Pablo León-Villagrá

Department of Cognitive and Psychological Sciences
Brown University
Box 1910
Providence, RI. 02912 USA

Email: pablo_leon_villagra@brown.edu
URL: pabloleonvillagra.com
Orcid: 0000-0002-2709-7602

Education

2015 – 2020 Ph.D., University of Edinburgh
Institute for Language, Cognition, and Computation
Thesis: *Representational Principles of Function Generalization*
Supervisor: Prof. Christopher G. Lucas

2012 – 2015 M.Sc. Cognitive Science, University of Osnabrück
Thesis: *Causal Reasoning and the Markov Assumption in a Physical Microworld*
Supervisors: Prof. Frank Jäkel, Prof. Dave Lagnado
Thesis Grade: 1.0 (A+), Overall: 1.0 (Distinction)

2008 – 2012 B.Sc. Cognitive Science, University of Osnabrück
Thesis: *Categorization in Chess*
Supervisor: Prof. Frank Jäkel
Thesis Grade: 1.0 (A+), Overall: 1.2 (Distinction)

Academic Experience

2021 – now Postdoctoral Research Associate, Brown University, USA
I research children's categorical development and develop novel experimental methods in Prof. Daphna Buchsbaum's Computational Cognitive Development Lab.

2020 – 2021 Postdoctoral Research Fellow, University of Warwick, UK
I developed group- and individual-level experiments to study idea generation, modeled statistical regularities in human sequential data, and examined patterns in human random sequences in Prof. Adam Sanborn's and Prof. Nick Chaters' SAMPLING research group.

2019 – 2020 Visiting Ph.D. student, University of Toronto, Canada
During my six-month visit in Prof. Daphna Buchsbaum's Computational Cognitive Development Lab, I ran developmental studies in categorization.

2017 Internship at the Alan Turing Institute, London, UK
During the three-month internship, I developed and implemented a prototype online application that allows citizen engagement through interactive explanations and visualization.

2014 Research Assistant, University of Osnabrück, Germany
I developed, programmed, ran, and analyzed human categorization experiments in Prof. Frank Jäkel's Cognitive Modeling Group.

2014 Research Internship, University College London, UK
During the three-month visit to Prof. Dave Lagnado's Causal Cognition lab, I developed a physics-based online experiment and researched computational models of causal cognition.

Grants & Scholarships

2024 – 2027 National Science Foundation ($895,000)
Novel Computational methods to examine students' concepts of biological variability. Awarded with Prof. Buchsbaum (Brown University) and Prof. Rosengren (University of Rochester)

2023 Brown Data Science Research Grant ($25,000)

2023 Brown Research Seed Grant ($50,000)

2015 – 2018 Ph.D. Scholarship
School of Informatics, Institute for Language, Cognition and Computation

Publications

Forthcoming

under review Castillo, L., **León-Villagrá, P.**, Falbén, J., Chater, N., and Sanborn, A. N. People Need a Few Seconds to Be Random

under review Falbén, J., Castillo, L., **León-Villagrá, P.**, Chater, N., and Sanborn, A. N. Biased Mind or Biased World? Assessing the Accuracy of Cultural Beliefs that Underlie Social Judgments

submitted **León-Villagrá, P.**, Castillo, L., Chater, N., and Sanborn, A. N. Belief Elicitation Using Random Generation Tasks.

submitted **León-Villagrá, P.**, Lucas, C. G., and Buchsbaum, D. Learning Children's Conceptual Spaces using Deep Metric Learning

in prep. **León-Villagrá, P.**, Schulz, E., Speekenbrink, M., Gershman, S. J., and Lucas, C. G. One-shot Learning of Compositional Functions.

in prep **León-Villagrá, P.**, and Lucas, C. G. Generalizing how Functions Compose across Tasks.

Peer-reviewed articles

2024 **León-Villagrá, P.**, Mathiaparanam, O., Rosengren, K., and Buchsbaum, D. How Red Is a Ladybeetle? Examining People's Notions of Biological Variability. In: *Proceedings of the 45th Annual Conference of the Cognitive Science Society* (45).

