

Dr. Rodrigo Echeveste

*sinc(i), UNL/CONICET
Santa Fe, Argentina*

Place and date of birth: 20/01/1987, Rosario, Argentina

Nationality: Argentine

Contact: *sinc(i), Ciudad Universitaria UNL,
Ruta Nacional Nº 168, km 472.4,
FICH, 4to Piso (3000) Santa Fe –
Argentina*

E-mail: *recheveste@sinc.unl.edu.ar*

Phone number: +54 342 4575233 ext 192

Website: rodrigoecheveste.wixsite.com/home



CURRENT POSITIONS

Assistant Researcher (Investigador Asistente) for CONICET, *sinc(i)*, CONICET/UNL, Santa Fe, Argentina.

Chief of practical works, FICH, UNL, Santa Fe, Argentina.

EDUCATION

Degree: Doctoral Degree in Natural Sciences (Dr. phil. Nat.), in the speciality of Physics. Grade: Magna Cum Laude. Thesis title: *“Complementary Approaches to Synaptic Plasticity: from Objective Functions to Biophysics”*. Supervisor: Prof. Dr. Claudius Gros. Institut für Theoretische Physik, Goethe Universität, Frankfurt am Main, Germany, (May 2016).

Degree: “Magister en Ciencias Físicas” (Master’s Degree Program in Physics). Instituto Balseiro, Universidad Nacional de Cuyo, Argentina, (January 2011 – December 2011). Thesis title: “Sensory Perception in Autistic Children”. Supervisor: Dr. Inés Samengo. GPA: 9.71/10, obtaining the *Prize for best student in Physics of Instituto Balseiro* (December 2011).

Degree: “Licenciado en Física” (equivalent to a 5 year degree course in Physics). Instituto Balseiro, Universidad Nacional de Cuyo, Argentina, (July 2008 – December 2010). Thesis title: “Sensory Perception in Autistic Children”. Supervisor: Dr. Inés Samengo. GPA: 8.4/10.

Three years of “Licenciatura en Física” (First three years* of a 5 year degree course in Physics), Universidad Nacional de Rosario, Argentina, (2005 – 2008). GPA: 9.5/10.

* *Instituto Balseiro demands all of it’s students to complete at least 2 years in a related-field Undergraduate Course in another University before entering the Institute.*

LANGUAGES

Spanish (mother tongue), **English** (advanced), **French** (advanced), **German** (intermediate).

WORK EXPERIENCE

RESEARCH POSITIONS

Assistant Researcher (Investigador Asistente) for Argentina's National Research Council (CONICET). Place of work: sinc(i), FICH, Universidad Nacional del Litoral (UNL), Santa Fe, Argentina. (November 2019 – present date)

Repatriation Postdoctoral position granted by Argentina's National Research Council (CONICET). Place of work: sinc(i), FICH, Universidad Nacional del Litoral (UNL), Santa Fe, Argentina. Director: Diego Milone. Codirector: Inés Samengo. (September 2019 – October 2019)

Research Associate (postdoctoral position) working with Prof. Máté Lengyel and Dr. Guillaume Hennequin at the CBL Lab, Engineering Department, University of Cambridge, UK (June 2016 – July 2019).

Part-time Research Assistant (Wissenschaftliche Hilfskraft) working with Prof. Claudius Gros at the Institut für Theoretische Physik, Goethe Universität, Frankfurt am Main, Germany (May 2014 – April 2016).

Research Assistant (Wissenschaftlicher Mitarbeiter) working with Prof. Claudius Gros at the Institut für Theoretische Physik, Goethe Universität, Frankfurt am Main, Germany (October 2012- April 2014) and (May 2016).

TEACHING EXPERIENCE

Chief of practical works for Physics I and II, Facultad de Ingeniería y Ciencias Hídricas, Universidad Nacional del Litoral (February 2020 – present).

Supervisor at Pembroke College, University of Cambridge, UK. Subject: 2nd year Mathematics for Engineers (Academic years 2016-2017, 2017-2018, and 2018-2019).

