Pedro Pessoa

Curriculum vitae

Education

2022 **PhD in Physics**, *University at Albany – State University of New York*, Albany, NY – USA

2017 **MSc in Physics**, *University at Albany – State University of New York*, Albany, NY – USA

2014 **BSc in Molecular Sciences**, *University of São Paulo*, São Paulo, SP – Brazil

Publications

[1] P. Pessoa, J. A. Martinez, V. Vandenbroucke, F. Delvigne, and S. Pressé. Simulation-based inference captures non-Markovian effects as exemplified in protein production kinetics through cell division. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)* **123**, e2517309123 (2026).

[2] I. Menendez-Montes, C. Marin-Vicente, S. Mukherjee, M. Salama Ahmed, M. J. Gomez, C. G. Anene-Nzelu, M. Lee, S. Koslowski, A. Solmonson, T. Tassin, S. R. Ali, P. Pessoa, A. Elnwasany, N. T. Lam, S. Thet, E. Calvo, A. C. Cardoso, A. H. M. Pereira, F. Xiao, P. Wang, N. U. N. Nguyen, C.-C. Hsu, A. Mohamed, H. El-feky, A. K. Westfall, R. DeBerardinis, R. S.-Y. Foo, M. Kinter, S. Pressé, L. Szweda, A. Asaithamby, J. A. Enriquez, M. Torres, J. Vazquez, and H. A. Sadek. Mitochondria directly interact with the nuclear pore complex. *Nature* **654**, 786 (2026).

[3] Z. H. Hendrix, L.W. Q. Xu, B. Naingolan, P. Pessoa, A. Saurabh, S.Pressé. Many short traces are nearly as informative as one uninterrupted trace in recovering hidden-state kinetics. *The Journal of Chemical Physics* **165**, 124117 (2026).

[4] C. Lu, S. A. Tashev, P. Pessoa, R. Kruithoff, D. P. Shepherd, and S. Pressé. Stochastic colonization and host-to-host transmission shape gut bacterial variability. *Under review. Available on bioRxiv:* `https://www.biorxiv.org/content/10.64898/2026.05.11.724410v1` (2026).

[5] P. Pessoa, S. Pressé and S. B. Ozkan. Allostery beyond amplification: temporal regulation of signaling information. *Under review. Available on arXiv:* `https://arxiv.org/abs/2601.01850` (2026).

[6] R. Kruithoff, M. D. Spendlove, S. J. Sheppard, M. Schweiger, P. Pessoa, M. Abbasi, S. Pressé, B. B. Bartelle, D. P. Shepherd. GPU-accelerated, self-optimizing processing for 3D multiplexed iterative RNA-FISH experiments. *Under review. Available on bioRxiv:* `https://www.biorxiv.org/content/10.1101/2025.10.10.681751v1` (2025).

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[7] P. Pessoa, C. Lu, S. A. Tashev, R. Kruithoff, D. P. Shepherd, and S. Pressé. REPOP: Bacterial population quantification from plate counts. *eLife* **14**, RP107122 (2025).

[8] P. Pessoa, M. Schweiger, L. W. Q. Xu, T. Manha, A. Saurabh, J. A. Camarena, and S. Pressé. Avoiding subtraction and division of stochastic signals using normalizing flows: NFdeconvolve. *iScience* **28**, 113823 (2025).

[9] P. Pessoa, P. Campitelli, D. P. Shepherd, S. B. Ozkan, and S. Pressé. Mamba time series forecasting with uncertainty quantification. *Machine Learning: Science and Technology* **6**, 035012 (2025).

[10] J. S. Bryan IV, P. Pessoa, M. Tavakoli, and S. Pressé. Perspectives: Comparison of deep learning segmentation models on biophysical and biomedical data. *Biophysical Journal* **124**, 1327 (2025).

[11] P. Pessoa, M. Schweiger, and S. Pressé. Avoiding matrix exponentials for large transition rate matrices. *The Journal of Chemical Physics* **160**, 094109 (2024).

[12] P. Pessoa and S. Pressé. How many submissions are needed to discover friendly suggested reviewers? *PLOS ONE* **18**, e0284212 (2023).

[13] P. Pessoa. Information geometry and Bose–Einstein condensation. *Chaos: An Interdisciplinary Journal of Nonlinear Science* **33**, 033101 (2023).

