



**Camilo A. Miguel
Signorelli**



Contact



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Oxford, UK.



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Motivations



Innovation
Entrepreneurship
Leadership



Education
Research
Cognitive &
Computer Science

Languages



Spanish: Native



English: Advanced



French: Basic



Technical Competencies

Matlab and Python
languages, Microsoft Tools,
Micro-electrode Technique,
Cut Open electrophysiology,
Psychophysics, EEG.



Education

2018-Curr

DPhil/PhD Student

University of Oxford and collaborations with UNICOG-
Sorbonne Université & CBC-Universitat Pompeu Fabra.

2013-2016

MSc in Neuroscience

Universidad de Valparaíso, Chile.

2005-2010

Degree in Physics

With Minor degree in Entrepreneurship Management,
Pontificia Universidad Católica de Chile, Chile.



Research Experience

2018-Curr

Research on Compositional Neuro-Cognition

Quantum Group, Department of Computer Science.
Supervisor Samson Abramsky and Bob Coecke.

2016-2019

Research Assistant Models of Consciousness

Computational Group at Center of Brain and
Cognition, Barcelona, and UNICOG lab at NeuroSpin,
Paris. Supervisor Gustavo Deco and Bechir Jarraya.

2015-2016

Visiting Research Assistant

PAF Group at Centre de Recherche Cerveau &
Cognition - UMR5549 (CerCo), Toulouse, France.
Supervisor Jean-Michel Hupe.

2014-2015

Visiting Research Student

Theoretical Neurobiology of Cortical Circuits at Clinical
and Experimental Neurosciences Research Unit,
IDIBAPS, Barcelona, Spain. Supervisor Albert Compte.

2014-2015

Research Assistant Fondecyt 2014 – #1141276

Neurobiology and Behavior Laboratory at Universidad
de Valparaíso, Chile. Supervisor Alexis Dagnino.

2013-2015

Research Assistant ANR-47 Project

Circuits and Systems Neuroscience Group at Center
Interdisciplinary of Neuroscience of Valparaíso, Chile.
Supervisor María José Escobar & Adrian Palacios.

2012-2013

Research Assistant Fondecyt 2012 – #1120864

Structure and function of Molecular Sensors at Center
Interdisciplinary of Neuroscience of Valparaíso, Chile.
Supervisor Alan Neely.

2011-2012

Quantum theories of Consciousness

Laboratory of Basic and Applied Neurodynamics,
School of Psychology, Pontificia Universidad Católica
de Chile, Santiago de Chile. Supervisor Eugenio
Rodríguez.



Scholarships and Awards

- ✓ March 2016. Doctoral Scholarship CONICYT-PFCHA/DOCTORADO BECAS CHILE /2016-72170507
- ✓ October 2015. Financial support CNRS- UMR 5549 for a research stay in CerCo lab, Toulouse
- ✓ September 2015. Scholarship for BCBT Summer School 2015, Universitat Pompeu Fabra, Barcelona. The Convergent Science Network.
- ✓ March 2013. Master National Scholarship CONICYT-PCHA/Magíster Nacional/2013/22130274



Professional Experience

2011-2012

Coordinator 3M Business Incubator

3M, Santiago de Chile.
Coordinated Open innovation Strategies of the Company.

2011-2012

Six Sigma Green Belt

3M, Santiago de Chile.
Developed 5 projects of New Product Introduction and 2 improvement processes (DMAIC).

2008-2009

Own Entrepreneur in nutrition products

Santiago de Chile.
Marketing and sales of nutrition products.



Volunteer Experience

2009

General Coordinator

Trabajos Voluntarios UC, Santiago de Chile.
Coordinated and Managed of all volunteer work areas: Logistics, Finance, Marketing, Projects, Training, etc.

2008

Marketing Coordinator

Trabajos Voluntarios UC, Santiago de Chile.
Coordinated and Managed the Marketing strategy of Volunteering Program.

2006-2010

Volunteer

Trabajos Voluntarios UC, Santiago de Chile.
Volunteer in many areas, teaching children, adults, building houses, actor in a play, between others.



Teaching Experience

2011-2012

Tutorials Quantum Mechanics for psychologists and neuroscientists.

Pontificia Universidad Católica de Chile, Santiago de Chile.

2010-2010

Leadership Training for Volunteers.

Trabajos Voluntarios UC, Santiago de Chile.



Publications

Journals

2018

Can Computers Become Conscious and Overcome Humans? CM Signorelli. *Frontiers in Robotics and AI*. Vol 5. Art 121. Doi:10.3389/frobt.2018.00121
Two paradigms of bistable plaid motion reveal independent mutual inhibition processes. JM Hupé, CM Signorelli, D. Alais. *Journal of Vision*. (Submitted)

Peer Reviewed Conference Paper

2018

Moral Dilemmas for Artificial Intelligence: a position paper on applications of Compositional Quantum Cognition. CM Signorelli and XD Arsiwalla. *Quantum Interaction 2018. Lecture Notes in Computer Science (Nice)*.

