SALVADOR DURA-BERNAL, PH.D.

1810, Cortelyou Rd., 4B, Brooklyn 11226, NY, USA · ☎ +1-917-446-2747 · ✉ salvadordura@gmail.com · DOB: 21/06/82

EDUCATION

2006-2010 **Ph.D. degree in Computational Neuroscience**
Centre for Robotics and Neural Systems at University of Plymouth · Plymouth, UK
Dissertation: A cortical model of object perception based on Bayesian networks and belief propagation. (Examiner: Prof. A. SIllito, UCL)

2005-present **Psychology degree (3rd year)**
Universidad Nacional de Educacion a Distancia (UNED) · Spain

2000-2006 **B.Sc. and M.Sc. degree in Telecommunication Engineering**
Universidad de Las Palmas de Gran Canaria · LPGC, Spain
Dissertation: Air traffic simulator on multiagent platform (Summa cum laude)

ACADEMIC APPOINTMENTS

2016-Present **Adjunct Professor**
Dept. of Chemical and Biomolecular Engineering · New York University (NYU), Tandon School of Engineering, USA

2015-Present **Research Instructor (Faculty)**
Dept. of Physiology and Pharmacology · State University of New York Downstate Medical Center, USA

2012-Present **Post-Doctoral Research Fellow in DARPA REPAIR and NIH U01 projects**
Neurosimulation lab, Dept. of Physiology and Pharmacology · State University of New York Downstate Medical Center, USA

2011-2012 **Post-Doctoral Research Fellow in EU FP7 SCANDLE and ONR MURI projects**
Centre for Robotics and Neural Systems · University of Plymouth, UK
Center for Language and Speech Processing · Johns Hopkins University, USA

PUBLICATIONS

Journal Papers

2016 Dura-Bernal S, Neymotin SA, Kerr CC, Sivagnanam S, Majumdar A, Francis JT, Lytton WW. **Evolutionary algorithm optimization of biological learning parameters in a biomimetic neuroprosthesis.** *IBM Journal of Research and Development (Computational Neuroscience special issue)* (Submitted)

2016 Neymotin SA, Dura-Bernal S, Lakatos P, Sanger TD, Lytton WW. **Multitarget multiscale simulation for pharmacological treatment of dystonia in motor cortex.** *Frontiers in Pharmacology* (Accepted)

2016 Seidenstein A, Dura-Bernal S, Lytton WW, Schurmann F, McDougal R, Hines M. **Simulation neurotechnologies for advancing brain research: Parallelizing large networks in NEURON.** *Neural Computation* (Accepted)

2016 Dura-Bernal S, Li Kan, Neymotin SA, Francis JT, Principe JC, Lytton WW. **Restoring behavior via inverse controller in a lesioned cortical spiking model driving a virtual arm.** *Frontiers in Neuroscience (Neuroprosthetics)* 10:28. doi: 10.3389/fnins.2016.00028

2015 Dura-Bernal S, Zhou X, Neymotin SA, Przekwas A, Francis JT, Lytton WW. **Cortical spiking network interfaced with virtual musculoskeletal arm and robotic arm.** *Frontiers in Neurorobotics* 9:13. doi: 10.3389/fnbot.2015.00013

2014 Lee G, Matsunaga A, Dura-Bernal S, Zhang W, Lytton WW, Francis JT, Fortes AB. **Towards real-time communication between in vivo neurophysiological data sources and simulator-based brain biomimetic models.** *Journal of Computational Surgery* 3:12

2013 Dura-Bernal S, Chadderdon GL, Neymotin SA, Francis JT, Lytton WW. **Towards a real-time interface between a biomimetic model of sensorimotor cortex and a robotic arm.** *Pattern Recognition Letters* 36, 204-212

2013 Dura-Bernal S, Garreau G, Georgiou J, Andreou A, Denham SL, Wennekers T. **Multimodal integration of micro-Doppler sonar and auditory signals for behaviour classification with convolutional networks.** *International Journal of Neural Systems* 23, 1350021

2012 Dura-Bernal S, Wennekers T, Denham SL. **Top-Down Feedback in an HMAX-Like Cortical Model of Object Perception Based on Hierarchical Bayesian Networks and Belief Propagation.** *PLoS ONE* 7(11): e48216.