2024 Sanborn, A.N., Zhu, J.Q., Spicer, J., **León-Villagrá, P.**, Castillo, P., Falbén, J., Li, Y-X., Tee, A., and Chater, N. Noise in Cognition: Bug or Feature? In: Perspectives on Psychological Science

2024 Castillo, L., **León-Villagrá, P.**, Chater, N., and Sanborn, A. N. Explaining the Flaws in Human Random Generation as Local Sampling with Momentum. In: *PLOS Computational Biology*, 20

2023 Herrera-Berg, E., Browne, T. V., **León-Villagrá, P.**, Vives, M. L., and Calderon, C. B. Large Language Models are biased to overestimate profoundness. In: *Proceedings of the 2023 Conference on*

Empirical Methods in Natural Language Processing.

2022 **León-Villagrá, P.** Ehrlich, I., Lucas, C. G., and Buchsbaum, D. Uncovering Children's Concepts and Conceptual Change. In: *Proceedings of the 44th Annual Conference of the Cognitive Science Society* (44), 687–693.

2022 Zhu, J. Q., **León-Villagrá, P.**, Chater, N., and Sanborn, A. N. Understanding the Structure of Cognitive Noise. In: *PLOS Computational Biology*, 18 (8), 1-11.

2022 **León-Villagrá, P.**, Castillo, L., Chater, N., and Sanborn, A. N. Eliciting Human Beliefs Using Random Generation. In: *Proceedings of the 44th Annual Conference of the Cognitive Science Society*, (44), 2000–2006.

2021 Castillo, L., **León-Villagrá, P.**, Chater, N., and Sanborn, A. N. Local Sampling with Momentum Accounts for Human Random Sequence Generation. In: *Proceedings of the 43rd Annual Conference of the Cognitive Science Society* (43), 1956–1962.

2020 Chater, N., Zhu, J. Q., Spicer, J., Sundh, J., **León-Villagrá, P.**, and Sanborn, A. N. Probabilistic Biases Meet the Bayesian Brain. In: *Current Directions in Psychological Science, 29* (5), 506-512.

2020 **León-Villagrá, P.**, Otsubo, K., Lucas, C. G., and Buchsbaum, D. Uncovering Category Representations with Linked MCMC with People. In: *Proceedings of the 42nd Annual Conference of the Cognitive Science Society* (42), 1722-1728.

2019 **León-Villagrá, P.**, Klar, V. S., Sanborn, A. N., and Lucas, C. G. Exploring the Representation of Linear Functions. In: *Proceedings of the 41st Annual Conference of the Cognitive Science Society* (41), 2105–2111.

2019 **León-Villagrá, P.** and Lucas, C. G. Generalizing Functions in Sparse Domains. In: *Proceedings of the 41st Annual Conference of the Cognitive Science Society* (41), 2112–2118.

2018 **León-Villagrá, P.**, Preda, I., and Lucas, C. G. Data Availability and Function Extrapolation. In: *Proceedings of the 40th Annual Conference of the Cognitive Science Society* (40), 2017–2022.

2017 Matthews, A., Van Der Wilk, M., Nickson, T., Fujii, K., Boukouvalas, A., **León-Villagrá, P.**, Ghahramani, Z., Hensman, J. GPflow: A Gaussian Process Library using TensorFlow. In: *The Journal of Machine Learning Research, 18* (40), 1-6.

2013 **León-Villagrá, P.**, and Jäkel, F. Categorization and Abstract Similarity in Chess. In: *Proceedings of the 35th Annual Conference of the Cognitive Science Society* (35), 2860-2865.

Book Chapters

2024 Zhu, J. Q., Chater, N., **León-Villagrá, P.**, Spicer, J., Sundh, J., and Sanborn, A. N. An Introduction to Psychologically Plausible Sampling Schemes for Approximating Bayesian Inference. In: *Sampling in Judgment and Decision Making*. Cambridge University Press.

