

Tiago Paixão

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Experience

2023–present	Head of Advanced Data Analysis – Instituto Gulbenkian de Ciência – GIMM Core facility dedicated to bioinformatics, data analysis, computational biology, experimental design and data management
2020–2023	Head of Quantitative Biology and Digital Science – Instituto Gulbenkian de Ciência Core facility dedicated to data analysis, computational biology, experimental design and data management Main duties and achievements – Provide support to research groups at IGC on data analysis, statistics, experimental design and data management – Development of Bayesian framework for the evaluation of the performance of serological tests
2018–2019	Head of Clinical Research – Imagebiopsy Lab Medical software company in the field of Artificial Intelligence for medical diagnosis Main duties and achievements – Clinical and statistical validation of medical software – Development of machine learning based models for the prediction of disease states ★ Lead in the clearance process of the KOALA software by the US Food and Drug Administration (FDA) ★ Developed highly accurate machine-learning model for the prediction of rapid cartilage loss in osteoarthritis ★ Developed web-based interface for machine-learning models
2012–2017	Postdoctoral researcher – Institute of Science and Technology Austria Supervisor: Dr. Nicholas H. Barton Main duties and achievements · Conducting research at the interface of biology and computer science · Supervising PhD students and postdocs ★ co-PI and site coordinator for EU-FP7 project SAGE ★ Integrated computer science methods into evolutionary genetics to analyse the speed the adaptation ★ Created statistical methods to analyse the evolutionary potential of a continuous trait, regardless of genetic architecture
2008–2011	Postdoctoral researcher – University of Houston Supervisor: Dr. Ricardo Azevedo Main duties and achievements · Conducting research on evolutionary genetics and the dynamics and evolution of gene regulatory networks · Established mathematical framework to analyse probabilistic sex determination in <i>T. thermophila</i> ★ Created a computational framework to analyse the predictability of evolutionary trajectories ★ Contributed computational and statistical expertise to one of the first measurements of germline mutation rates
2003–2007	PhD student – Instituto Gulbenkian de Ciência Supervisor: Dr. Jorge Carneiro Main duties and achievements · Conducting research in theoretical biology ★ Created a mathematical model to analyse the consequences of stochastic gene expression for populations of isogenic cells ★ Honorable mention in award for Best European Thesis in Mathematical Biology

2001–2002	Research Assistant – Instituto Superior Técnico Non-Linear Dynamics Group Supervisor: Dr. Rui Dilão Main duties and achievements · Conducting research on the non-linear dynamics of the Lorenz attractor · Developed a toy dynamical system to explain the essential features of the transition to the Lorenz strange attractor
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Education

2003–2007	PhD in Biomedical Sciences Universidade do Porto / Instituto Gulbenkian de Ciência Supervisor: Dr. Jorge Carneiro & Dr. Manuel Vilanova Dissertation title: “ <i>The Stochastic Basis of Somatic Variation</i> ”
1996–2001	MSc/BSc Degree in Physics Engineering Instituto Superior Técnico Graduate thesis title: “ <i>Equilibrium states in the Frenkel-Kontorova model and the transition to the continuum</i> ” Thesis supervisor: Rui Dilão

Grants and Awards

2021	EMBO Practical Course: Computational optical biology Funding scheme: EMBO Practical Course pc21/16 Total funding: 27.900 €
2020	Comprehensive study of the mutational effects in E.coli Funding scheme: FCT-CPCA - Call on Advanced Computing Projects FCT/CPCA/A1/7350/2020 Total funding: in kind (50000 vcpu hours in supercomputer)
2021–2024	Mechanisms of life and death of infected flies (co-PI) Funding scheme: Fundação para a Ciência e Tecnologia PTDC/BIA-BIO/4693/2021 Total funding: 249.935 €
2013–2016	Project SAGE - Speed of Adaptation in Genetics and Evolutionary computation (PI - site coordinator) Funding scheme: EU FP7 FET Young Explorers FP7/2007-2013 grant agreement 618091 (SAGE) Total funding: 2.047.602€ (584.081€ to TP as site coordinator at IST Austria)
2009	Postdoctoral fellowship Funding scheme: Fundação para a Ciência e Tecnologia postdoctoral fellowship SFRH/BPD/43753/2008 Total funding: 26.940€
2008	3rd place in Reinhart Heinrich Doctoral Thesis Award Award for Best European Doctoral Thesis on Mathematical Biology European Society of Mathematical Biology
2003	PhD fellowship Funding scheme: Fundação para a Ciência e Tecnologia PhD fellowship SFRH/BD/10550/2002 Total funding: 47.000€

Teaching experience

2019-2022	Co-organizer of the Statistics and Quantitative Biology PhD course at IGC’s PhD Programme in Integrative Biology and Biomedicine
2020	Co-organizer of the Evolution PhD course at IGC’s PhD Programme in Integrative Biology and Biomedicine