Supervisor at the Department of Engineering, University of Cambridge, UK. Subject: 3rd year Introduction to Neuroscience (Lent 2017, 2018, 2019).

Tutor at the Goethe University of Frankfurt, Germany, for the subjects: *Introduction to Programming for Physicists* (October 2014 – February 2015), *Self-Organization: Theory and Simulations* (April 2014 – August 2014), *Electrodynamics* (October 2013 – February 2014, and October 2015 – February 2016), *Complex and Adaptive Dynamical Systems* (April 2013 – August 2013), *Programmierpraktikum (Java Programming Course)* (October 2012 – February 2013).

Ad Honorem Teaching Assistant at Instituto Balseiro, Universidad Nacional de Cuyo, Argentina for the course *Thermodynamics* (January 2011 – July 2011).

Teacher of the subject *Physics* at the Levelling Course for the Admission to the “Tecnicaturas Universitarias” (University Technician's Course), Instituto Politécnico Superior “General San Martín”, Universidad Nacional de Rosario, Argentina (2007-2008).

Teaching Assistant at the Preparation Courses for the Physics Olympiads for Secondary School Students, Instituto Politécnico Superior “General San Martín”, Universidad Nacional de Rosario, Argentina (2005-2007).

ELECTED POSITIONS

Member of the Academic Senate of Instituto Balseiro, elected by the body of Undergraduate Students (September 2009 – September 2010).

AFFILIATIONS

Academic Associate of Pembroke College (December 2017 – July 2019).

RESEARCH GRANTS AND SCHOLARSHIPS

Research grant for Doctoral candidates from the German Academic Exchange Service (DAAD) with the goal of obtaining a PhD in Physics at the Goethe Universität, Frankfurt, Germany (May 2014 – April 2016).

Full Scholarship from “Fundación YPF” to pursue Bachelor and then Master studies at Instituto Balseiro, Universidad Nacional de Cuyo, Argentina (August 2008 – December 2011).

AWARDS

Prize for best student in Physics of Instituto Balseiro awarded by the Bariloche Chapter of the Argentine Association of Physics (AFA). This prize is awarded to the student with the best general average for the combined Bachelor and Master’s Degree Studies in Physical Science at Instituto Balseiro (December 2011).

TRAVEL GRANTS

Competitive Travel Grants for Advanced PhD Students to present their work in the 2016 ELSC Annual Retreat. Kibbutz Ein Gedi, Israel (January 2016).

Mentorship Travel Grant Award to attend the Computational and Systems Neuroscience (COSYNE) meeting 2015. Salt Lake City, USA (March 2015).

PUBLICATIONS

ARTICLES IN JOURNALS

Echeveste, R., Aitchison, L., Hennequin G., & Lengyel, M. *Cortical-like dynamics in recurrent circuits optimized for sampling-based probabilistic inference*. In press, **Nature Neuroscience** (2020), <https://doi.org/10.1038/s41593-020-0671-1>

Tourigny, D.S., Karim, M.K.A, Echeveste, R., Kotter, M.R.N., & O'Neill, J.S. *Energetic substrate availability regulates synchronous activity in an excitatory neural network*. **PLOS ONE** (2019)

Fonseca, M., Vattuone, N., Clavero, F., Echeveste, R., & Samengo, I. *The subjective metric of remembered colors: An information-theoretical analysis of the geometry of human chromatic memory*. **PLOS ONE** (2019), 14(1), e0207992. doi:10.1371/journal.pone.0207992

Echeveste, R., & Lengyel, M. *The redemption of noise: inference with neural populations*. (invited commentary on Ma et al. *Nature Neuroscience* 9:1432-1438, 2006). **Trends in Neurosciences** (2018), 41(11), 767-770. doi:10.1016/j.tins.2018.09.003

Trapp, P., Echeveste, R., & Gros, C. *E-I balance emerges naturally from continuous Hebbian learning in autonomous neural networks*. **Scientific Reports** (2018), 8(1), 8939. doi:10.1038/s41598-018-27099-5

Echeveste, R., Eckmann, S., & Gros, C. *Drifting states and synchronization induced chaos in autonomous networks of excitable neurons*. **Frontiers in Computational Neuroscience** (2016), 10:98. doi: 10.3389/fncom.2016.00098

Echeveste, R., Eckmann, S., & Gros, C. *The Fisher Information as a Neural Guiding Principle for Independent Component Analysis*. **Entropy** (2015), 17(6), 3838-3856; doi:10.3390/e17063838.

