Arthur Prat-Carrabin

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2024 - **Harvard University,** Cambridge
Postdoctoral Fellow. Department of Psychology, Computational Cognitive Neuroscience Lab. PI: Samuel Gershman.

2018 - 2023 **Columbia University,** New York
Associate Research Scholar. Department of Economics, Cognition and Decision Lab. PI: Michael Woodford. (2018-2022: Postdoctoral Research Scholar; spring 2021: Fellow at the Italian Academy for Advanced Studies in America.)

EDUCATION

2013 - 2017 **École Normale Supérieure – Physics Department,** Paris
- PhD Student. Advisor: Rava Azeredo da Silveira.
- Thesis: "Bayesian models of human online inference"

2005 - 2009 **École Polytechnique,** Palaiseau (Paris)
- French leading "Grande École d'Ingénieur" (scientific school)
- Courses in mathematics, statistics, econometrics, economics, quantum statistical physics, and mechanics

2008 - 2009 **ENSAE,** Paris *(École Nationale de Statistique et d'Administration Économique)*
- National statistics school. Courses in statistics, economics, and finance.

2002 - 2005 **Lycée Henri IV**, "Classes Préparatoires," Paris
- Three-year intensive courses in Mathematics, Physics, and Chemistry.

ACADEMIC VISITS & SUMMER SCHOOLS

April-May 2024 **University of Zurich**, Department of Economics, Zurich, Switzerland
Academic guest, invited by Christian Ruff, Professor of Neuroeconomics and Decision Neuroscience

July 2018 **Sloan Nomis Summer School on the Cognitive Foundations of Economic Behavior**, Vitznau, Switzerland

2013-2016 **Princeton Neuroscience Institute**, Princeton, NJ
Visiting Student Research Collaborator
(Three visits: Nov. 2013-Feb. 2014, Oct.-Dec. 2015, and Oct.-Nov. 2016)

Aug. 2016 **Champalimaud Center for the Unknown**, Lisbon, Portugal
CAJAL Course in Computational Neuroscience

PUBLICATIONS & MANUSCRIPTS

2026 **Prat-Carrabin, A.**, Gershman, S. *Toward a precise theory of imprecise representations.* Perspective paper. arthurprat.com/perspective

2026 **Prat-Carrabin, A.**, Yamamoto, R., Gershman, S. *Efficient coding makes and breaks Weber's law.* bioRxiv. doi.org/10.64898/2026.08.10.744043

2026 **Prat-Carrabin, A.***, de Hollander, G.*, Bedi, S., Gershman, S., Ruff, C. *Distributed range adaptation in human parietal encoding of numbers.* Nature Communications (in press). doi.org/10.1101/2025.09.25.675916

2026 **Prat-Carrabin, A.**, Harl, M., Gershman, S. *Fast efficient coding and sensory adaptation in gain-adaptive recurrent networks.* Nature Communications. doi.org/10.1038/s41467-026-73032-0

2026 **Prat-Carrabin, A.**, Woodford, M. *Endogenous Precision of the Number Sense.* eLife. doi.org/10.7554/eLife.101277

2025 **Prat-Carrabin, A.**, Gershman, S. *Bayesian estimation yields anti-Weber variability.* PNAS Nexus. doi.org/10.1093/pnasnexus/pgaf275

2024 **Prat-Carrabin, A.**, Woodford, M. *Imprecise counting of observations in averaging tasks predicts primacy and recency effects.* bioRxiv. doi.org/10.1101/2024.09.29.615676

2024 **Prat-Carrabin, A.**, Woodford, M. *Imprecise Probabilistic Inference from Sequential Data*. Psychological Review. doi.org/10.1037/rev0000469

2024 **Prat-Carrabin, A.**, Meyniel, F., Azeredo da Silveira, R. *Resource-rational account of sequential effects in human prediction*. eLife. doi.org/10.7554/eLife.81256

2022 **Prat-Carrabin, A.**, Woodford, M. *Efficient coding of numbers explains decisions bias and noise*. Nature Human Behaviour. nature.com/articles/s41562-022-01352-4

2021 **Prat-Carrabin, A.**, Woodford, M. *Bias and variance of the Bayesian-mean decoder*. In M. Ranzato et al., eds., Advances in Neural Information Processing Systems 34 (NeurIPS 2021). proceedings.neurips.cc/paper/2021