Are brains computers, emulators or simulators? XD Arsiwalla, CM Signorelli, JY Puigbo, IT Freire, P Verschure. *Living Machines: Conference on Biomimetic and Biohybrid Systems (Paris)*. Doi:10.1007/978-3-319-95972-6_3 .

What is the Physics of Intelligence? XD Arsiwalla, CM Signorelli, JY Puigbo, IT Freire, P Verschure. *Front. Artif. Intell. Appl. Proceeding 21st Int. Conf. Catalan Assoc. Artif. Intell.* 308, 283–286.

Can Computers Overcome Humans? Conscious interaction and its implications. CM Signorelli. *IEEE 17th International Conference on Cognitive informatics and Cognitive Computing (Berkeley, CA)*.

2017

Types of Cognition and its implications for future high-level cognitive machines. CM Signorelli. *AAAI Spring Symposium Series (Berkeley, CA)*. <https://www.aaai.org/ocs/index.php/SSS/SSS17/paper/view/15310>

Repositories

2017

Global Efficiency of Retinal Networks shows Robustness and Degenerate States. CM Signorelli. Report bioRxiv, 2017. <http://www.biorxiv.org/>

Posters and Abstracts

2017

Types of Cognition from Large Scale cognitive Brains and its Implications for future High-Level Machines. CM Signorelli. Poster at Brain Dynamics on Multiple Scales, 2017. Max Planck Institute. Dresden, Germany. ([link Max Planck](#))

Population Omitted Stimuli Responses on Retinal Ganglion Cells. J. Araya, R. Herzog, C. Miguel-Signorelli, MJ. Escobar, AG. Palacios. ERM 2017. Paris, France.

2016

Hierarchical competition of motion integration and depth ordering in the multistable perception of moving plaids. JM Hupé and CM Signorelli. Abstract GDR Vision 2016. Toulouse, France.

2015

Changes induced at neural level with a pattern of flashes do not affect topological measures in the retinal network. CM Signorelli, M Pizarro, R Herzog, A Compté, MJ Escobar, A Palacios. Poster GDR Vision 2015. Grenoble, France.

2014

Gap junctions involved in spiking activity: ganglion cells and their retinal networks affected by a connexin blocker. M Pizarro, J Araya, C Miguel, R Herzog, C Ravello, M Escobar, AG Palacios. Poster in X Reunión Anual Sociedad Chilena de Neurociencia. 1-4 de October 2014. Valdivia, Chile.

Adaptation and short Memory to frequency patterns in OSR ganglion cells. C Miguel, M Pizarro, M Escobar, AG Palacios. Poster in CINV-Max Planck Meeting 2014. Valparaíso.

2013

Study of conformational changes in voltage sensor of Calcium channels. D De Giorgis, C Miguel, G Contreras, A Neely. Poster in CINV Annual Meeting 2013. Valparaíso.

Thesis

2016

Temporal changes in retinal network due to patterns of oscillatory stimuli suggest an oscillatory plasticity mechanism. Camilo A. Miguel. Universidad de Valparaíso, Facultad de Ciencias. Editor: Universidad de Valparaíso, Chile, 2016. <http://bibliotecas.uv.cl/>

2010

Delta Gravity clásica esféricamente simétrica. Camilo A. Miguel, Pontificia Universidad Católica de Chile. Facultad de Física. Editor: Pontificia Universidad Católica de Chile, 2010.



Presentations and Seminars

Presentations

- 2018** **Quantum Interaction 2018, Nice, France.**
Title: Moral Dilemmas for Artificial Intelligence
- 2017** **5th Winter School Human Brain Project, Future Medicine XXX -Brain Science and Artificial Intelligence, 2017. Obergurgl, Austria.**
Title: Competition Models of motion integration and depth ordering in Multistable perception of moving plaids
- 4th Summer School Human Brain Project, Future Computing -Brain Science and Artificial Intelligence, 2017. Obergurgl, Austria.**
Title: Can Computers overcome humans?