Conference Papers and Book Chapters

2015 Li K, Dura-Bernal S, Francis JT, Lytton WW, Principe JC. **Repairing lesions via kernel adaptive inverse control in a biomimetic model of sensorimotor cortex.** *In Neural Engineering (NER), 2015 7th International IEEE/EMBS Conference*, pp. 478-481, IEEE.

2013 Dura-Bernal S, Chadderdon GL, Neymotin SA, Zhou X, Przekwas A, Francis JT, Lytton WW. **Virtual musculoskeletal arm and robotic arm driven by a biomimetic model of sensorimotor cortex with reinforcement learning.** *In Signal Processing in Medicine and Biology Symposium (SPMB), 2013* pp. 1-5, IEEE.

2013 Ramenahalli R, Mendat D, Dura-Bernal S, Culurciello E, Niebur E, Andreou AG. **Audio-Visual Saliency Map: Overview, Basic Models and Hardware Implementation** *In Information Sciences and Systems (CISS), 2013 47th Annual Conference on, 2013*, pp. 1-6, IEEE.

2011 Garreau G, Dura-Bernal S, Andreou C, Andreou A, Georgiou J, Wennekers T, Denham SL. **Gait-based person and gender recognition using micro-Doppler signatures.** *In Biomedical Circuits and Systems Conference (BioCAS), 2011* pp.444-7, IEEE.

2011 Dura-Bernal S, Garreau G, Andreou C, Andreou A, Georgiou J, Wennekers T, Denham SL. **Human action categorization using ultrasound micro-Doppler signatures**. *Human Behavior Understanding*, In series: Lecture Notes in Computer Science Volume 7065, 2011 pp 18-28, Springer Berlin Heidelberg.

2011 Dura-Bernal S, Denham SL, Wennekers T. **The Role of Feedback in a Hierarchical Model of Object Perception**. *From Brains to Systems: Brain-Inspired Cognitive Systems*, In series: Advances in Experimental Medicine and Biology, Volume 718, pp 165-79 Springer New York.

2011 Dura-Bernal S, Wennekers T, Denham SL. **Modelling object perception in cortex: hierarchical Bayesian networks and belief propagation.** *In Information Sciences and Systems (CISS), 2011 45th Annual Conference on, 2011* pp.1-6, IEEE.

2010 Denham SL, Dura-Bernal S, Coath M, Balaguer-Ballester E. **Neurocomputational Models of Perceptual Organization** *Unconscious memory representation in perception:*

Processes and mechanisms in the brain, In series: Advances in Consciousness Research 78,Chapter 6. pp 147-177, John Benjamins Publishing.

Conference abstracts

2016 Dura-Bernal S, Suter BA, Neymotin SA, Kerr CC, Quintana A, Gleeson P, Shepherd GMG, Lytton WW. **NetPyNE: a Python package for NEURON to facilitate development and parallel simulation of biological neuronal networks.** *Computational Neuroscience (CNS'16).*

2016 Dura-Bernal S, Menzies RS, McLauchlan C, van Albada SJ, Kedziora DJ, Neymotin SA, Lytton WW, Kerr CC. **Effect of network size on computational capacity.** *Computational Neuroscience (CNS'16).*

2016 Neymotin SA, Dura-Bernal S, Seidenstein A, Lakatos P, Sanger TD, Lytton WW. **Multiscale modeling of M1 multitarget pharmacotherapy for dystonial.** *Computational Neuroscience (CNS'16).*

2015 Dura-Bernal S, Majumdar A, Neymotin SA, Sivagnanam S, Francis JT, Lytton WW. **A dynamic data-driven approach to closed-loop neuroprosthetics based on multiscale biomimetic brain models.** *IEEE Conference on High Performance Computing 2015 Workshop: Dynamic Data Driven Applications Systems (DDDAS).*

2015 Dura-Bernal S, Suter BA, Neymotin SA, Quintana AJ, Gleeson P, Shepherd GMG, Lytton WW. **Normalized cortical depth (NCD) as a primary coordinate system for cell connectivity in cortex: experiment and model.** *Society for Neuroscience (SFN'15).*