2021 **Prat-Carrabin, A.**, Wilson, R., Cohen, J.D., Azeredo da Silveira, R. *Human Inference in Changing Environments with Temporal Structure.* Psychological Review. dx.doi.org/10.1037/rev0000276

2021 **Prat-Carrabin, A.**, Meyniel, F., Tsodyks, M., Azeredo da Silveira, R. *Biases and Variability from Costly Bayesian Inference*. Entropy. 23(5):603. doi.org/10.3390/e23050603

GRANTS, AWARDS, & DISTINCTIONS

2024 **NYU SPiNES Finalist**
New York University – Seminars by Postdocs in Neuroscience: Extramural Series

2022	**Paper of the Year Award – Society for NeuroEconomics** Prat-Carrabin, A., Woodford, M. *Efficient coding of numbers explains decisions bias and noise* (2022). Nature Human Behaviour.
2021	**Spotlight Presentation – 35th Conference on Neural Information Processing Systems (NeurIPS 2021)** Prat-Carrabin, A., Woodford, M. *Bias and variance of the Bayesian-mean decoder.*
Spring 2021	**Fellowship - The Italian Academy for Advanced Studies in America - Columbia University.** "Art, Humanities, and Neuroscience Fellowship" – Appointment as a Postdoctoral Research Scholar at the Italian Academy.
2020	**Poster Spotlight – Society for NeuroEconomics Annual Meeting** *Efficient encoding of numbers explains biased judgments.*
2016	**Competitive Travel Grant - Hebrew University ELSC Annual Retreat** Edmond & Lily Safra Center for Brain Science, Hebrew University of Jerusalem.
2013	**Fondation Pierre-Gilles de Gennes PhD Fellowship**
2007	**"Outstanding Leadership" Mention - Ecole Polytechnique** "Exceptional student in campus and leadership activities"

TALKS

2026-11 *forthcoming*	Cognitive Area Current Works Symposium, Department of Psychology, Yale University. *Invited speaker. Title TBD.*
2026-07	Cognitive Science Society Annual Conference (Cogsci), Rational Revision Workshop. *"Imprecise beliefs, polarized beliefs"*.
2026-02	Warwick Business School, UK. *"A theory of imprecise representations"*
2025-12	Department of Neuroscience, American University. *"Flexible Neural Coding for Adaptive Behavior"*
2025-10	Laboratory for Computational Vision (PI: Eero Simoncelli), Center for Computational Neuroscience, Flatiron Institute, New York. *"Adaptive efficient coding of magnitudes"*.
2025-10	Center for Brain Science, Harvard University. 'Neurolunch' seminar. *"Distributed range adaptation in human parietal encoding of numbers"*
2025-10	Society for NeuroEconomics, Annual Meeting, Boston. *"Adaptive efficient coding of numerosity in parietal cortex"*
2025-07	Zurich Center for Neuroeconomics, University of Zurich, Switzerland. *"Fast efficient coding and sensory adaptation in gain-adaptive recurrent networks"*
2025-02	Center for Brain Science, RIKEN, Tokyo. *"Optimal Representations under Neurocognitive Constraints"*
2025-01	Department of Psychology, University of California San Diego. *"Optimal Representations under Neurocognitive Constraints"*

2024-11 Harvard Medical School Systems Club, Harvard University. *"The Number Sense under Limited Resources"*

2024-10 Human and Machine Cognition Lab (PI: Charley Wu), University of Tübingen. *"The Number Sense under Limited Resources"* (online)

2024-10 Learning Memory & Decision Lab (PI: Matt Nassar), Brown University. *"The Number Sense under Limited Resources"*

2024-09 Cognition, Brain, and Behavior Research Seminar, Harvard University. *"The Number Sense under Limited Resources"*

2024-05 Ruff Lab, Zurich Center for Neuroeconomics, University of Zurich, Switzerland. *"Flexible neural coding of numerosity",* with G. de Hollander.

