

Luiz Max Carvalho

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Summary

Natural biological processes emit signals, which are often too “high” or too “low” for us to “hear”. My goal as a scientist is to develop and apply statistical and mathematical tools to decode and quantify these biological signals. I hope a better understanding of these entities can lead to a progressive reduction of the world’s disease burden. Bringing state-of-the-art statistical practice to the Life Sciences has been a major focus of my career in recent years. My interests lie in **Biostatistics**, ranging from complex networks to spatial analysis to statistical phylogenetics.

As you will notice if you continue reading, I am a big fan of collaboration, interacting with colleagues around Brazil and abroad. My current interests are:

- Bayesian inference of deterministic models;
- Combining (pooling) probability distributions;
- Learning from historical data under model misspecification;
- Phylogeny estimation: MCMC exploration of time-tree space – characterising time-tree space, new transition kernels;
- Coupling mathematical models to coalescent-based population reconstructions;

Please feel free to contact me if your interests lie anywhere near these topics.

Google Scholar: <https://scholar.google.com/citations?user=y2mxpbcAAAAJ&hl=en>

Currículo Lattes : <http://lattes.cnpq.br/7282202947621572>

*I also hold a an Adjunct Assistant Professor at the Biostatistics Department at the University of North Carolina, Chapel Hill https://sph.unc.edu/adv_profile/luiz-carvalho/

Publications

Published/Accepted – peer reviewed

- [1] F. P. Camara, A. L. Gomes, Carvalho, L. M., and L. G. Castello, “Dynamic behavior of sylvatic yellow fever in Brazil (1954-2008),” *Rev. Soc. Bras. Med. Trop.*, vol. 44, no. 3, pp. 297–299, 2011.
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- [3] F. P. Camara, Carvalho, L. M., and A. L. Gomes, “Demographic profile of sylvatic yellow fever in Brazil from 1973 to 2008,” *Trans. R. Soc. Trop. Med. Hyg.*, vol. 107, pp. 324–327, May 2013.
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Under review

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- [33] E. C. Araujo, C. T. Codeço, S. Loch, L. B. Vacaro, L. P. Freitas, R. M. Lana, L. S. Bastos, I. F. de Almeida, F. Valente, Carvalho, Luiz M, *et al.*, “Large-scale epidemiological modeling: Scanning for mosquito-borne diseases spatio-temporal patterns in Brazil,” *arXiv preprint arXiv:2407.21286*, 2024.
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Conference papers

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- [39] Y. Yao, Carvalho, Luiz Max, and D. Mesquita, “Locking and quacking: Stacking Bayesian models predictions by log-pooling and superposition,” in *NeurIPS 2022 Workshop on Score-Based Methods*, 2022.
- [40] T. da Silva, Carvalho, Luiz Max, A. Souza, S. Kaski, and D. Mesquita, “Embarrassingly parallel GFlowNets,” *International Conference on Machine Learning*, 2024.

Book chapters

- [41] F. Camara and Carvalho, L. M., “Febres Hemorrágicas virais [Viral hemorrhagic fevers],” in *Introdução à Virologia Humana* (N. Santos, M. T. Romanos, and M. D. Wigg, eds.), Rio de Janeiro: Guanabara Koogan, 3rd ed., 2014.
- [42] Carvalho, L. M., “Métodos Bayesianos para inferir o padrão de dispersão de agentes patogênicos : filogeografia do vírus da febre aftosa na América do Sul como um caso de estudo [Bayesian methods to infer spread patterns for pathogens: the phylogeography of Foot-and-Mouth Disease virus in South America as a case study],” in *Abordagens Moleculares em Veterinária* (M. V. Cunha and J. Inácio, eds.), Lisbon: Lidel Editora, 1st ed., 2014.
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Tech reports

- [45] C. Codeço, D. Villela, F. Coelho, L. Bastos, Carvalho, LM, M. Gomes, O. Cruz, and R. Lana, “Risco de espalhamento da COVID-19 em populações indígenas: considerações preliminares sobre vulnerabilidade geográfica e socioeconômica [Risk of spread of COVID-19 in indigenous populations: preliminary considerations on geographic and socioeconomic vulnerability],” *Rio de Janeiro: Fiocruz: FGV*, vol. 18, 2020.

- [46] F. C. Coelho, L. M. Carvalho, R. M. Lana, O. G. Cruz, L. S. Bastos, C. T. Codeco, M. F. Gomes, and D. Villela, “Modeling the post-containment elimination of transmission of COVID-19,” *medRxiv*, 2020.
- [47] L. M. Carvalho and G. A. Moreira, “Adaptive truncation of infinite sums: applications to statistics,” *arXiv preprint arXiv:2202.06121*, 2022.
- [48] L. M. Moschen and L. M. Carvalho, “Bivariate beta distribution: parameter inference and diagnostics,” *arXiv preprint arXiv:2303.01271*, 2023.

Work in progress¹

L. Zimmermann, Carvalho, L.M., L. Vasconcellos, L. Bastos, C. Struchiner, and A. H. Lopes, “Temperature-dependent oviposition and egg eclosion of Chagas disease vector *Rhodnius prolixus*”, In preparation.