2015 Neymotin SA, Suter BA, Migliore M, Dura-Bernal S, Shepherd GMG, Lytton WW. **Optimizing computer models of layer 5 motor cortex pyramidal neurons using somatic whole-cell recordings.** *Society for Neuroscience (SFN'15).*

2015 Dura-Bernal S, Kerr CC, Neymotin SA,Suter BA, Shepherd GMG, Francis JT, Lytton WW. **Large-scale M1 microcircuit model with plastic input connections from biological PMd neurons used for prosthetic arm control.** *Computational Neuroscience (CNS'15).*

2015 Choi JS, Menzies RJ, Dura-Bernal S, Francis JT, Lytton WW, Kerr CC. **Spiking network modeling of neuronal dynamics in individual rats.** *Computational Neuroscience (CNS'15).*

2014 Dura-Bernal S, Li K, Brockmeier A, Kerr CC, Neymotin SA, Principe J, Francis JT, Lytton WW. **Repairing lesions via microstimulation in a spiking network model driving a virtual arm.** *Society for Neuroscience (SFN'14).*

2014 Kerr CC, Choi JS, Dura-Bernal S,S, Francis JT, Lytton WW. **One size does not fit all: calibrating microstimulation to individual subjects using spiking network models.** *Society for Neuroscience (SFN'14).*

2014 Dura-Bernal S, Li K, Brockmeier A, Kerr CC, Neymotin SA, Principe J, Francis JT, Lytton WW. **Modulation of virtual arm trajectories via microstimulation in a spiking model of sensorimotor cortex.** *Computational Neuroscience (CNS'14).*

2014 Kerr CC, O'Shea DJ, Goo W, Dura-Bernal S, Francis JT, Diester I, Kalanithi P, Deisseroth K, Shenoy K, Lytton WW. **Network-level effects of optogenetic stimulation in a computer model of macaque primary motor cortex.** *Computational Neuroscience (CNS'14).*

2014 Dura-Bernal S, Prins N, Neymotin S, Prasad A, Sanchez J, Francis JT, Lytton WW. **Evaluating Hebbian reinforcement learning BMI using an in silico brain model and a virtual musculoskeletal arm.** *Neural Control of Movement (NCM'14).*

2014 Kerr CC, O'Shea DJ, Goo W, Dura-Bernal S, Francis JT, Diester I, Kalanithi P, Deisseroth K, Shenoy K, Lytton WW. **Information flow in optogenetically stimulated macaque motor cortex: simulation and experiment.** *Neural Control of Movement (NCM'14).*

2014 Principe JC, Dura-Bernal S, Schroeder CE, Keil A, Ding M, Lytton WW. **Biomimetic multiscale modeling of cognitive architecture and active sensing.** *IARPA MICrONS Proposer's Day, Riverdale, Maryland (July 17).*

2013 Dura-Bernal S, Zhou X, Chadderdon GL, Przekwas A, Lytton WW. **Interfacing a biomimetic model of sensorimotor cortex with a musculoskeletal model and a robotic arm.** *Society for Neuroscience (SFN'13).*

2009 Dura S, Wennekers T, Denham SL. **Feedback in a hierarchical model of object recognition in cortex.** *Computational Neuroscience (CNS'09)*

2009 Durabernal S, Wennekers T, Denham SL. **The role of cortical feedback in a hierarchical model of object perception.** *Proceedings of the 32nd European Conference on Visual Perception, ECVP'2009, Regensburg.* Perception 38 ECVP Abstract Supplement:134.

Invited Talks

2016 **From Bayesian Models of the Visual Cortex to Spiking Models of Motor Cortex.** Research, Innovation and Dissemination Center for Neuromathematics (NeuroMat), University of Sao Paulo.

2015 **Computational Neuroscience.** Meet the Professional Series, Department of Biomedical Science, New York University (NYU) Tandon School of Engineering.

2013 **From Bayesian Models of the Visual Cortex to Spiking Models of Motor Cortex.** Applied Neuroscience Seminar, Applied Physics Lab, Johns Hopkins University.

2010 **A model of object perception in cortex based on Bayesian networks and belief propagation.** Probabilistic Neural Computation Series, Psychology Department, University of Sheffield.