Echeveste, R., & Gros, C. *Two-trace model for spike-timing dependent synaptic plasticity*. **Neural Computation** (2015), 27 (3), 672-698. doi:10.1162/NECO_a_00707

Echeveste, R., & Gros, C. *Generating functionals for computational intelligence: the Fisher information as an objective function for self-limiting Hebbian learning rules*. **Frontiers in Robotics and AI** (2014), 1:1. doi: 10.3389/frobt.2014.00001

ARTICLES IN PROCEEDINGS

Echeveste, R., & Gros, C. *An objective function for self-limiting neural plasticity rules*. **ESANN 2015 Proceedings** (2015), ISBN 978-287587014-8.

ARXIV PAPERS

Echeveste, R., Hennequin, G., & Lengyel, M. *Asymptotic scaling properties of the posterior mean and variance in the Gaussian scale mixture model*. **arXiv:1706.00925** (2017)

EXTENDED ABSTRACTS

Gros, C., & Echeveste, R. *The Fisher information as a guiding principle for self-organizing processes*. **Workshop on Information Theoretic Incentives for Artificial Life** (2014). p.5

THESES

PhD Thesis: *Complementary approaches to Synaptic Plasticity: from Objective Functions to Biophysics*. Supervisor: Dr. Claudius Gros. Goethe University Frankfurt, Germany (2016). Link: <http://publikationen.ub.uni-frankfurt.de/frontdoor/index/index/year/2016/docId/29770>

Master's Thesis: *Sensory Perception in Autistic Children*. Supervisor: Dr. Inés Samengo. Instituto Balseiro, Universidad Nacional de Cuyo, Argentina (2011). Link (in Spanish with an English abstract): <http://ricabib.cab.cnea.gov.ar/316/1/1Echeveste.pdf>

PEER REVIEW WORK

JOURNALS

- NEURAL NETWORKS
- PLOS COMPUTATIONAL BIOLOGY

CONFERENCES

- COSYNE
- Workshop on GRaphs in biomedicAl Image analysis - GRAIL

POSTER AND ORAL PRESENTATIONS

TALKS

"Cortical-like dynamics in recurrent circuits optimized for sampling-based probabilistic inference". Brainmap Seminar, Martinos Center, Harvard Medical School and MIT (August 2020).

"Webinar de la Pandemia. Y ahora ¿qué? Cuatro jóvenes interrogan el futuro." Webinar organized by Usina Social, livestreamed on youtube (June 2020).

“Dinámica en Redes Neuronales: un ida y vuelta entre teoría y experimentos”. Seminar of the Medical Physics Department, Centro Atómico Bariloche, Bariloche, Argentina (February 2020).

“Dinámica en Redes Neuronales: un ida y vuelta entre teoría y experimentos”. Seminario del Laboratorio de Cronobiología de la Universidad Nacional de Quilmes. Quilmes, Buenos Aires, Argentina (November 2019).

“Cortical-like dynamics emerge in recurrent neural networks optimized for sampling-based probabilistic inference”. XXXIV Reunión Anual de la SAN. Carlos Paz, Córdoba, Argentina (October 2019).

“Cortical-like dynamics emerge in recurrent neural networks optimized for sampling-based probabilistic inference”. MAFI Seminar, Babeş-Bolyai University. Cluj-Napoca, Romania (June 2019).

“Cortical-like dynamics emerge in recurrent neural networks optimized for sampling-based probabilistic inference”. NeuroBioTheory Seminar, Frankfurt Institute for Advanced Studies (FIAS). Frankfurt, Germany (May 2019).

“Dinámica cortical en redes neuronales recurrentes entrenadas para realizar inferencia por muestreo bajo restricciones biológicas”. Seminario del sinc(i). Santa Fe, Argentina (April 2019).

