



Samuel Liebana Garcia

Education

- 2021–Present **DPhil in Neuroscience**, *University of Oxford*, Oxford (UK)
2nd Year Computational Neuroscience PhD student working on building and testing theories of learning - supervised by Dr Andrew Saxe, Prof Rafal Bogacz and Dr Armin Lak.
- 2020–2021 **MSc in Neuroscience**, *University of Oxford*, Oxford (UK)
1st rotation (3 months) on characterizing turbulence in the brain with Prof Morten Kringelbach and Prof Gustavo Deco. 2nd rotation (4 months) with Dr Andrew Saxe and Dr Armin Lak on trial-by-trial bayesian inference of race model parameter trajectories capturing how mice learn a perceptual decision-making task.
- 2016–2020 **BA & MEng Engineering Tripos**, *University of Cambridge*, Cambridge (UK)
Specialized in Information, Electrical, and Control Systems Engineering. Selected Courses: Computational Neuroscience; Prob. Machine Learning; Advanced Information Theory and Coding; Statistical Signal Analysis; Deep Learning and Structured Data; Computer Vision.

Master theses

- MSc thesis *A Learning Race Model of Visually Guided Mouse Behaviour*
Supervisors Dr Andrew Saxe (UCL) and Dr Armin Lak (Oxford)
Description We present an improved framework for the modelling of evolving perceptual decision-making behaviour. We build on past work to design a flexible Bayesian fitting procedure to obtain trial-by-trial fits of probabilistic behavioral models. We apply the framework to a race model to study the learning dynamics of mice learning to perform a perceptual decision-making task over several thousands of trials.
- MSc thesis *Turbulence in MEG Brain Data*
Supervisors Prof Morten Kringelbach (Oxford) and Prof Gustavo Deco (Pompeu Fabra)
Description (Deco & Kringelbach, 2020) found turbulent-like dynamics in human rsfMRI data. However, BOLD does not directly measure neural activity, hence factors other than functional activity could cause this. To demonstrate turbulent functional activity, we design a novel measure of turbulence and show high levels in HCP rsMEG data. We also show that turbulence correlates with improved information processing.
- MEng thesis *An Investigation on the Properties of the DNA Data Storage Channel*.
Supervisor Dr Jossy Sayir (Cambridge)
Description DNA has potential to be a high-density and long-lasting storage medium. However, we lack in-depth understanding of the effect that DNA storage has on information integrity, and how to protect against losses. We model the errors involved in a typical DNA storage process using an information-theoretic *communication channel*. We then derive analytical capacity results of simplified versions of this model.

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* 18 July 1998

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Experience

Vocational

- Jul–Sep 2019 **Summer Undergraduate Research Fellow (SURF)**, *Caltech*, Pasadena
Investigation on the use of causal discovery algorithms to identify causal relations in a transistor-level simulation of the MOS6502 microprocessor. The overall aim was to validate causal inference as a technique to study the brain; the microprocessor serving as a well-understood ground truth to verify the effectiveness. Supervised by Prof Frederick Eberhardt.
- Jul–Sep 2018 **DAAD RISE Scholar**, *Universitätsklinikum Freiburg*, Freiburg im Breisgau
Contributed to a study on Subthalamic Nucleus Deep Brain Stimulation (STN DBS) for mitigating the symptoms of Parkinson's Disease (PD). I developed a MATLAB toolbox for the analysis of electrophysiological data from a 6-OHDA (neurotoxin) PD model for rats, compared behavioural biomarkers between healthy and PD rats from a battery of tests (Rotarod, Cylinder Test etc.), and wrote a program for waveform generation and form verification of DBS stimuli. Supervised by Dr Soheil Mottaghi and Prof Ulrich Hoffman.

Miscellaneous

- Jul–Aug 2017 **Summer Intern**, *Tecnova*, Almeria
During my internship at Tecnova I designed a retractable greenhouse roof to enable the cultivation of sub-tropical plants in Almeria. I also produced technical sketches of a mechanism to open/close thermal side-curtains running along crop lines in greenhouses. Lastly, I helped write and test a program for 2 KR AGILUS sixx KUKA robotic arms to automatize the production of plant grafts.

Languages

Spanish	Mothertongue	
English	Proficient (C2 of CEFR)	Certificate: Cambridge Certificate of Proficiency in English.
Italian	Proficient (C2 of CEFR)	Certificate: 10 years growing up in Italy.
German	Advanced (C1 of CEFR)	Certificate: Goethe Zertifikat C1.
French	Advanced (C1 of CEFR)	Certificate: CUED Language Unit Advanced Diploma.

Computer skills

Legend					
	■ ■ ■ ■ ■	basic knowledge	■ ■ ■ ■ ■	extensive project experience	
	■ ■ ■ ■ ■	intermediate knowledge with some project experience	■ ■ ■ ■ ■	deepened expert knowledge	
			■ ■ ■ ■ ■	expert / specialist	
	Level	Skill	Years	Comment	
Language:	■ ■ ■ ■ ■	Python	7	<i>Able to code quickly and efficiently.</i>	
	■ ■ ■ ■ ■	MATLAB	5	<i>Used in several past projects.</i>	
	■ ■ ■ ■ ■	C++	2	<i>Used for MEng coursework.</i>	
	■ ■ ■ ■ ■	L ^A T _E X	5	<i>All my theses/reports are written in L^AT_EX.</i>	
OS:	■ ■ ■ ■ ■	Linux, MAC, WOS	6	<i>Use all on a daily basis (local & remote).</i>	
ML Libraries:	■ ■ ■ ■ ■	JAX	2	<i>For bayesian models of decision-making.</i>	
	■ ■ ■ ■ ■	Pytorch	2	<i>For previous (non-bayesian) models.</i>	
	■ ■ ■ ■ ■	Tensorflow	2	<i>For Kaggle competitions.</i>	