2020	Co-organizer of the Systems Biology PhD course at IGC's PhD Programme in Integrative Biology and Biomedicine
2014–2016	Lecturer at the Graduate Programme Science for Development (PhD program PGCD) http://pages.igc.gulbenkian.pt/pgcd/en/
2008 and 2009	Organizer of the Dynamical Systems Course at PDBC (PhD Program in Computational Biology) at Instituto Gulbenkian de Ciência (Portugal).
2007	Lecturer of the Modeling of Biological Systems Course at the PDBEB (PhD Program in Experimental Biology and Biomedicine) held in Coimbra, Portugal.
2000–2001	Teaching Assistant to the courses Physics I (Mechanics and Thermodynamics) and Experimental Physics at Instituto Superior Técnico (Portugal)

Academic Service

2007–	Invited reviewer for: PLoS Biology, PLoS Computational Biology, Evolution, Genetics, Proceedings of the Royal Society B, Theoretical Population Biology, Journal of Theoretical Biology, Scientific Reports, G3, GECCO and Royal Society Open Science
2022	Member of the PhD evaluation jury for the thesis “ <i>The Role of Competition in Microbial Evolution: A theoretical and computational study of recurrent mutations within complex ecosystems</i> ” by Massimo Amicone - ITQB (Portugal)
2022	Member of the PhD evaluation jury for the thesis “ <i>Habitat loss and fragmentation: effects on genetic diversity and differentiation</i> ” by Gabriele Maria Sgarlata - ITQB (Portugal)
2022	Member of the PhD evaluation jury for the thesis “ <i>Studies of Staphylococcus aureus cell cycle: New approaches for automated analysis</i> ” by Bruno Saraiva - ITQB (Portugal)
2021	Member of the PhD evaluation jury for the thesis “ <i>Finite Mixture Models based on Scale Mixtures of Skew-Normal distributions applied to serological data</i> ” by Tiago Domingues - FCUL (Portugal)
2018	Member of the PhD evaluation jury for the thesis “ <i>Stability, Robustness, and Phenotype Accessibility in Boolean Gene Regulatory Networks</i> ” by Ricardo Pinho - ITQB (Portugal)
2014	Member of the PhD evaluation jury for the thesis “ <i>Variation in protein expression levels in cell populations</i> ” by Thiago Guzela - ITQB (Portugal)

Peer Reviewed Publications

Most relevant publications marked with *

- 2025 Figueiredo, A., Rastogi, S.T., Ramos, S., Nogueira, F., De Villiers, K., de Sousa, A.G.G., Votborg-Novell, L., von Wedel, C., Tober-Lau, P., Jentho, E., Pagnotta, S., Mesquita, M., Cardoso, S., Bortolussi, G., Muro, A.F., Tranfield, E.M., Thibaud, J., Duarte, D., Sousa, A.L., Pinto, S.N., Kitoko, J., Mombo-Ngoma, G., Mischlinger, J., Junntila, S., Alenquer, M., Amorim, M.J., Vasavda, C., Bosma, P.J., Violante, S., Drotleff, B., Tiago Paixão, Portugal, S., Kurth, F., Elo, L.L., Paul, B.D., Martins, R., Soares, M.P., , “ *A metabolite-based resistance mechanism against malaria.* ” **Science** 388, eadq6741. doi:10.1126/science.adq6741
- 2025 Vishwakarma, R., Sgarlata, G.M., Soriano-Paños, D., Rasteiro, R., Maié, T., Tiago Paixão, Tournebize, R., Chikhi, L., , “ *Species-Specific Traits Shape Genetic Diversity During an Expansion-Contraction Cycle and Bias Demographic History Reconstruction.* ” **Molecular Ecology** 34, e17597. doi:10.1111/mec.17597