2009 **Feedback in a Hierarchical Model of Object Perception.** Centre for Robotics and Neural Systems Inaugural Workshop, Plymouth.

TEACHING AND DISSEMINATION

2016-Present **Development and teaching of undergraduate course as Adjunct Professor.** *Topics in Biology: Computational Neuroscience.* NYU Tandon School of Engineering, NY

2015 **Development and teaching of Biomedical Engineering graduate course.** *Modeling in Life Sciences: Computational Neuroscience.* SUNY Downstate, NY

2014 **Contributed session to NEURON Workshop at SFN'14** *Interfacing NEURON with external/virtual devices.* Washington, US

2014 **Development and teaching of Neuroscience curriculum for middle school students.** New York Academy of Science, NY.

2014 **Practicum in Teaching STEM and Mentoring Middle School Students.** New York Academy of Science Graduate Course, NY.

2011 **Spanish and English as second language.** Summer school in Dakar, Senegal.

2010 **Contributed lectures to module CTCN3311 of BSc in Computer Science.** *Shape, form and object recognition in the brain.* University of Plymouth.

2009-2012 **Science, technology, engineering and maths (STEM) Ambassadors programme.** *Science engagement talks at schools and community colleges.* UK

2009 **Contributed lectures to module CTCN5206 of MSc in Computational Neuroscience.** *Hierarchical Information Processing and Models of the Brain.* University of Plymouth.

PROFESSIONAL DEVELOPMENT

Academic Reviewer : PLoS Computational Biology, PLoS ONE, Neural Computation, Neural Networks, Pattern Recognition Letters, Computational Neuroscience meeting, Nature Scientific Reports

Academic Memberships : Society for Neuroscience, Organization for Computational Neuroscience, Society for the Neural Control of Movement.

Workshops attended

2014 **Workshop on Interfacing Models with Brain Signals to Investigate Cognition**, UC Irvine.

2010 **Cognitive Neuromorphic Engineering Workshop**, Capocaccia, Italy. *Learning, attention, graphical models, cortical hierarchies and hardware implementation.*

2008 **Parallel C and Neuron Workshop**, University of Plymouth. *Special emphasis on large-scale V1 model running on computer cluster.*

2008 **Bayesian Cognition winter school**, Chamonix, France. *Probabilistic models of perception, inference, decision, action, learning and neural processing.*

2006 **Fuzzy Logic and its applications**, LPGC University, Spain.

2005 **Image and video compression standards**, IEEE students branch, Spain.

PROFESSIONAL SKILLS

Parallel Computing Administrator of 500-core HPC cluster and Nvidia K40 GPU.

Robotics Barrett's 7-DOF WAM robot arm.

Programming Python, MATLAB, NEURON, C, C++, JAVA, ADA, Visual Basic.

Electronics Digital and analog electronic circuit design using IDASS, Pspice, VHDL and Verilog.

Web development Work experience as freelance web developer, PHP, HTML, Flash, Dreamweaver.

Languages Spanish *(native)*, English *(Cambridge CPE)*, French *(Cambridge IGCSE)*

REFERENCES

William W. Lytton, Prof.
Dept. of Physiology and Pharmacology (Neurosimulation Lab)
State University of New York, Downstate Medical Center
450, Clarkson Av., Box 31
Brooklyn, NY 11203
☎ +1 718 270-6789
✉ billl@neurosim.downstate.edu

Joseph T. Francis, Prof.
Dept. of Physiology and Pharmacology (BMI Lab)

State University of New York, Downstate Medical Center
450, Clarkson Av.
Brooklyn, NY 11203
☎ +1 718 270 6338
✉ joe.francis@downstate.edu

Susan L. Denham, Prof.
Plymouth Institute of Cognition
University of Plymouth
A219, Portland Sq. Building
Plymouth, PL4 8AA, U.K.
☎ +44 (0)1752 584913
✉ s.denham@plymouth.ac.uk

Andreas G. Andreou, Prof.
Department of Electrical and Computer Engineering
The Johns Hopkins University
400B Barton Hall, Homewood Campus
3400 North Charles Street, Baltimore, MD 21218
☎ +1(410)516-8361
✉ andreou@jhu.edu