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Publications

- [1] Soheil Mottaghi, Niloofar Afshari, Oliver Buchholz, **Liebana, Samuel**, and Ulrich G. Hofmann. Modular current stimulation system for pre-clinical studies. *Frontiers in Neuroscience*, 14, 2020.
- [2] Soheil Mottaghi, Sandra Kohl, Dirk Biemann, **Liebana, Samuel**, Ruth Eneida Montaña Crespo, Oliver Buchholz, Mareike Wilson, Carolin Klaus, Michelle Uchenik, Christian Munkel, Robert Schmidt, and Ulrich G. Hofmann. Bilateral intracranial beta activity during forced and spontaneous movements in a 6-ohda hemi-pd rat model. *Frontiers in Neuroscience*, 15, 2021.
- [3] Soheil Mottaghi, Sandra Kohl, **Liebana, Samuel**, Mareike Wilson, Carolin Klaus, Christian Munkel, and Ulrich G. Hofmann. Hemi-parkinsonian rat motor/non-motor symptom evaluation with deep brain stimulation. In *2019 9th International IEEE/EMBS Conference on Neural Engineering (NER)*, pages 369–372, 2019.
- [4] **Liebana, Samuel**, Aeron Laffere, Rafal Bogacz, Andrew Saxe, and Armin Lak. Behavioral and dopaminergic computations of learning from naive to expert. *in prep.*, 2022.

Conference activity

- PMLTSS Attended the 2022 Princeton Machine Learning Theory Summer School (06/13-06/17/2022) and presented my DPhil research work at its poster session.
- RLDM Presented poster entitled *A Computational and Experimental Framework for Testing Theories of Learning* (06/08-06/11/2022).
- COSYNE Attended conference and workshops (03/17-03/22/2022).
- Neuromatch Presented a virtual flash talk entitled *A Learning Race Model of Visually Guided Mouse Behavior* in conference (12/01-12/02/2021).
- IEEE NER'19 Short paper entitled *Hemi-Parkinsonian Rat Motor/Non-Motor Symptom Evaluation with Deep Brain Stimulation* [3] in conference proceedings (03/20-03/23/2019).

Awards and activities

- 2020 AT&T Cambridge Laboratories Prize in Communications Engineering.
- 2019 Caltech Summer Undergraduate Research Fellowship (SURF) Scholarship.
- 2019 Lillas Sophia Ashworth Hallett Scholarship for academic excellence.
- 2019 Christina Barnard Prize for academic excellence.
- 2019 Gladstone Memorial Trust Travel Award.
- 2019 Charlotte Rycroft Travel Award.
- 2018 DAAD Research in Science and Engineering (RISE) Scholarship.
- 2018 Satyanarayana Madabhushi Prize for top Part IB Eng. Tripos Girton College student.
- 2018 Mary Ann Leighton Scholarship for academic excellence.
- 2018 Mars Lander Prize for best C++ automatic re-entry controller.
- 2017 Sir Francis Goldsmid Scholarship for academic excellence.

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- 2017 Phyllis Tillyard Prize for academic excellence.
- 2016 Participant in the prestigious European Union Contest for Young Scientists (EUCYS).
- 2015 1st Prize in Senior Projects of European Schools Science Symposium (ESSS).
- 2015 Top 5 in Italian Regional (Emilia-Romagna) Chemistry Olympiad.
- 2015 Top 10 in Italian Regional (Emilia-Romagna) Philosophy Olympiad.

--- Licenses and certifications

- Coursera Completed Machine Learning course by Prof. Andrew Ng in July 2018. Credential ID 5N4HCLS2ZNZV.
- ASPA PIL C Personal Licence category C (PIL C) for performing regulated procedures on rats and mice under the Animals (Scientific Procedures) Act 1986. Received training as required under the UK and EU training framework and approved by the Universities' Accreditation Scheme at the Univeristy of Oxford.

--- Societies and interests

- Cortex Club IT Officer for the Cortex Club, the University of Oxford's neuroscience society, for the 2021/2022 and 2022/2023 academic year. My roles involve designing and keeping the society website up to date, coordinating the mailing list, arranging the AV setup for hybrid talks, and editing/publishing talk recordings. I have also arranged speaker invitations and the AV setup for larger symposiums throughout the year.
- CUSS Co-founder and General Secretary of the Cambridge University Spanish Society (CUSS) from 2016-2020.
- Music Regularly play the sopranino, descant, and treble baroque recorders and enjoy performing at and attending classical music concerts.
- Languages Currently learning Hindi and Farsi.
- Physics Have always been very passionate about physics and regularly read and chat about the current problems in the field.

--- Referees (additional upon request)

Dr Andrew Saxe. *Email:* a.saxe@ucl.ac.uk. *Role:* PhD supervisor. *Position:* Henry Dale Fellow and Joint Group Leader at Gatsby Computational Neuroscience Unit and Sainsbury Wellcome Centre. *Address:* 25 Howland Street, London, W1T 4JG.

Dr Armin Lak. *Email:* armin.lak@dpag.ox.ac.uk. *Role:* PhD supervisor. *Position:* Henry Dale Fellow at Department of Physiology, Anatomy and Genetics, University of Oxford. *Address:* Sherrington Building, Sherrington Rd, Oxford, OX1 3PT.

Prof Rafal Bogacz. *Email:* rafal.bogacz@bndu.ox.ac.uk. *Role:* PhD supervisor. *Position:* Medical Research Council (MRC) Investigator at MRC Brain Network Dynamics Unit, University of Oxford. *Address:* Mansfield Rd, Oxford, OX1 3TH.

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