Carvalho, L.M., G. Baele, M.A. Suchard, A. Rambaut, “An efficient, tunable time-tree transition kernel for Bayesian phylogenetics”, In preparation.

Carvalho, L.M., Dudas, G., Stadler, T., Rambaut, A., Bedford, T. “Bayesian estimation of R_0 from sub-critical chains of transmission under observation error”, In preparation.

Education

2009–2012	BSc (hons.) Microbiology and Immunology, Federal University of Rio de Janeiro, Brazil.
2014–2018	PhD Evolutionary Biology, University of Edinburgh, UK. Thesis committee: Richard Everitt (Reading) and Jarrod Hadfield (Edinburgh).

Professional Experience

2010–2013	Pan American Health Organization (PAHO) Position: Statistical Assistant Role: Developed and analysed quality control experiments for veterinary diagnostic tests; Research on Foot-and-Mouth Disease virus (FMDV) phylodynamics
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¹Drafts in final phase of preparation

Academic Experience

2009–2011	<p>Infectious Diseases Epidemiology Division (SEDI), Institute of Microbiology, Federal University of Rio de Janeiro</p> <p>Position: Scientific initiation student</p> <p>Supervisor: Prof. Dr. Fernando Portela Câmara</p> <p>Role: research on the epidemiology of AIDS, sylvatic yellow fever and dengue.</p>
2012–2013	<p>Programme for Scientific Computing (PROCC), Oswaldo Cruz Foundation (Fiocruz)</p> <p>Position: Scientific initiation student</p> <p>Supervisor: Prof. Dr. Oswaldo Gonçalves Cruz</p> <p>Role: research on spatial partition methods for health areal data.</p>
2013–2014	<p>Programme for Scientific Computing (PROCC), Oswaldo Cruz Foundation (Fiocruz)</p> <p>Position: Scientific initiation student</p> <p>Supervisors: Prof. Dr. Claudio Struchiner and Dr. Leonardo Bastos</p> <p>Role: research on Bayesian inference of deterministic population growth models, multilevel binary regression and opinion pooling.</p>
2014–2018	<p>Institute of Evolutionary Biology (SBS), University of Edinburgh</p> <p>Position: PhD student</p> <p>Supervisors: Andrew Rambaut and Darren Obbard</p> <p>Role: research on statistical phylogenetics methods for RNA virus phylodynamics.</p>
2018–2019	<p>Programme for Scientific Computing (PROCC) and National School of Public Health (ENSP), Oswaldo Cruz Foundation</p> <p>Position: Postdoctoral Researcher</p> <p>Supervisor: Claudio Struchiner</p> <p>Role: research on statistical methods applied to Public Health.</p>
2020–	<p>School of Applied Mathematics (EMAp), Getúlio Vargas Foundation (FGV)</p> <p>Position: Lecturer (Assistant Professor)</p> <p>Role: research on Biostatistics and teaching Statistics at the graduate and undergraduate levels.</p>

Memberships

Brazilian Statistical Association (ABE), Analytical Methods in Epidemiological Surveillance Group (MAVE).

Teaching Experience

2007–2011	High School Chemistry and Biology for underprivileged students I was a voluntary teacher of whole-year high school courses on organic chemistry, general chemistry and biology.
2010–2013	Basics of Mathematics and Statistics for Microbiology Federal University of Rio de Janeiro Supervisor: Prof. Dr. Fernando Portela Câmara Basic calculus; descriptive statistics, Gaussian distribution and hypothesis testing.
2010	Topics in Human Physiology Federal University of Rio de Janeiro Supervisor: Prof. Dr. Pedro Paulo Elsas By means of seminars and group discussions, we approach particular aspects of human physiology and stimulate the students to draw general conclusions about the subjacent biological processes.
2012	Bioinformatics Federal University of Rio de Janeiro Supervisor: Prof. Andrew Macrae, PhD Basics on Bioinformatics: basic genome annotation, databases, alignment, phylogenetics.
2014-2017	Molecular Evolution University of Edinburgh Supervisor: Prof. Andrew Rambaut, PhD Molecular phylogenetics.
2017	Statistics for Genetics University of Edinburgh Supervisor: Ian White TA in the Bayesian module
2020–	Statistical inference School of Applied Mathematics (EMAp) Undergraduate and graduate (PhD) courses (60 hours).
2023–	Statistical modelling School of Applied Mathematics (EMAp) Undergraduate (PhD) course (60 hours).
2020–	Computational Statistics School of Applied Mathematics (EMAp) PhD course (60 hours).
2021–	Bayesian Statistics School of Applied Mathematics (EMAp) PhD course (60 hours).

Awards

2010	Honourable Mention - XVI Week of Microbiology and Immunology, Federal University of Rio de Janeiro.
2011	Honourable Mention - XVII Week of Microbiology and Immunology, Federal University of Rio de Janeiro.
2011	Selected for Oral presentation – XXII National Meeting of the Brazilian Society for Virology.
2012	Honourable Mention - XVIII Week of Microbiology and Immunology.
2014	Selected for Oral presentation – XII Brazilian Meeting on Bayesian Statistics.
2014	Principal's Career Development Scholarship, University of Edinburgh.

Languages

Portuguese	Native
English	Fluent (CAE – Grade A)
Spanish	Advanced

References

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