[14] P. Pessoa. Entropic dynamics yields reciprocal relations. In: Nielsen F., Barbaresco F. (eds) *Geometric Science of Information. Lecture Notes in Computer Science* **12829**, 227–234 (2021).

[15] P. Pessoa. Legendre transformation and information geometry for the maximum entropy theory of ecology. *Physical Sciences Forum* **3**, 1 (2021).

[16] B. A. Costa and P. Pessoa. Statistical mechanics of unconfined systems: Challenges and lessons. *Physical Sciences Forum* **3**, 8 (2021).

[17] P. Pessoa. Bose–Einstein statistics for a finite number of particles. *Physical Review A* **104**, 043318 (2021).

[18] P. Pessoa and C. Cafaro. Information geometry for Fermi–Dirac and Bose–Einstein quantum statistics. *Physica A: Statistical Mechanics and its Applications* **576**, 126061 (2021).

[19] F. X. Costa and P. Pessoa. Entropic dynamics of networks. *Northeast Journal of Complex Systems* **3**, 5 (2021).

[20] P. Pessoa, F. X. Costa, and A. Caticha. Entropic dynamics on Gibbs statistical manifolds. *Entropy* **23**, 494 (2021).

[21] P. Pessoa and B. A. Costa. Comment on Tsallis, C. Black hole entropy: A closer look. *Entropy* **22**, 1110 (2020).

[22] P. Pessoa and A. Caticha. Exact renormalization groups as a form of entropic dynamics. *Entropy* **20**, 25 (2018). *Editor's Choice*

Invited talks

2026 *Probability Puzzles* (**Outreach**), Society of Physics Students – Professor Talk

2026 *BiFISH: Joint 3D RNA localization and decoding with Julia*, ASU Research Technology Office Ignite: Julia on the Sol Supercomputer

2026 *Inference on biological dynamics with memory*, Troy University – The Center for Relativity and Cosmology and the Department of Mathematics and Statistics Colloquium

2026 *Probability Puzzles* (**Outreach**), Troy University – Honors Speaker Insight Series

2026 *Starting from zero: navigating a PhD abroad*, (**Outreach**) "Robust Systems: Tales of Stability and Strength" – SIAM Annual Meeting and SIAM Conference on the Life Sciences

2026 *Inference on biological dynamics with memory*, ICPT-SAIRF / IFT-UNESP – Bioseminars

2026 *Obtaining maximum information from Petri dishes*, ICPT-SAIRF / IFT-UNESP – Bioseminars

2025 *Inference on biological dynamics with memory*, ASU School of Mathematical and Statistical Sciences – Data Science Seminar

2025 *On neural networks, biophysics, and the future of inference*, University at Albany – Department of Physics Colloquium

2025 *Obtaining maximum information from plate counting*, ASU Center for Biological Physics – Chalk Talk

2024 *Inverting whichever biophysical model you can simulate*, ASU and CY Cergy – Soft Matter/Biological Physics Workshop

2024 *Distinguishing signal from noise with NFdeconvolve*, ASU American Physics Society Chapter – Blackboard Briefings

2024 *Brain teasers* (**Outreach**), Science on Tap, Tempe, AZ

2023 *Why do we need Bayesian statistics? A tutorial*, ASU American Physics Society Chapter – Grad2Grad Seminar

2022 *How not to be fooled by probabilities*, ASU American Physics Society Chapter – Blackboard Briefings

2022 *How many submissions are needed to discover friendly suggested reviewers?*, ASU American Physics Society Chapter – Grad2Grad Seminar

Presented works

2026 *Inherited or produced?*, Science Slam, German Academic International Network (GAIN), San Francisco, CA – USA **conference**

2026 *Inference on biological dynamics with memory*, SIAM Conference on the Life Sciences, Cleveland, OH – USA **conference**

2026 *Neural network assisted inference in biological dynamics*, Symposium on Probability and Entropy in Physics and Beyond, University at Albany - State University of New York, Albany, NY – USA **symposium**

2026 *Inference in non-Markovian and multiscale biological dynamics*, Barret Memorial Lectures, University of Tennessee, Knoxville, TN – USA **conference**

2026 *Mutual information throughout allosteric regulation: It is not a shouting match*, Protein Folding Dynamics Gordon Research Conference (GRC), Pomona, CA – USA **conference**

2025 *Learning memory kernel parameters for coarse-grained simulations*, Biophysical Society Annual Meeting (BPS), Los Angeles, CA – USA **conference**

