

## Latin American Summer School in Computational Neuroscience 2017

The principal aim of **LACONEU2017: 4th Latin-American Summer School in Computational Neuroscience** is to promote in Latin America the field of Computational Neuroscience through cutting edge mathematical and computational science tools and its applications in Biomedical Research and Clinical Application. The multidisciplinary study of brain function using neuroscience, mathematics and computational approaches helps to a better understanding of brain functionalities under normal or pathological states, as well as, to enhance important advances in education, theoretical frameworks, brain imaging, and biomedical therapies.

The organization of **LACONEU2017** will cover many critical and complementary areas (see topics from the program) with a direct impact and benefice for helping further interaction among participants. The courses deal from biophysics properties of neuronal network and their capacity for driving specific behavior up to the applications of this knowledge to a large field of brain function research from normal to pathological states. For instance, unpaired learning and memory brain capacity that affect a large human population with neurodegenerative process, where their understanding at the earliest stages improves compensatory therapies. The later is a critical step to help mental health welfare.

### Scientific committee

- **María-José Escobar**  
Departamento de Electrónica  
Universidad Técnica Federico Santa María  
Valparaíso, Chile
- **Patricio Orio**  
Centro Interdisciplinario de Neurociencia de Valparaíso  
Universidad de Valparaíso  
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- **Adrián Palacios**  
Centro Interdisciplinario de Neurociencia de Valparaíso  
Universidad de Valparaíso  
Valparaíso, Chile
- **Wael El-Deredy**  
Escuela de Ingeniería Biomédica  
Universidad de Valparaíso  
Valparaíso, Chile

## Scientific Program

### Week 1

#### Monday 9th

09:15 – 9:45: **Registration**

09:45 – 10:15: **Welcome**, A. Palacios, P. Orio and M.J. Escobar

10:15 – 10:45: COFFEE BREAK

10:30 – 11:30: **School Lecture:** Patricio Orio, "Biophysics of neural excitability"

11:30 – 12:30: **School Lecture:** Antonio Roque, "Sustained activity in a spiking cortical network model: phenomenology"

13:00 – 14: 30: LUNCH

14:30 – 16:30: **Tutorial Python.** Carolina Saavedra.

16:30 – 18:00: **Plenary Talk:** "A stochastic model for spiking neural networks: analysis and simulations", Antonio Roque

18:00 – 19:00: Welcome Reception

#### Tuesday 10th

09:15 – 10:15: **School Lecture:** Antonio Carlos Roque, "Sustained activity in a spiking cortical network model: mechanisms".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **School Lecture:** Patricio Orio, "Stochastic models of ion channel activation".

11:45 – 12:45: **School Lecture:** Adrián Palacios, "The retina: a benchmark for brain science".

13:00 – 14:30: LUNCH

14:30 – 16:30: **Tutorial Neuron:** Patricio Orio.

16:30 – 17:00: COFFEE BREAK

17:00 – 19:00: Student's work.

**Wednesday 11th**

09:15 – 10:15: **School Lecture:** María José Escobar, "Classification of retinal ganglion cells".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **School Lecture:** Rubén Herzog, "Computing with Neural Networks".

11:45 – 12:45: **School Lecture:** Nelson Trujillo, "The Bayesian Inference framework in a nutshell".

13:00 – 14:30: LUNCH

14:30 – 16:30: **Tutorial BRIAN:** María-José Escobar.

16:30 – 17:00: COFFEE BREAK

17:00 – 19:00: Student's work.

**Thursday 12th**

09:15 – 10:15: **School Lecture:** Matías Zañartu, "Digital signal processing".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **School Lecture:** Matías Zañartu, "Auditory system and psychoacoustics".

11:45 – 12:45: **School Lecture:** María José Escobar, "Learning in Spiking Neural Networks".

13:00 – 14:30: LUNCH

14:30 – 16:30: **Tutorial Statistics in Science** Pedro Valencia.

16:30 – 17:00: COFFEE BREAK

17:00 – 19:00: Student's work.

**Friday 13th**

09:15 – 10:15: **School Lecture:** Nelson Trujillo, "The Variational Bayes method, a gentle introduction".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **Tutorial EEG:** Pavel Prado / Wael El-Deredy.

11:45 – 12:45: **Tutorial EEG lab:** Pavel Prado / Wael El-Deredy.

13:00 – 14:30: LUNCH

14:30 – 16:30: Student's work: project presentation.

16:30 – 17:00: COFFEE BREAK

17:00 – 19:00: Student's work: project presentation.

## Week 2

### Monday 16th

09:15 – 10:15: **School Lecture:** Albert Compte, "Computational network models of spatial working memory".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **School Lecture:** Albert Compte, "Computational network models of spatial working memory".

11:45 – 12:45: **School Lecture:** Bruno Cessac, "Retinal waves: theoretical basis".

13:00 – 14:30: LUNCH

14:30 – 16:30: Student's work.

16:30 – 17:00: COFFEE BREAK

17:00 – 18:00: Student's work.

### Tuesday 17th

09:15 – 10:15: **School Lecture:** Alain Destexhe, "Stochastic integrative properties: from single neurons to the network".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **School Lecture:** Alain Destexhe, "Stochastic integrative properties: from single neurons to the network".

11:45 – 12:45: **School Lecture:** Bruno Cessac, "Retinal waves: experiments and theory".

