"Sempre gostei de perceber como funcionam as coisas"

O investigador português, radicado na Florida, recebeu do Instituto de Engenheiros Eléctricos e Electrónicos dos EUA o Prémio Carreira na área da Engenharia Biomédica. De passagem por Portugal, falou ao Expresso. É um dos líderes mundiais na área da Neuroengenharia Computacional. Nascido no seio de uma família burguesa do Porto, José Carlos Príncipe vive desde 1987 em Gainsville, uma pequena cidade universitária da Florida. Aos 57 anos, acaba de juntar mais uma distinção a um currículo impressionante. Docente universitário, investigador e empreendedor, ainda tem tempo para a fotografia, o golfe e o seu Porsche Boxter, que lhe tem valido alguns encontros com a polícia.

For the full text (in Portuguese), please see http://clix.expresso.pt/gen.pl?p=stories&op=view&fokey=ex.stories/122418

Expresso

CNELers recognized at E-Fair for design and creativity



CNEL students used an EOG (electro-oculography) system for their E-Fair demo. Electrodes detect electrical signals generated by eye movements. Those signals were then used to play a simple video game. Pictured left to right are Aysegul Gunduz, Steve Yen (modeling the EOG), Danny Schoonover, and Wenjuan Yan.

The CNEL team earned a Certificate of Special Recognition for "creative demonstrations, innovative design, and outstanding performance in the 2008 Engineering and Science Fair" for their poster and demonstration, entitled, "Video Game Control through Eye Movements." All CNEL and Hybrid lab members participated in the event.

The E-fair is an annual event hosted by the College of Engineering designed to acquaint elementary, middle, and high school student with opportunities in Engineering. This year's fair was the biggest ever, with elementary and secondary students from eight neighboring counties, as well as students from four local community colleges.

Publications and Research Proposals

Published Journal Papers:

Park, I., A.R.C. Paiva, J. Principe, T.B. DeMarse, "An Efficient Algorithm for Continuous-time Cross Correlogram of Spike Trains." J. Neuroscience Methods, Vol. 168, Issue 2, 15 March 2008, 514-523.

Guo, X., X. Qi, and J.G. Harris. "A time-to-first-spike imager." IEEE Sensors Journal, 7(8):1165-1175, Aug. 2007.

Submitted Journal Papers:

DiGiovanna, J., B. Mahmoudi, J. Fortes, J. C. Principe, and J. C. Sanchez, "Co-adaptive Brain Machine Interface via Reinforcement Learning" IEEE Transactions on Biomedical Engineering.

Paiva, A. R. C., I. Park, and J. C. Principe, "A comparison of binless spike train measures," Neurocomputing.

To Appear:

Weifeng Liu, J. Principe, "The Kernel Affine Projection Algorithms," EURASIP Journal on Advances in Signal Processing, 2008.

Camacho, A. "A sawtooth waveform inspired pitch estimator for speech and music." Journal of the Acoustical Society of America.

Ravinthula, V., V. Garg, J.G. Harris, and J.A.B. Fortes. "Time-Mode Circuits for Analog Computation." International Journal of Circuit Theory and Applications.

Accepted Conference Papers:

Liu, W. and J. C. Principe, "Extended recursive least squares algorithm in RKHS," 1st IAPR Workshop on Cognitive Information Processing, 2008

Park, Il and J.C. Principe, "Correntropy based on Granger causality." ICASSP 2008.

Paiva, A., I. Park and J.C. Principe, "Reproducing Kernel Hilbert Spaces for Spike Train Analysis." ICASSP 2008

Seth, S., and J.C. Principe, "Compressed Signal Reconstruction using the Correntropy Induced Metric Reconstruction." ICASSP 2008.

Gray, D. and J. Principe, "Dimensionality reduction and information-theoretic divergence between sets of LADAR images. SPIE Defense & Security 2008.

Harris, J.G., J. Xu, M. Rastogi, A. Singh-Alvarado, V. Garg, J.C. Principe, K. Vuppamandia, "Real time signal reconstruction from spikes on a digital signal processor." IEEE ISCS 2008.

Proposal:

Gray, David. "Target Separability and ATR Performance Using Kernel PCA and Information-Theoretic Divergence Measures."