2025 *Bayesian single-particle tracking using normalizing flows*, Biophysical Society Annual Meeting (BPS), Los Angeles, CA – USA **conference**

2025 *Capturing quantitative bacterial population kinetics within individual C. elegans*, Biophysical Society Annual Meeting (BPS), Los Angeles, CA – USA **conference**

2024 *Normalizing flows for simulation-based inference of non-Markovian and multiscale stochastic processes*, SIAM Conference on Mathematics of Data Science 2024, Atlanta, GA – USA **conference**

2024 *Improving difficult inference tasks and likelihood evaluations with neural networks*, Biophysical Society Annual Meeting (BPS 2024), Philadelphia, PA – USA **conference**

2023 *Accelerating likelihood calculations for biochemical network discovery*, Biophysical Society Annual Meeting (BPS 2023), San Diego, CA – USA **conference**

2021 *Bose-Einstein statistics for a finite number of particles*, IWoSP 2021 – International Workshop on Statistical Physics (held online), Antofagasta – Chile **conference**

2021 *Entropic dynamics yields reciprocal relations*, GSI 2021 – 5th Conference on Geometric Science of Information (held online), Paris – France **conference**

2021 *Statistical mechanics of unconfined systems: challenges and lessons*, MaxEnt 2021 – 40th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering (held online), Graz – Austria **conference**

2021 *Legendre transformation for the maximum entropy theory of ecology*, MaxEnt 2021 – 40th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering (held online), Graz – Austria **conference**

2021 *Entropic dynamics on Gibbs statistical manifolds*, Entropy 2021: The Scientific Tool of the 21st Century (held online), Porto – Portugal **conference**

2021 *Entropic dynamics on Gibbs statistical manifolds*, Recent Advances in Info-Metrics Research (held online), Washington, DC – USA **workshop**

2021 *Entropic dynamics of networks*, Fourth Northeast Regional Conference on Complex Systems (held online), Binghamton, NY – USA **conference**

2019 *Entropic dynamics on Gibbs statistical manifolds*, Conference on Perspectives in Nonlinear Dynamics, São Paulo, SP – Brazil **conference**

2019 *Entropic dynamics on Gibbs statistical manifolds*, StatPhys27 – International Conference on Statistical Physics, Buenos Aires – Argentina **conference**

2018 *Entropic renormalization groups on statistical manifolds*, Entropy 2018: From Physics to Information Sciences and Geometry, Barcelona – Spain **conference**

2017 *Exact renormalization groups as a form of entropic dynamics*, MaxEnt 2017 – 37th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering, Jarinu, SP – Brazil **conference**

2014 *Kidney sensing*, iGEM Jamboree, Boston, MA – USA **symposium**

2013 *Statistical mechanics of moral values*, SiicUSP – International University of São Paulo Symposium for Undergraduate Research, São Carlos, SP – Brazil **symposium**

2013 *Detecthol*, iGEM Latin America Jamboree, Santiago – Chile **symposium**

Awards

2022 **Graduate award for theoretical research**, *Department of Physics, University at Albany – SUNY*

2021 **Best PASCAL talk**, *Department of Physics, University at Albany – SUNY*

2021 **Best oral presentation award**, *Entropy 2021 conference*

2016 **Alam award for outstanding performance in the PhD comprehensive exam**, *Department of Physics, University at Albany – SUNY*

2014 **Bronze medal**, *International Genetically Engineered Machine Competition, iGEM Foundation*

2013 **Silver medal**, *International Genetically Engineered Machine Competition, iGEM Foundation*

2013 **First place**, *University of São Paulo – Knowledge Olympiad (teaching modality)*

2013 **Honorable mention**, *SiicUSP Symposium for Undergraduate Research, University of São Paulo*

Held positions

2022–current **Postdoctoral research scholar**, *Arizona State University*, Tempe, AZ – USA
Member of Pressé Lab, Department of Physics.

2021–2022 **Adjunct lecturer**, *University at Albany – SUNY*, Albany, NY – USA
Lab instructor for Physics Lab I & II.

2019 **Lecturer and lab manager**, *University at Albany – SUNY*, Albany, NY – USA
Instructor for the following courses:
General Physics I (summer course);
General Physics Lab I (summer course, course coordinator).

2017–2021 **Teaching assistant**, *University at Albany – SUNY*, Albany, NY – USA
Lab instructor for General Physics Lab I & II;
Discussion teacher for Physics I & II.
Grader for: Quantum Mechanics I & II; Introduction to General Relativity; Information Physics; Quantum Field Theory.