2024 Sundh, J., Sanborn, A. N., Zhu, J., Spicer, J., **León-Villagrá, P.**, and Chater, N. Approximating Bayesian Inference through Internal Sampling. In: *Sampling in Judgment and Decision Making*. Cambridge University Press.

2021 Sanborn, A. N., Zhu, J. Q., Spicer, J., Sundh, J., **León-Villagrá, P.**, and Chater, B. Sampling as the Human Approximation to Probabilistic Inference. In: *Human-Like Machine Intelligence*. Oxford University Press.

Talks

Invited Talks

2023 Developmental Brown Bag Seminar Series, Brown University, Providence, RI, USA

2022 Computational Cognitive Science Lab, Melbourne, Australia (virtual)

2020 Developmental Brown Bag Seminar Series, Brown University, Providence, RI, USA (virtual)

2018 MIT-IBM Research, Cambridge, MA, USA

2017 Colloquium of the Institute of Cognitive Science, Osnabrück, Germany

2015 Symposium: Oswald Wiener: Selbstbeobachtung — Denkpsychologie, Müerz, Austria

Conference & workshop presentations

2022 15th Biannual Conference of the German Society for Cognitive Science, Freiburg, Germany

2022 44th Annual Meeting of the Cognitive Science Society, Toronto, Canada

2022 32nd Annual Meeting of the Canadian Society for Brain, Behaviour, and Cognitive Science, Halifax, Canada

2021 Conference of the Society for Mathematical Psychology, Virtual

2020 Concepts in Action: Representation, Learning and Application workshop, Virtual

2019 XI. Dubrovnik Conference on Cognitive Science, Dubrovnik, Croatia

2018 14th Biannual Conference of the German Society for Cognitive Science, Best Presentation Award, Darmstadt, Germany

Posters

2024 46th Annual Meeting of the Cognitive Science Society, Rotterdam, The Netherlands

2024 Sampling Approaches in Cognition and Neuroscience Workshop, Warwick, UK

2024 Cognitive Development Society, Pasadena, CA, USA

2023 45th Annual Meeting of the Cognitive Science Society, (virtual)

2023 Conference of the Society for Mathematical Psychology, Amsterdam, The Netherlands

2022 63rd Annual Meeting of the Psychonomic Society, Boston, USA

2022 44th Annual Meeting of the Cognitive Science Society, Toronto, Canada

2022 Cognitive Development Society, Madison, WI, USA

2021 43rd Annual Meeting of the Cognitive Science Society, (virtual)

2021 Budapest CEU Conference on Cognitive Development, (virtual)

2020 42nd Annual Meeting of the Cognitive Science Society, (virtual)

2019 41st Annual Meeting of the Cognitive Science Society, Montreal, Canada

2018 40th Annual Meeting of the Cognitive Science Society, Madison, WI, USA

2017 39th Annual Meeting of the Cognitive Science Society, London, UK

2016 Human-Like Computing Machine Intelligence Workshop, Cumberland Lodge, UK

2013 Interdisciplinary College, Möhnesee-Günne, Germany

2013 35th Annual Meeting of the Cognitive Science Society, Berlin, Germany

Teaching Experience

Guest Lectures

2021 *Bayesian Approaches in Behavioural Science* (PS931)
University of Warwick, UK
I gave a guest lecture on an advanced belief elicitation technique, Markov-Chain Monte Carlo with People, for a M.Sc. Psychology course.

Teaching Assistance, Tutoring, and Marking

2018 – 2019 Teaching Assistant, Tutor and Marker, *Computational Cognitive Science* (INF-CCS) University of Edinburgh, UK
Course taught to third-year B.Sc. students in Informatics and Psychology. As a teaching assistant, I was solely responsible for creating materials for weekly tutorials in R. As a tutor and marker, I taught small weekly seminars and graded the weekly assignments.