2023-09 Air Force Center of Excellence in the Neuroscience of Decision-Making, Department of Biomedical Engineering, Columbia University, New York. *"Endogenous Imprecision of the Number Sense"*

2022-09 Shenhav Lab, Department of Cognitive, Linguistic & Psychological Sciences, Brown University. *"Imprecise Probabilistic Inference from Sequential Data"*

2022-09 Zuckerman Institute Postdoctoral Seminars, Columbia University, New York. *"Constrained representations of numerical magnitudes"*

2022-01 Laboratory for Computational Vision (PI: Eero Simoncelli), Center for Computational Neuroscience, Flatiron Institute, New York. *"Bias and variance with efficient coding and Bayesian-mean decoding"*

2021-12 "*Spotlight presentation"* – NeurIPS 2021 (35th Conference on Neural Information Processing Systems). *"Bias and variance of the Bayesian-mean decoder",* online.

2021-08 Horga lab, Department of Psychiatry, Columbia University, New York. *"Imprecise Probabilistic Inference from Sequential Data"*

2021-02 Computational Perception and Cognition Lab (PI: Alan Stocker), UPenn, Philadelphia. *"Encoding-decoding of numbers explains biased judgments"*

2021-02 Italian Academy Seminar, Columbia University, New York. *"Encoding-decoding of numbers explains biased judgments"*

2020-10 Neuromatch 3.0. *"Efficient encoding of numbers explains biased judgments"*.

2020-02 Cognition and Decision Making Joint Lab Meeting, Columbia University, New York. *"Efficient encoding of numbers explains biased judgments"*

2019-02 2019 Sloan-Nomis Workshop on the Cognitive Foundations of Economic Behavior, NYU, New York. *"Encoding-decoding of numbers explains biased judgments"*

2017-11 Flowers Lab (PI: Pierre-Yves Oudeyer), INRIA (Institut National de Recherche en Informatique et en Automatique), Bordeaux, France. *"Models of human online inference in the presence of temporal structure"*

2017-01 2017 ELSC Annual Retreat in Ein Gedi, Hebrew University of Jerusalem, Israel. *"Modulation of inference by the temporal statistics of stimuli"*

2016-08 Champalimaud Center for the Unkown, Lisbon, Portugal. *"Robustness and variability of efficient spiking networks"*, with Lueckmann, J.-M. & Gibor L.

2016-03 Laboratoire de Physique Statistique (LPS), École Normale Supérieure, Paris. *"Inference in presence of temporal structure in the signal"*

2015-07 Institut des Systèmes Intelligents et de Robotique (ISIR), Université Pierre et Marie Curie, Paris. *"Inference of change points with temporal structure"*

2014-04 Laboratoire de Neurosciences Cognitives (LNC), École Normale Supérieure, Paris. *"Inference of change-point stimulus with temporal structure"*

2014-02 Princeton Neuroscience Institute (PNI), Princeton, NJ. *"Inference of change-point stimulus with temporal structure"*

POSTERS

2023-10 **Prat-Carrabin, A.**, Woodford, M. A Bayesian noisy-memory account of recency effects in averaging tasks. *Society for NeuroEconomics Meeting.* Vancouver, BC.

2022-11 **Prat-Carrabin, A.**, Woodford, M. Constrained representations of numerical magnitudes. *3rd Workshop on Mental Effort.* Brown University, Providence, RI.

2022-10 **Prat-Carrabin, A.**, Woodford, M. Constrained representations of numerical magnitudes. *Society for NeuroEconomics Meeting 2022*. Arlington, VA.

2022-08 **Prat-Carrabin, A.**, Woodford, M. Constrained representations of numerical magnitudes. *Conference on Cognitive Computational Neuroscience (CCN 2022)*. San Francisco, CA.

2022-07 **Prat-Carrabin, A.**, Woodford, M. Imprecise Probabilistic Inference from Sequential Data. *Cognitive Science Society Annual Conference (Cogsci).* Toronto.

2022-07 **Prat-Carrabin, A.**, Woodford, M. Imprecise Probabilistic Inference from Sequential Data. *Computational Psychiatry Course* (CPC++). New York.

2021-12 **Prat-Carrabin, A.**, Woodford, M. Bias and variance of the Bayesian-mean decoder. *35th Conference on Neural Information Processing Systems (NeurIPS 2021)*. Online.

2021-09 **Prat-Carrabin, A.**, Woodford, M. Imprecise Probabilistic Inference from Sequential Data. *Society for NeuroEconomics Meeting 2021*. Online.

2020-10 *"Poster Spotlight"* – **Prat-Carrabin, A.**, Woodford, M. Efficient encoding of numbers explains biased judgments. *Society for NeuroEconomics Meeting 2020*.