“Internally generated network dynamics for probabilistic inference: from data to theory (and back again)”. Bernstein Conference 2018 Satellite Workshop “Internally generated network dynamics: experiment and theory”. Berlin, Germany (September 2018).

“Synchronization in a non-uniform network of excitatory spiking neurons.”. Echeveste, R., & Gros, C. American Physical Society (APS) March Meeting. Baltimore, USA (March 2016).

“An objective function for Hebbian self-limiting synaptic plasticity rules”. Gros, C., Eckmann, S., & Echeveste, R. American Physical Society (APS) March Meeting. Baltimore, USA (March 2016).

“Dynamical states in the sensorimotor loop of a rolling robot”. Sándor, B., Jahn, T., Martin, L., Echeveste, R., & Gros, C. American Physical Society (APS) March Meeting. Baltimore, USA (March 2016).

“Self-stabilizing Plasticity Rules derived from the Stationarity Principle of Statistical Learning”. ELSC Retreat. Kibbutz Ein Gedi, Israel (January 2016).

“Complementary approaches to Computational Neuroscience: Objective Functions and Biophysics”. Condensed Matter Theory Seminar, ITP, Frankfurt University. Frankfurt, Germany (November 2015).

“Complementary approaches to Synaptic Plasticity: Objective Functions and Biophysics”. Cambridge University, Engineering Department, CBL. Cambridge, UK (October 2015).

“Complementary approaches to Synaptic Plasticity: Objective Functions and Biophysics”. NeuroBioTheory seminar, Frankfurt Institute for Advanced Studies (FIAS). Frankfurt, Germany (January 2015).

“Asymmetric two-trace model for STDP”. DPG-Frühjahrstagung (German Physical Society Meeting) 2014, Condensed Matter Section. Dresden, Germany (April 2014).

“Física y Autismo: El Rol de la Física en Problemas Tradicionalmente Reservados a Otras Disciplinas”. Asociación Latina de Programación Neurolingüística y Tecnologías Afines (A.La.P.N.L.). Paraná, Entre Ríos, Argentina, (July 2011).

POSTERS

Computational and Systems Neuroscience (COSYNE) meeting 2019, “Cortical-like dynamics in recurrent E-I networks optimized for fast probabilistic inference”, Rodrigo Echeveste, Guillaume Hennequin, Máté Lengyel. Lisbon, Portugal (February 2019).

Bernstein Conference, “Fast sampling-based probabilistic inference with non-linear recurrent neural networks under biological constraints”, Rodrigo Echeveste, Guillaume Hennequin, and Máté Lengyel. Berlin, Germany (September 2018).

Bernstein Conference, “How to train your dRagoNN: teaching neural networks probabilistic inference under biological constraints”, Rodrigo Echeveste, Guillaume Hennequin, and Máté Lengyel. Göttingen, Germany (September 2017).

Bernstein Conference, “EI balance: necessary or inevitable?”, Philp Trapp, Rodrigo Echeveste, and Claudius Gros. Göttingen, Germany (September 2017).

Computational and Systems Neuroscience (COSYNE) meeting 2017, “GSM = SSN: recurrent neural circuits optimised for probabilistic inference”, Rodrigo Echeveste, Guillaume Hennequin, Máté Lengyel. Salt Lake City, USA (February 2017).

Computational Neuroscience Society (CNS) meeting, “A simple effective model for STDP: from spike pairs and triplets to rate- encoding plasticity” Rodrigo Echeveste, and Claudius Gros. Prague, Czech Republic (July 2015).

Computational Neuroscience Society (CNS) meeting, “Should Hebbian learning be selective for negative excess kurtosis?” Claudius Gros, Samuel Eckmann, and Rodrigo Echeveste. Prague, Czech Republic (July 2015).

EITN Workshop on Learning and Plasticity, “An Objective Function for Hebbian self-stabilizing Plasticity Rules.”, Rodrigo Echeveste, Samuel Eckmann, and Claudius Gros. Paris, France (June 2015).