2018 – 2019 Tutor, *Informatics Research Review* seminar (INF-R11136), University of Edinburgh, UK
Course taught to M.Sc. students in Informatics to prepare for their final thesis projects. Responsibilities included teaching weekly seminars on writing and good research practices to a group of 30 students, and providing writing feedback on students' research project plans.

2016 – 2019 Teaching Assistant, Tutor, Demonstrator, and Marker, *Introduction to Cognitive Science* (INF1-CG), University of Edinburgh, UK
Course taught to informatics and psychology B.Sc. students. As a teaching assistant, I was solely responsible for creating weekly course exercises, lab materials and assignments. As a tutor and demonstrator, I led small seminar groups. As a demonstrator, I provided support for students in weekly programming and data analysis labs. As a marker, I graded students' weekly assignments.

2013 – 2014 Tutor, *Multivariate Statistics* (Multivariate Verfahren), University of Osnabrück, Germany
Course taught to M.Sc. students in Psychology and Cognitive Science. I provided support in weekly multivariate statistics tutorials.

Undergraduate Supervision at Brown University

At Brown University, I have co-supervised several students through independent studies, volunteering positions, and projects sponsored through the Karen T. Romer Undergraduate Teaching and Research Awards (UTRA):

2025 Emily Wang (Independent Study), Christine Wu (Volunteer Research Assistant), Andrew Park (Independent Study), Sophia Huang (Volunteer Research Assistant)

2024 Emily Wang (UTRA), Sawyer Strasberg (UTRA), Christine Wu (Volunteer Research Assistant), Andrew Park (Independent Study), Sophia Huang (UTRA)

2023 Hayley Guillen (UTRA), Claire Washington (UTRA), Josh Benzon (UTRA), Christine Wu (UTRA), Liana Haigis (Independent Study)

2022 Liana Haigis (Independent Study), Areshva Aisha Mir (UTRA), Liam O'Connor (UTRA), Jude McCutcheon (UTRA), Luis Gomez (UTRA)

2021 Jackson Webster (Volunteer Research Assistant), Liana Haigis (UTRA)

Supervision M.Sc. Theses at the University of Warwick

2020 Xiaoqing Lyu, Iterated Function Learning in Financial Markets.
2020 Anush Sridhar, Connecting Individual Expectations with Financial Markets using Iterated Learning (received the prize for the best M.Sc. project in Behavioral and Economic Science).
2021 Li Lin, The Role of Contextual Information in Iterated Price-prediction Tasks.

Supervision M.Sc. Theses at the University of Edinburgh

2018 Ekaterina Gorbunova, Representations underlying Human Function Extrapolation.
2018 Verena S. Klar, Exploring the Representation of Linear Functions.
2017 Irina Preda, Data Availability and Function Extrapolation.

Workshops & Courses

2022 Sheridan Teaching Seminar Certificate I
2022 Computational Modeling of Behavior, Carney Center for Computational Brain Science, Brown University
2022 Data Science Course Design, Harriet W. Sheridan Center for Teaching and Learning, Brown University
2019 Diverse Intelligences Summer Institute, University of St. Andrews, UK
2016 CRiSM Mater Class, Non-parametric Bayes, University of Warwick, UK

Professional Service

Ad-hoc reviewer for Cognition, the Journal of Experimental Psychology: Learning, Memory, and Cognition and Philosophical Transactions A, Thinking & Reasoning, Infant and Child Development, Cognitive Science Society, the German Cognitive Science Society, Budapest CEU Conference on Cognitive Development (BCCCD), Society for Research in Child Development (SRCD)

Workshop Organization

2023 Cognitive AI 2023, University of Bari, Italy

Technical Skills

Skills Bayesian Methods, Deep Learning, Full-stack web development, Machine Learning
Analysis GPy, GPFlow, MATLAB, PyMC3, PyTorch, R, SPARK, SPSS, Stan
Web & Apps Actionscript, JavaScript, Node.js, Python, React, SQL, Scala, Svelte
Experiments Psychtoolbox, PsychoPy

Languages

German – Mother tongue
Spanish – Mother tongue
English – Native level proficiency

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