2020-09 **Prat-Carrabin, A.**, Woodford, M. Efficient encoding of numbers explains biased judgments. *Online Bernstein Conference 2020*.

2019-05 **Prat-Carrabin, A.**, Ho, B., Woodford, M. Efficient encoding of numbers explains biased judgments. *Zuckerman Institute Mind Brain Behavior Symposium*, Columbia University, New York, USA.

2019-02 **Prat-Carrabin, A.**, Ho, B., Woodford, M. Efficient encoding of numbers explains biased judgments. *Computational and Systems Neuroscience (Cosyne)*, Lisbon.

2018-10 **Prat-Carrabin, A.,** Ho, B., Woodford, M. Efficient encoding of numbers explains biased judgments. *Society for Neuro-Economics 2018 Annual Meeting*, The Wharton School, University of Pennsylvania, Philadelphia.

2016-05 **Prat-Carrabin, A.**, Azeredo da Silveira, R. Modulation of inference by the temporal statistics of stimuli. *Symposium on Biology of Decision Making 2016 (SBDM)*, Institut du Cerveau et de la Moelle Épinière (ICM), Paris.

2014-05 **Prat-Carrabin, A.**, Azeredo da Silveira, R. Inference of change-point signals with temporal structure. *Symposium on Biology of Decision Making 2014 (SBDM)*, Institut du Cerveau et de la Moelle Épinière (ICM), Paris.

COMMUNITY SERVICE

2021-2025 **Reviewer:**
- MIT Press (book)
- Nature Communications
- Proceedings of the National Academy of Sciences (PNAS)
- NeurIPS 2026
- NeurIPS 2025 Workshop Proposals
- PLOS Computational Biology
- Communications Psychology
- CogSci 2025
- Conference on Reinforcement Learning and Decision Making (RLDM)
- PCI Registered Reports
- Scientific Reports
- American Economic Journal: Microeconomics
- Open Mind: Discoveries in Cognitive Science
- Conference on Cognitive Computational Neuroscience

2022-09 **Teaching Assistant** – *Barcelona Summer School for Advanced Modeling of Behavior.* In charge of a tutorial and of supervising two group projects.

2018-2020 **Co-organizer** – *Cognition and Decision "pre-seminar" for PhDs and postdocs*, Columbia University.

2007 **A.S.E. humanitarian association,** Huaviña, Chile
Two-month work on the construction of a local product factory.

2007 **President of student orientation retreat,** École Polytechnique
Managed a twelve-person team to organize a €130k four-day event to welcome the 500 freshman students to École Polytechnique

2006 **Founder of a student association ("Atypix")**
Organized a forum to meet Ecole Polytechnique alumni with unexpected careers.

Other Professional Experience

S1 2015	**Innhotep,** Innovation Consulting, Paris Consulting analyst in Tech & Innovation. Main assignment: Réseau de Transport d'Électricité (French electricity transmission operator).
2011 - 2014	**Whale Street SAS,** Co-Founder Social media analysis for financial markets. Startup selected by the City of Paris startup accelerator program. Worked on Natural Language Processing, statistics algorithms, and database administration.
2009 - 2011	**InfraRed Capital Partner,** Paris *(formerly HSBC Specialist Investment)* Motorways and High-Speed railways investments. Worked on financial stress tests, risk analysis, traffic prediction models, legal issues and negotiations.
2010 - 2011	**Mobile application development,** Androïd Developed ClopClop, a mobile application that locates open retailers nearby.
2008 - 2009	**Mathematics & Physics Oral Examiner**, Lycée Henri IV, Paris Examiner for weekly oral exams of students in the new "Classes Préparatoires aux Études Supérieures".
2008	**Financial Agency of the Embassy of France,** New York Study on investment banks: activity and regulation before and after Bear Stearns.
2005 - 2006	**Military training in the French Military Police Force** Midshipman, in the French "Gendarmerie" Polynesian Base.

Other Skills & Interests

Languages	**French**, **English**, and **Spanish** (intermediate level).
Computer skills	**Python**, javascript (good level) ; working knowledge of Django, Matlab, C++, PostgreSQL, Objective-C, Java, Ruby, Stata, Mathematica, SAS, and R.
Other	Interests in contemporary dance, literature, running, kiteboarding, and music.