Osnabrück Computational Cognition Alliance Meeting (Occam) 2015, “From Stationarity to ICA: an Objective Function for Hebbian self-stabilizing Plasticity Rules.”, Rodrigo Echeveste, Samuel Eckmann, and Claudius Gros. Osnabrück, Germany (May 2015).

European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN) 2015, “An objective function for self-limiting neural plasticity rules.” Rodrigo Echeveste and Claudius Gros. Bruges, Belgium (April 2015).

DPG-Frühjahrstagung (German Physical Society Meeting) 2015, Condensed Matter Section, “An objective function for Hebbian self-stabilizing neural plasticity rules”, Rodrigo Echeveste and Claudius Gros. Dresden, Germany (March 2015).

Computational and Systems Neuroscience (COSYNE) meeting 2015, “Deducing Hebbian Adaption Rules from the Stationarity Principle of Statistical Learning”, Claudius Gros and Rodrigo Echeveste. Salt Lake City, USA (March 2015).

Winter School in Quantitative Systems Biology. Topic: Systems Neuroscience. Abdus Salam International Centre for Theoretical Physics (ICTP), “Two-trace model for STDP” Rodrigo Echeveste and Claudius Gros. Trieste, Italy (December 2014).

ESI Systems Neuroscience Conference (ESI-SyNC) 2014, “Learning in Neural Models driven by Objective Functions”, Rodrigo Echeveste and Claudius Gros. Frankfurt, Germany (July 2014).

Osnabrück Computational Cognition Alliance Meeting (Occam) 2014, “Two-trace model for STDP”, Rodrigo Echeveste and Claudius Gros. Osnabrück, Germany (May 2014).

DPG-Frühjahrstagung (German Physical Society Meeting) 2014, Condensed Matter Section, “Self-stabilizing Learning Rules in Neural Models driven by Objective Functions”, Rodrigo Echeveste and Claudius Gros. Dresden, Germany (April 2014).

XXVIII Congreso de la Sociedad Argentina de Investigación en Neurociencias (SAN), “Visual-memory strategies employed by children in the autistic spectrum”, Melisa Maidana Capitán, Rodrigo Echeveste, Inés Samengo. Huerta Grande, Argentina (September 2013).

Bernstein Conference 2013, “Self-stabilizing Learning Rules in Neural Models driven by Objective Functions”, Rodrigo Echeveste and Claudius Gros. Tübingen, Germany (September 2013).

Osnabrück Computational Cognition Alliance Meeting (Occam) 2013, “Learning in Neural Models driven by Objective Functions”, Rodrigo Echeveste and Claudius Gros. Osnabrück, Germany (May 2013).

Taller Regional de Física Estadística y Aplicaciones a la Materia Condensada (Trefemac), “Estrategias de memoria visual en sujetos con diagnóstico del espectro autista”, Melisa Maidana Capitán, Rodrigo Echeveste and Inés Samengo. La Plata, Argentina (May 2013).

Third EUCogIII Members Conference, “Learning in Neural Models driven by Objective Functions”, Rodrigo Echeveste and Claudius Gros. Palma de Mallorca, Spain (April 2013).

97a Reunion Nacional de la Asociacion Física Argentina (AFA), “Estrategias de memoria visual en sujetos con diagnóstico del espectro autista”, Melisa Maidana Capitán, Rodrigo Echeveste and Inés Samengo. Villa Carlos Paz, Córdoba, Argentina (September 2012).

XXVI Reunión Anual de la Sociedad Argentina de Investigación en Neurociencias (SAN), “Sensory Stimulus Categorization in Autistic Children”, Rodrigo Echeveste and Inés Samengo. Huerta Grande, Argentina (October 2011).

II Reunión Conjunta de la Asociación de Física Argentina y la Sociedad Uruguaya de Física (AFA-SUF), “Categorización de Estímulos Sensoriales en Niños Autistas”, Rodrigo Echeveste and Inés Samengo. Montevideo, Uruguay (September 2011).

ATTENDED COURSES, SCHOOLS, RETREATS, AND CONFERENCES

ADDITIONAL UNIVERSITY COURSES

Machine Learning Course from the Computational Science Degree Course at Universidad Nacional de Rosario, Argentina (March - July 2012) Grade obtained: 10 out of 10.