3. 2025 Etibor, T.A., Tiago Paixão, Amorim, M.J., , “ *Fluorescence Loss After Photoactivation (FLAPh): A Pulse-Chase Cellular Assay for Understanding Kinetics and Dynamics of Viral Inclusions*” in: Yamauchi, Y., Amorim, M.J. (Eds.), **Influenza Virus: Methods and Protocols**. Springer US, New York, NY, pp. 125–140. doi:10.1007/978-1-0716-4326-6_6
4. 2025 Espigares, F., Alvarado, M.V., Abad-Tortosa, D., Varela, S.A.M., Sobral, D., Faisca, P., Tiago Paixão, Oliveira, R.F., “*Optimistic and pessimistic cognitive judgement bias modulates the stress response and cancer progression in zebrafish.*” **Transl Psychiatry** 15, 111. doi:10.1038/s41398-025-03311-9
5. 2025 Paulo, T.F., Akyaw, P.A., Tiago Paixão, Sucena, É., , “ *Evolution of resistance and disease tolerance mechanisms to oral bacterial infection in Drosophila melanogaster.* ” **Open Biol.** 15, 240265. doi:10.1098/rsob.240265
6. 2024 Ramos, S., Jeney, V., Figueiredo, A., Tiago Paixão, Sambo, M.R., Quinhentos, V., Martins, R., Gouveia, Z., Carlos, A.R., Ferreira, A., Pais, T.F., Lainé, H., Faísca, P., Rebelo, S., Cardoso, S., Tolosano, E., Penha-Gonçalves, C., Soares, M.P., , “ *Targeting circulating labile heme as a defense strategy against malaria.* ” **Life Science Alliance** 7. doi:10.26508/lsa.202302276
7. 2024 Oliveira, R., Neves-Costa, A., Pedroso, D., Tiago Paixão, Barros, A.B., Moita, L.F., Gil-Gouveia, R., , “ *CLOCK gene circannual expression in cluster headache.* ” **Cephalalgia** 44, 03331024241247845. doi:10.1177/03331024241247845
8. 2024 Caramalho, I., Matoso, P., Ligeiro, D., Tiago Paixão, Sobral, D., Fitas, A.L., Limbert, C., Demengeot, J., Penha-Gonçalves, C., , “ *The rare DRB1*04:08-DQ8 haplotype is the main HLA class II genetic driver and discriminative factor of Early-onset Type 1 diabetes in the Portuguese population.* ” **Front. Immunol.** 14, 1299609. doi:10.3389/fimmu.2023.1299609
9. 2023 Qian Wu, Euclides Sacomboio, Lara Valente de Souza, Rui Martins, Jamil Kitoko, Sílvia Cardoso, Temitope W Ademolue, Tiago Paixão, Jaakko Lehtimäki, Ana Figueiredo, Caren Norden, Pierre-Louis Tharaux, Guenter Weiss, Fudi Wang, Susana Ramos, Miguel P Soares, “*Renal control of life-threatening malarial anemia*” **Cell Reports** doi:10.1016/j.celrep.2023.112057
10. 2022 Maria Anna Smolle, Christoph Goetz, Dietmar Maurer, Ines Vielgut, Michael Novak, Gerhard Zier, Andreas Leithner, Stefan Nehrer, Tiago Paixão, Richard Ljuhar and Patrick Sadoghi , “*Artificial intelligence-based computer-aided system for knee osteoarthritis assessment increases experienced orthopaedic surgeons’ agreement rate and accuracy*” **Knee Surgery, Sports Traumatology, Arthroscopy** doi:10.1007/s00167-022-07220-y
11. 2022 Tiago R. Velho, Rafael Maniés Pereira, Tiago Paixão, Nuno Carvalho Guerra, , Ricardo Ferreira, Hugo Corte-Real, Ângelo Nobre, Luís Ferreira Moita, “*Sequential Organ Failure Assessment Score in the ICU As a Predictor of Long-Term Survival After Cardiac Surgery*” **Critical Care Explorations** doi:10.1097/CCE.0000000000000682
12. 2022 Tiago R. Velho, Ricardo Ferreira, Katharina Willmann, Dora Pedroso, Tiago Paixão, Rafael Maniés Pereira, Nádia Junqueira, Nuno Carvalho Guerra, Dulce Brito, Ana G. Almeida, Ângelo Nobre, Thomas Köcher, Fausto Pinto, Luís Ferreira Moita, “*Role of Omega-6 Fatty Acid Metabolism in Cardiac Surgery Postoperative Bleeding Risk*” **Critical Care Explorations** doi:10.1097/CCE.0000000000000763

