Matthew Ricci

Data Science Initiative
Brown University
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Current position

Postdoctoral Associate
Data Science Initiative
Brown University
Advisor: Stuart Geman

Areas of interest

Machine learning for network dynamics
Systems of coupled oscillators
The representation of syntactic structures in neural networks

Education

2020 ***Ph.D. in Computational Neuroscience***
Brown University
Specialization: Neural dynamics, computer vision
Advisor: Thomas Serre
Dissertation: "Towards Systematic Vision: Limitations of Convolutional Neural Networks and Future Directions in Oscillatory Coding"

2012 ***MA/BA in Mathematics***
University of Pennsylvania
Specialization: Signal processing
Advisor: Philip Gressman

2012 ***BA in Musicology***
University of Pennsylvania
Specialization: American modernism and performance practice
Advisors: Arman Schwartz, Emily Dolan

Appointments held

Aug. 2018 - Dec. 2018 — ***Visiting Doctoral Researcher***
Département d'informatique
École normale supérieure, Paris
Principal Investigator: Stéphane Mallat

2013-2014 — ***Research Assistant***
Rutgers University Center for Cognitive Science
Principal Investigator: Randy Gallistel

Grants, honors & awards

Sep. 1, 2020- Sep 1, 2021 — Zuckerman Postdoctoral Fellowship (Declined)
Hebrew University of Jerusalem
Principal Investigator: Mor Nitzan

Sep. 1, 2017- July 1, 2019 — NSF Graduate Research Fellowship
Award no. 1644760
Principal Investigator: Thomas Serre

2018 — Brown University Graduate School Travel Grant

2017 — CCN Travel Grant

Jan. 1, 2015- Jan. 1, 2017 — NIH Vision Training Grant
Award no. 5T32EY018080-08
Principal Investigator: Michael Paradiso

2012 — Admitted to Phi Beta Kappa

2012 — Phi Beta Kappa Outstanding Thesis Award, University of Pennsylvania

2012 — Rose Award for Outstanding Thesis, University of Pennsylvania

2011 — Submatriculated into graduate program, Department of Mathematics, University of Pennsylvania

Peer-Reviewed Publications

Published

Alamia, A., Luo, C., Ricci, M.G., Kim, J., Serre, T. and VanRullen, R. (forthcoming) Differential involvement of EEG oscillatory components in identy vs. spatial-relation reasoning tasks. eNeuro

Ricci, M., Cadène, R., & Serre, T. (2021). Same-different conceptualization : A machine vision perspective. Current Opinion in Behavioral Sciences, 37, 47–55. https://doi.org/10.1016/j.cobeha.2020.08.008

Ricci, M., and Serre, T. (2020). Hierarchical Models of the Visual System. Encyclopedia of Computational Neuroscience, 1–14. https://doi.org/10.1007/978-1-4614-7320-6345 − 2

Kim, J., Ricci, M.G., and Serre, T. (2018) Not-so-CLEVR: Learning same-different relations strains feedforward neural networks, Journal of the Royal Society Interface, 8(4), https://doi.org/10.1038/35073582

Ricci, M.G, Kim, J. and Serre, T. (2018) Same-Different Problems Strain Convolutional Neural Networks, Proceedings of the 40th Annual Conference of the Cognitive Science Society.

Ricci, M.G., and Gallistel, R. (2017). Accurate Step-Hold Tracking of Smoothly Varying Periodic and Aperiodic Probability. Atten. Percept. Psychophys., 1–32. https://doi.org/10.3758/s13414-017-1310-0

Submitted

Chalvidal, M., Ricci, M.G., Serre, T., VanRullen, R. Go With the Flow: Adaptive Control for Neural ODEs

Gallistel, C.R., Johansson, F., Jirenhed, D.-A., Rasmussen, A., Ricci, M.G., Hesslow, G. Quantitative Properties of the Learned Pause in the Spontaneous Firing of the Cerebellar Purkinje Cell

Technical Reports and Preprints

Chalvidal, M., Ricci, M.G., Serre, T., VanRullen, R. Go With the Flow: Adaptive Control for Neural ODEs. arXiv:2006.09545 [cs.LG]

Alamia, A., Luo, C., Ricci, M.G., Kim, J., Serre, T., VanRullen, R. Differential involvement of EEG oscillatory components in sameness vs. spatial-relation visual reasoning tasks bioRxiv 2019.12.16.877829

Gallistel, C. R., Johansson, F., Jirenhed, D.-A., Rasmussen, A., Ricci, M., and Hesslow, G. (2020). Quantitative Properties of the Creation and Activation of a Cell-Intrinsic Engram. BioRxiv, 2020.03.17.995258.

Ricci, M.G., Kim, J and Johansson, F. A Passage-of-time Model of the Cerebellar Purkinje Cell, 2016, arXiv:1605.03060v2 [q-bio.NC]

Works in Progress

Ricci, M.G., Thackray, J., Theis, T., Abraira, V. Automated modeling of higher-order behavioral sequences in mouse models of spinal injury (In preparation)

Ricci, M.G., Zhang, Y., Soni, A., Chalvidal, M., Jung, M., Serre, T. Learning to control huge systems of coupled oscillators (In preparation)

Ricci, M.G., Linsley, D., Govindarajan, L., Serre, T., Generalized Adversariality: Parameterized data set optimization to evaluate the limits of neural models and mechanisms (In preparation)

Articles Reviewed

Sims, C. R. (2016). Rate-distortion theory and human perception. Cognition, 152, 181–198. https://doi.org/10.1016/j.cognition.2016.03.020

Conferences, Talks and Workshops

As conference presenter

June 2020 — Ricci, M.G, "N'Sync: Learning to Synchronize in Complex Networks" Brown Uncoference. June 29-30, 2020.