SCHOOLS

INCF Summer School: Information Processing in Neural Systems: From Single Neurons to Large-Scale Models of Cognition, Osnabrück, Germany (May 2015).

Winter School in Quantitative Systems Biology. Topic: Systems Neuroscience. Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy (December 2014).

Winter School “Escuela de Ciencias Informáticas (ECI) 2010” del Departamento de Computación, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Buenos Aires, Argentina (July 2010). Courses taken: Reinforcement Learning, Natural Language Generation.

CONFERENCES, RETREATS, WORKSHOPS, AND MEETINGS

XXXIV Reunión Anual de la SAN. Carlos Paz, Córdoba, Argentina (October 2019).

Computational and Systems Neuroscience (COSYNE) workshop and main meeting 2018. Lisbon and Cascais, Portugal (February-March 2019).

8th Annual Cambridge Neurological Society Symposium. Topic: Neuroinflammation. Cambridge, UK (February 2019).

Bernstein Conference 2018. Berlin, Germany (September 2018).

Cambridge Memory Meeting 2018. Cambridge, UK (May 2018)

Computational and Systems Neuroscience (COSYNE) workshop and main meeting 2018. Denver and Breckenridge, USA (March 2018).

Bernstein Conference 2017. Göttingen, Germany (September 2017).

Computational and Systems Neuroscience (COSYNE) main meeting and workshop 2017. Salt Lake City and Snowbird, USA (February 2017).

Workshop: *The state and future of probabilistic methods for modeling brain functions*. Budapest, Hungary (September 2016).

American Physical Society (APS) March Meeting. Baltimore, USA (March 2016).

ELSC Retreat. Kibbutz Ein Gedi, Israel (January 2016).

Computational Neuroscience Society (CNS) meeting. Prague, Czech Republic (July 2015).

EITN Workshop on Learning and Plasticity. Paris, France (June 2015).

Osnabrück Computational Cognition Alliance Meeting (Occam) 2015. Osnabrück, Germany (May 2015).

European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN) 2015. Bruges, Belgium (April 2015).

DPG-Frühjahrstagung (German Physical Society Meeting) 2015. Condensed Matter Section, Dresden, Germany (March 2015).

Computational and Systems Neuroscience (COSYNE) meeting 2015. Salt Lake City, USA (March 2015).

ESI Systems Neuroscience Conference (ESI-SyNC) 2014. Frankfurt, Germany (July 2014).

Osnabrück Computational Cognition Alliance Meeting (Occam) 2014. Osnabrück, Germany (May 2014).

DPG-Frühjahrstagung (German Physical Society Meeting) 2014, Condensed Matter Section. Dresden, Germany (April 2014).

INS conference: "The Dynamic Brain". Marseille, France (November 2013).

Bernstein Conference 2013. Tübingen, Germany (September 2013).

Osnabrück Computational Cognition Alliance Meeting (Occam) 2013. Osnabrück, Germany (May 2013).

Third EUCogIII Members Conference. Palma de Mallorca, Spain (April 2013).

XXVI Reunión Anual de la SAN, Huerta Grande, Córdoba, Argentina (October 2011).

II Reunión Conjunta de la Asociación de Física Argentina y la Sociedad Uruguaya de Física (AFA-SUF), Montevideo, Uruguay (September 2011).

Segunda Reunión Conjunta de Neurociencias (IIRCN): XXV Reunión Anual de la Sociedad Argentina de Investigación en Neurociencias (SAN) y XII Taller Argentino de Neurociencias (TAN). Huerta Grande, Córdoba, Argentina (October 2010).

Course "Physics and Neuroscience: heading towards quantitative biology". Huerta Grande, Córdoba, Argentina (October 2010).

95° Reunión de la Asociación de Física Argentina (AFA). Malargüe, Mendoza, Argentina (September 2010).

"XXIV International Conference on Photonic, Electronic and Atomic Collisions". Rosario, Santa Fe, Argentina (July 2005).

Santa Fe, Argentina, August 2020.