Others Attended Conferences and Seminars

Brain Dynamics on Multiple Scales - Paradigms, their Relations, and Integrated Approaches	2017. Place: Max Planck Institute for the Physics of Complex Systems. Dresden, Germany.
Forum Annuel du GDR Vision	2015. Place: Université Pierre-Mendès-France, Grenoble, France. Organize by Alan Chauvin (LPNC, UGA), Michel Dojat (INSERM, UGA), Laurent Madelain (Univ Lille).
Barcelona Cognition, Brain and Technology BCBT Summer School	2015. Place: Universitat Pompeu Fabra, Barcelona. Organized by the European coordination action Convergent Science Network of Biomimetics and Neurotechnology CSN II.
The Neural Bases of Learning and Memory	2014. Place: Universidad Catolica de Chile. Organized by Centro Interdisciplinario de Neurociencia UC Speakers: S. Wiener, M. Belluscio, P. Bekinschtein.
Latin American Summer School in Computational Neuroscience	2014. Place: Instituto de Sistemas Complejos de Valparaíso. Organized by CINV, Inria, ISCV, Max Planck and UFSM.
CINV-Max Planck Meeting	2014. Place: Museo Naval, Valparaíso. Organized by CINV and Max Planck.
CINV annual Meeting	2013. Place: Parque Cultural de Valparaíso. Organized by CINV.
CINV annual Meeting	2012. Place: Parque Cultural de Valparaíso. Organized by CINV.
Seminar in Neuroscience and Clinical Social Cognition	2010. Place: Auditorium UDP. Organized by Universidad Diego Portales.

Application Form

Applied Category Theory 2019 Summer School

Student name and contact

Camilo A. Miguel Signorelli
camiguel@uc.cl

Relevant Background

Currently, I am a PhD. student under the supervision of Bob Coecke and Samson Abramsky at University of Oxford; with previous experience in neuroscience, psychophysics and cognitive research (present ongoing projects are still part of collaboration with some of these previous groups).

Moreover, I officially attended courses in pictorial calculus applied to quantum mechanics (Quantum Computer Science at Oxford), reading courses about categorical models of meaning (Oxford) and auditor of one course about categories (categories, proofs and processes at Oxford). Moreover, my thesis project suggests the application of category and process theories formalisms to neuroscience and emergent properties, therefore I am currently studying some of the main concepts and looking for the correct formalism to define the research question and affront it thanks to categories and its definitions.

Some familiar backgrounds are the three first chapters of “New structures for Physics”, 2011, Bob Coecke (Editor). Therefore, I expect this summer school can bring me more confidence about my current knowledge on category theory and their applications to biology, neuroscience and cognition.

Date PhD. Submission

Suggested (Three years research project University of Oxford): December 2020.
Expected (Four years research project University of Oxford t): December 2021.

Summary Thesis Project (one sentence)

Title

Emergent Systems: From Psychology to Physics through categorical semantic

Applications of Category theory and Process theories to cognitive systems and foundations of neuroscience.

Project Preferences

1. Title: Toward a mathematical foundation for autopoiesis
Mentor: David Spivak
2. Title: Formal and experimental methods to reason about dialogue and discourse using categorical models of vector spaces
Mentor: Mehrnoosh Sadrzadeh

Commit to coming to Oxford

Yes, I actually live in Oxford.

Brief motivation statement

My current research project is the application of category theory and process theories to formulate and affront the issues about neural systems and their emergent properties. More specifically, some approaches to mind-matter relations.

Category theory and the graphical language of process theories can bring us new types of reasoning and semantic to re-state these questions and even suggest new alternative approaches to solve them. Some of these new applications have been very fruitful in areas such as computer science and recently physics; therefore it can be proposed that similar mathematical frameworks may generate new knowledge about neuroscience and cognition. A main and important goal would be a mathematical semantic unification to, at least, understand different questions thanks to common concepts, and ideally investigate commonalities and similar general solutions to different fields.

These are my main motivations to study applications of category theory and the reasons why I would like to attend ACT 2019 summer school and conference, together, of course, with the possibility to increase my understanding about category theory and its applications. ACT 2019 can be an opportunity to discuss and apply new foundations of neuroscience and cognition, spread knowledge and learn about new topics in different areas to finally generate synergies and future collaborations with students and professors.

Furthermore, ACT is a new emergent field, and recently with a new journal, applications of category theory are also becoming an influential research area. Therefore, being one of the first students in these schools sets a precedent in my carrier, and eventually enabling me to become part of future versions, helping as tutor or moderator in student discussions.

Finally, this second version of the school and conference present a very innovative format, both to learn about the topic of interest disseminating new knowledge, and to generate future productive collaborations, thanks to the goal of translating discussions and lectures into papers, publications and critical reviews (blog posts). All these activities support the community strategy to spread and make ACT a new useful trend in the science of the future, and of course, I would like to be part of it.



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reference for Camilo Miguel Signorelli Inbox x



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T

to me

Camilo is applying to do the project on autopoiesis.

Camilo is currently doing a Ph.D. here supervised by me and Bob Coecke.

His interests are in mathematical models in neuroscience, and he has an active interest in autopoiesis, from the wo

He is enthusiastic and highly motivated, and he has already published several papers in neuroscience before comir theory, and doing this project would clearly be very beneficial for him.

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