2008 IEEE International Workshop on MACHINE LEARNING FOR SIGNAL PROCESSING

Formerly the IEEE Workshop on Neural Networks for Signal Processing

October 16-19, 2008 Cancun, Mexico

Fiesta Americana Condesa Cancun, www.fiestamericana.com

IEEE Signal Processing Society

Organizing Committee:
General Chair: Jose Principe
Program Chair: Deniz Erdogmus
Technical Chair: Tülay Adali
Publicity Chairs: Ignacio Santamaria, Marc Van Hulle
Publication Chair: Jan Larsen
Data Competition: Ken Hild, Vince Calhoun
Local Arrangements: Juan Azuela

CALL FOR PAPERS

The workshop will feature keynote addresses, technical presentations, special sessions and tutorials that will be included in the registration. Tutorials will take place on the afternoon of 16 October, and the workshop will begin on 17 October. The two areas of concentration for MLSP 2008 are cognitive radio and kernel methods for nonlinear signal processing. Papers are solicited for, but not limited to, the following areas:

Algorithms and Architectures: Artificial neural networks, kernel methods, committee models, Gaussian processes, independent component analysis, advanced (adaptive, nonlinear) signal processing, (hidden) Markov models, Bayesian modeling, parameter estimation, generalization, optimization, design algorithms.

Applications: Speech processing, image processing (computer vision, OCR) medical imaging, multimodal interactions, multi-channel processing, intelligent multimedia and web processing, robotics, sonar and radar, biomedical engineering, financial analysis, time series prediction, blind source separation, data fusion, data mining, adaptive filtering, communications, sensors, system identification, and other signal processing and pattern recognition applications.

Implementations: Parallel and distributed implementation, hardware design, and other general implementation technologies.

For the fourth consecutive year, a **data analysis and signal processing competition** is being organized in conjunction with the workshop. The goal of the competition is to advance the current state-of-the-art in theoretical and practical aspects of signal processing domains. The problems are selected to reflect current trends, evaluate existing approaches on common benchmarks, and identify critical new areas of research. Previous competitions produced novel and effective approaches to challenging problems, advancing the mission of the MLSP community. A description of the competition, the submissions, and the results, will be included in a paper which will be published in the proceedings. Winners will be announced and awards given at the workshop.

Selected papers from MLSP 2008 will be considered for a special issue of The Journal of Signal Processing Systems for Signal, Image, and Video Technology, to appear in 2009. The MLSP technical committee may invite one or more winners of the data analysis and signal processing competition to submit a paper describing their methodology to the special issue.

SCHEDULE

Submission of full paper:	May 5, 2008
Notification of acceptance:	June 16, 2008
Camera-ready paper and author registration:	June 23, 2008
Advance registration before:	July 1, 2008

PAPER SUBMISSION PROCEDURE

Prospective authors are invited to submit a double column paper of up to six pages using the electronic submission procedure at **http://mlsp2008.conwiz.dk**. Accepted papers will be published on a CDROM to be distributed at the workshop.

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The Computational NeuroEngineering Laboratory explores the principles that guide our ability to comprehend brain function, treat brain disorders, and ultimately to interface directly with the brain. Our researchers combine principles from machine learning, signal processing theory, and computational neuroscience to advance the science of engineering systems. On the horizon is a technological revolution, where machines can be controlled by the brain. We envision a time when brain and machine can interface through conscious thought, enabling normal function in cases of brain injury or disease.

CNEL's Hybrid Computation Group combines elements of analog/digital and biological/artificial in an effort to develop biologically inspired algorithms for sensory and neural processing.

Visit us on the web: www.cnel.ufl.edu

Conference	Location & Date	Next Critical Date
IEEE International Symposium on Circuits and Systems (ICSAS 2008) http://www.iscas2008.org/	Seattle, Washington, USA May 18-20, 2008	Online Registration May 1, 2008
IEEE World Congress on Computational Intelligence (WCCI 2008) http://www.wcci2008.org/	Hong Kong June 1-6, 2008	Early Registration April 15, 2008
1st IAPR Workshop on Cognitive Information Processing (CIP) http://cip2008.di.uoa.gr/index.html	Santorini, Greece June 9-10, 2008	Early registration: April 7, 2008
IEEE 11th International Conference on Computational Science and Engineering (CSE) http://www.icmc.usp.br/~cse08/	Sao Paulo, Brazil July 16-18	Paper Submission April 25, 2008
IEEE Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS) http://www.embc2008.com/	Vancouver, BC, Canada August 20-25	Abstract Submission April 7, 2008
Eurpoean Symposium on Time Series Prediction (ESTSP 08) http://www.haikko.fi/kokoukset/en_GB/presentation/	Porvoo, Finland September 17-19	Paper Submission May 1, 2008
IEEE International Conference on Image Processing (ICIP 2008) http://www.icip08.org	San Diego, California, USA October 12-15, 2008	Acceptance Notification April 25, 2008
IEEE International Conference on Machine Learning for Signal Processing (MLSP 2008) http://mslp2008.conwiz.dk/	Cancun, Mexico October 16-19	Paper submission May 5, 2008

CIBMI Workshop is Coming!

A one-week workshop in Brain-Machine Interfaces will be held this summer as part of the NSF-Funded Center for Innovative Brain Machine Interfaces (CIBMI).

The workshop will provide students with hands-on experience with testbed research, while coached by researchers and graduate students on theory, tools, and practice in their chosen area.

More details will be sent out as soon as possible