Service

Conference and Event Organization

2026 **Organizer and session chair**, Probability and Information Theory in Biological Dynamical Systems, *SIAM Conference on the Life Sciences (LS26)*

2026 **Main organizer and session chair**, *Symposium on Probability and Entropy in Physics and Beyond, University at Albany*

2026 **Committee member and session chair**, *BioPhest Conference, Arizona State University*

2025 **Committee member and session chair**, *BioPhest Conference, Arizona State University*

2024 **Session organizer and chair**, MamBayes: Model-free long-horizon time series forecasting, *SIAM Conference on Mathematics of Data Science (MDS24)*

2024 **Session chair**, *ASU–CY Cergy Workshop on Soft Matter and Biological Physics*

2024 **Committee member and session chair**, *BioPhest Conference, Arizona State University*

Departmental, Educational, and Professional Service

2026 **Postdoctoral representative**, *Arizona State University Graduate Physics Society chapter*

2025 **Vice chair and student talk organizer**, *Arizona State University American Physics Society Chapter*

2025 **Lecturer, summer school**, *Center for Biological Physics, Arizona State University*

2024 **Lecturer, summer school**, *Center for Biological Physics, Arizona State University*

2021 **Committee member**, *New York State Master Teacher Program*

2019 **Committee member**, *New York State Master Teacher Program*

2019 **Vice chair and student journal club organizer**, *University at Albany Physics Registered Graduate Student Organization*

2012 **Seminar organizer, Molecular Sciences Program seminar series (CMnário)**, *University of São Paulo, Molecular Sciences Student Association*

Languages

Portuguese	Native
English	Fluent
Spanish	Advanced

Computer skills

Languages	Python (Pytorch, Numpy, Scipy, Matplotlib, Pandas, Scikit-learn), C, Julia, Matlab, R, and Bash
Version control	Git and GitHub
Others	SQL, LaTeX (TikZ, Beamer)
High-Performance Computing	Parallel computing, GPU computing (CUDA/PyTorch), SLURM-based clusters

Reviewer work

Advances in Neural Information Processing Systems (NeurIPS) – Curran Associates
Nature Communications – Springer Nature
Advanced Science – Wiley
IEEE Transactions on Multimedia – IEEE
Journal of Cell Biology – Rockefeller University Press
ACS Photonics – American Chemical Society
Chaos – AIP Publishing
Physica A: Statistical Mechanics and its Applications – Elsevier
New Journal of Physics – IOP Publishing
Physica Scripta – IOP Publishing
Journal of Physics: Complexity – IOP Publishing
Entropy – MDPI
Journal of Statistical Mechanics: Theory and Experiment – IOP Publishing
Journal of Physics A: Mathematical and Theoretical – IOP Publishing
Journal of Physics Communications – IOP Publishing

Awarded scholarships

2014–2017 **GDE, CSF – scholarship for doctorate abroad**, *CNPq – Conselho Nacional de Pesquisa e Desenvolvimento – Brazilian Federal Government*

2012–2014 **PIBIC – institutional scholarship for undergraduate research**, *University of São Paulo*

Additional education

2019 **Summer teaching boot camp for graduate students**, *Institute for Teaching, Learning & Academic Leadership*, University at Albany – SUNY, Albany, NY – USA

2014 **Summer program**, *IMPA – National Institute for Pure and Applied Mathematics*, Rio de Janeiro, RJ – Brazil, *Graduate courses*: Statistical Mechanics; Markov Chains and Mixing Times

2012 **Summer program**, *IME – Institute for Mathematics and Statistics of the University of São Paulo*, São Paulo, SP – Brazil, Courses: Introduction to probability calculus; Metric spaces

References

Steve Pressé, *Postdoctoral supervisor*, Director, Center for Single Molecule Biophysics, Biodesign Institute; Full Professor, Department of Physics and School of Molecular Sciences, Arizona State University
email: spresse@asu.edu Administrative contact: Lindsay Stephens, lindsay.stephens@asu.edu

S. Banu Ozkan, *Research collaborator*, Director, Center for Biological Physics; Full Professor, Department of Physics, Arizona State University
email: sozkan@asu.edu

Ariel Caticha, *PhD advisor*, Full Professor, Department of Physics, University at Albany, SUNY
email: acaticha@albany.edu