13:00 – 14:30: LUNCH

14:30 – 16:30: Student's work.

16:30 – 17:00: COFFEE BREAK

17:00 – 18:00: Student's work.

### Wednesday 18th - Satellite Workshop "Computational Neurosciences: Trends and Challenges for the 2030"

08:30 – 09:00: Registration

09:30 – 10:00: Albert Compte, "Activity-based and synaptic-based memories in prefrontal cortex during spatial working memory".

10:00 – 10:30: Alain Destexhe, "Propagating waves and their collisions in visual cortex".

10:30 – 11:00: Bruno Cessac, "Handling the spatio-temporal correlations in neuronal systems".

11:00 – 11:30: COFFEE BREAK

11:30 – 12:00: Laurent Perrinet, "Back to the present: how neurons deal with delays".

12:00 – 12:30: Nelson Trujillo-Barreto, "Identification of switching brain networks using mixtures of linear dynamical systems".

12:30 – 13:00: Tatyana Sharpee, "Theoretical principles for understanding biological complexity".

13:00 – 14:30: LUNCH

14:30 – 15:00: Patricio Orio, "Is chaos making a difference? Synchronization transitions in chaotic neural oscillators".

15:00 – 15:30: Frédéric Alexandre, "What Computational Neuroscience can offer to Machine Learning : Autonomous Learning".

15:30 – 16:00: Wael El-Dereby, "Frequency-dependent plasticity".

16:00 – 16:30: COFFEE BREAK

16:30 – 17:30: Final words and farewell.

#### Thursday 19th

09:15 – 10:15: **School Lecture:** Tatyana Sharpee, "Maximally informative neural codes".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **School Lecture:** Laurent Perrinet, "Sparse optimization in neural computations".

11:45 – 12:45: **Tutorial Network Simulation:** Albert Compte.

13:00 – 14:30: LUNCH

14:30 – 16:30: Student's work.

16:30 – 17:00: COFFEE BREAK

17:00 – 18:00: Student's work.

#### Friday 20th

09:15 – 10:15: **School Lecture:** Tatyana Sharpee, "Analysis of neural feature selectivity".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **School Lecture:** Laurent Perrinet, "Active inference: from Bayesian methods to dynamical neural inference".

11:45 – 12:45: Student's work.

13:00 – 14:30: LUNCH

14:30 – 16:30: Student's work.

16:30 – 17:00: COFFEE BREAK

17:00 – 18:00: Student's work.

### Week 3

#### Monday 23rd

09:15 – 10:15: **School Lecture:** Matthias Müller, "Brain Computer Interfaces: It's all about attention! Models of visual attention and neural correlates".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **School Lecture:** Luis Carrillo-Reid, "Simultaneous two-photon imaging and two-photon optogenetics of neuronal ensembles in awake animals".

11:45 – 12:45: **School Lecture:** Frédéric Alexandre, "Modeling the cerebral circuits for prediction of rewards".

13:00 – 14:30: LUNCH

14:30 – 16:30: Student's work.

16:30 – 17:00: COFFEE BREAK

17:00 – 18:00: **Plenary talk:** Matthias Müller, "Searching for the girl on the bicycle: Neural dynamics of sustained feature-based attention in the human brain".

#### Tuesday 24th

09:15 – 10:15: **School Lecture:** Frédéric Alexandre, "Neuromodulation: mechanisms and functions".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **School Lecture:** Matthias Müller, "Driving BCIs with flickering lights: What do we have to know about attentional resource allocation and its consequences on steady state visual evoked potentials (SSVEPs)".

11:45 – 12:45: **School Lecture:** Wael El-Deredy, "Detecting Brain State Dynamics and State Transitions via Hidden Markov Models I".

13:00 – 14:30: LUNCH

14:30 – 16:30: Student's work.

16:30 – 17:00: COFFEE BREAK

17:00 – 18:00: **Plenary talk:** Luis Carrillo-Reid, "Imprinting and recalling cortical ensembles in vivo".

### Wednesday 25th

09:15 – 10:15: **School Lecture:** Luis Carrillo-Reid, "Identification of neuronal ensembles from calcium imaging recordings".

10:15 – 10:45: COFFEE BREAK

10:45 – 11:45: **School Lecture:** Emilio Kropff, "Attractor memory in the Hippocampus".

11:45 – 12:45: **School Lecture:** Wael El-Deredy, "Detecting Brain State Dynamics and State Transitions via Hidden Markov Models II".

13:00 – 14:30: LUNCH

14:30 – 16:30: Student's work.

16:30 – 17:00: COFFEE BREAK

17:00 – 18:00: **Plenary talk:** Emilio Kropff, "Spatial navigation in the Hippocampus and Medial Entorhinal Cortex".

### Thursday 26th

09:00 – 10:00: **School Lecture:** To be announced.

10:00 – 11:00: **School Lecture:** Emilio Kropff, "Cortical versus Hippocampal attractors"

11:00 – 11:30: COFFEE BREAK

11:30 – 12:30: **School Lecture** To be announced.

13:00 – 14:30: LUNCH

14:30 – 16:30: Student's work.

16:30 – 17:00: COFFEE BREAK

17:00 – 18:00: Student's work.

### Fridady 27th

09:00 – 11:00: Student's presentation.

11:00 – 11:30: COFFEE BREAK

11:30 – 12:30: Student's presentation.

13:00 – 14:30: LUNCH & FAREWELL.