Feb. 2020 — Ricci, M.G., Zhang, Y., Soni, A., Jung, M., Serre, T. "Kura-Net: Exploring systems of coupled oscillators using deep learning" Poster, COSYNE 2020. Denver, USA. February 27-March 2, 2020.

Feb. 2019 — Ricci, M.G., Windolf, C., Serre, T. "A Formal Model of Neural Synchrony for Unsupervised Image Grouping". Poster, COSYNE 2019. Lisbon, Portugal. February 28-March 3, 2019.

July 2018 — "Not-So-CLEVR: Same-different problems strain feedforward neural networks". 40th Annual Meeting of the Cognitive Science Society", July 25, 2018. Monona Terrace Community and Convention Center, Madison, WI.

Sep. 2017 — "A Dichotomy of Visual Relations, Or the Limits of Convolutional Neural Networks", Conference on Cognitive Computational Neuroscience (CCN), September 6-8, 2017. Columbia University, NYC.

Aug. 2017 — "Deep RL Bootcamp", August 26-27, 2017, University of California, Berkeley. (Accepted)

June 2015

"Cell autonomous metabotropic signaling", Kavli Futures Symposium – The Synapse Hypothesis: To be or not to be. June 25-26, 2015. University of California, Santa Barbara

As guest speaker

June 2020 "The Kuramoto Model Meets Machine Learning: Some Early Results in the Statistical Modeling of Oscillatory Systems". University of Ghent. PI: Tom Verguts. June 19, 2020

Nov. 2019 "The Serre Lab: From machine learning to biology and back again", Information Theory (APMA 1710). Instructor: Govind Menon. November 11, 2019.

Oct. 2019 "Coupled Oscillators for Data Science: A Research Program", Serre Lab-ANITI Joint Meeting, PIs: Thomas Serre, Rufin VanRullen. October 24, 2019.

Sep. 2019 "Review: Coupled Oscillators for Perceptual Grouping", Carney Institute for Brain Science. September 5, 2019.

April 2019 "Systems of coupled neural oscillators: Results and applications based on Slotine, Izhikevich, Kuramoto", Carney Institute for Brain Science. April 30, 2019.

Aug. 2019 "Kosterlitz Machines", Carney Institute for Brain Science. August 7, 2019.

Oct. 2018 "Get Rhythm: Object Multiplexing in Phase Neural Networks". Centre de Recherche Cerveau et Cognition, Toulouse, France. October 2., 2018

March 2018 "Reinforcement Learning 101", Computational Cognitive Science (CLPS 1291). Instructor: Thomas Serre. March 22, 2018.

Dec. 2017 "Visual Relations and Convolutional Networks", Perception & Action Seminar, Brown University, Department of Cognitive, Linguistic and Psychological Sciences. December 7, 2017

Oct. 2015 "Contemporary Problems in Vision", Brown University, Department of Cognitive, Linguistic and Psychological Sciences. October 9, 2015.

June 2015 "Contemporary Problems in Vision", UCL Gatsby Computational Neuroscience Unit. June 26, 2015.

June 2015 "Challenges to Hebbianism: A Case from Cerebellar Learning", UCL Gatsby Computational Neuroscience Unit, June 25, 2015.

June 2015 "Challenges to Hebbianism: A Case from Cerebellar Learning", University of Geneva. June 3, 2015.

June 2015 "Challenges to Hebbianism: A Case from Cerebellar Learning", Neurospin. June 5, 2015.

March 2014 "Non-stationary Bernoulli Processes: Ideal Observers' Predictions and Surprisals", Rutgers University Center for Cognitive Science. March 28, 2014.

As organizer

April 2018 "Beyond Deep Learning Workshop: Session 2", Brown University, April 6, 2018
Speakers: David Heeger (NYU), Dima Amso (Brown University), Tom Griffiths (UC Berkeley)

Jan. 2018 "Beyond Deep Learning Workshop: Session 1", Brown University, January 18-19, 2018
Speakers: Matthias Bethge (Universität Tübingen), Randy Gallistel (Rutgers University), Gary Marcus (NYU), Samuel Gershman (Harvard)

Teaching

Brown University

2019-present ***Mentor***
Visiting undergraduate researcher, Yuwei Zhang
Nankai University
Project: An end-to-end differentiable clustering algorithm using the Kuramoto Model

2019 ***Teaching Assistant***
Human Cognition (CLPS 0200)
Instructor: Katheryn Spoehr

2018 ***Teaching Assistant***
Deep Learning in Brains, Minds and Machines (CLPS 1950)
Instructor: Thomas Serre

2017 ***Teaching Assistant***
Introduction to Programming for Mind, Brain and Behavior (CLPS 1292)
Instructor: Thomas Serre

2016-2018 ***Mentor***
Masters student, Charles Windolf
Department of Applied Mathematics, Brown University
Project: Angular Gibbs random fields for image processing

University of Pennsylvania

2012-2013 ***Tutor***
Multivariable calculus, linear algebra (MATH 103, MATH 104)
Department of Mathematics

Princeton Review

2013 ***SAT Instructor***
MCAT Instructor

References

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