13. 2022 , Susana Ramos, Temitope W Ademolue, Elisa Jenthoe, Qian Wu, Joel Guerra, Rui Martins, Gil Pires, Sebastian Weis, Ana Rita Carlos, Inês Mahú, Elsa Seixas, Denise Duarte, Fabienne Rajas, Sílvia Cardoso, António GG Sousa, Jingtao Lilue, Tiago Paixão, Gilles Mithieux, Fátima Nogueira, Miguel P Soares , “A *hypometabolic defense strategy against malaria* ” **Cell Metabolism** doi:10.1016/j.cmet.2022.06.011
14. 2022 Claudia Goncalves, Kyriacos Kareklas, Magda C. Teles, Susana A. M. Varela, João Costa, Ricardo B. Leite, Tiago Paixão, and Rui F. Oliveira., “*Phenotypic Architecture of Sociality and Its Associated Genetic Polymorphisms in Zebrafish*” **Genes, Brain and Behavior** e12809. <https://doi.org/10.1111/gbb.12809>
15. 2021 Gomes Pereira, Sónia, Ana Laura Sousa, Catarina Nabais, Tiago Paixão , Alexander J. Holmes, Martin Schorb, Gohta Goshima, Erin M. Tranfield, Jörg D. Becker, and Mónica Bettencourt-Dias. , “*The 3D architecture and molecular foundations of de novo centriole assembly via bicentrioles*” **Current Biology** <https://doi.org/10.1016/j.cub.2021.07.063>
16. 2021 Paiva, Rafael A., António G. G. Sousa, Camila V. Ramos, Mariana Ávila, Jingtao Lilue, Tiago Paixão, and Vera C. Martins. , “ *Self-Renewal of Double-Negative 3 Early Thymocytes Enables Thymus Autonomy but Compromises the β -Selection Checkpoint.* ” **Cell Reports** 35 (2) 108967 doi:10.1016/j.celrep.2021.108967
17. 2021 Ducrée, Jens, Martin Eitzrodt, Sönke Bartling, Ray Walshe, Tomás Harrington, Neslihan Wittek, Sebastian Posth, et al. , “ *Unchaining Collective Intelligence for Science, Research, and Technology Development by Blockchain-Boosted Community Participation.* ” **Frontiers in Blockchain** doi:10.3389/fbloc.2021.631648
18. 2021 Nagy-Staron, Anna, Kathrin Tomasek, Caroline Caruso Carter, Elisabeth Sonnleitner, Bor Kavcic, Tiago Paixão, and Calin C Guet. , “*Local Genetic Context Shapes the Function of a Gene Regulatory Network.*” **eLife** doi:10.7554/eLife.65993
19. 2020 Tiago Paixão, Matt DiFranco , Richard Ljuhar, Davul Ljuhar, Christoph Goetz, Zsolt Bertalan, Hans P. Dimai, Stefan Nehrer, “*A novel quantitative metric for joint space width: data from the osteoarthritis initiative*” **Osteoarthritis & Cartilage** doi: 10.1016/j.joca.2020.04.003
20. 2019 Stefan Nehrer, Richard Ljuhar, Peter Steindl, Rene Simon, Dietmar Maurer, Davul Ljuhar, Zsolt Bertalan, Hans P. Dimai, Christoph Goetz, Tiago Paixão, “*Automated Knee Osteoarthritis Assessment Increases Physicians’ Agreement Rate and Accuracy: Data from the Osteoarthritis Initiative*” **Cartilage** doi:10.1177/1947603519888793
21. 2017 Marta Lukacisinová, Sebastian Novak and Tiago Paixão, “*The evolution of stress-induced mutagenesis*” **PLoS Computational Biology** 13(7):e1005609
22. 2017 Mato Lagator*, Tiago Paixão*, Nicholas H Barton, Jonathan Bollback and Calin C. Guet, “*On the mechanistic basis of epistasis in cis-regulatory elements*” **eLife** 6:e25192 *equal contribution
23. 2017 Pietro Olivetto, Tiago Paixão, Jorge Pérez Heredia, Dirk Sudholt, and Barbora Trubenová, “*How to Escape Local Optima in Black Box Optimisation: When Non-Elitism Outperforms Elitism*” **Algorithmica** 10.1007/s00453-017-0369-2
24. 2017 Jorge Pérez Heredia and Tiago Paixão , “*An Application of Stochastic Differential Equations to Evolutionary Algorithms*” **Proceedings of the 14th ACM/SIGEVO Conference on Foundations of Genetic Algorithms (FOGA’17)** 3–11

25. 2017* Jorge Pérez Heredia, Barbora Trubenová, Dirk Sudholt and Tiago Paixão , “*Selection limits to adaptive walks on correlated landscapes*” **Genetics** 205(2) 803–825
26. 2016* Tiago Paixão and Nicholas H. Barton, “*The effect of gene interactions on the long-term response to selection*” **PNAS** 113(16) 4422–4427
27. 2016 Pietro Olivetto, Tiago Paixão, Jorge Pérez Heredia, Dirk Sudholt, and Barbora Trubenová, “*When Non-Elitism Outperforms Elitism for Crossing Fitness Valleys*” **Proceedings of the Genetic and Evolutionary Computation Conference (GECCO 2016)** 1163–1170
28. 2016* Tiago Paixão, Jorge Pérez Heredia, Dirk Sudholt, and Barbora Trubenová, “*Towards a Runtime Comparison of Natural and Artificial Evolution*” **Algorithmica** doi:10.1007/s00453-016-0212-1
29. 2016 Mirco Giacobbe, Calin C. Guet, Ashutosh Gupta, Thomas A. Henzinger, Tiago Paixão, Tatjana Petrov, “*Model Checking the Evolution of Gene Regulatory Networks*” **Acta Informatica** doi:10.1007/s00236-016-0278-x
30. 2015 Murat Tuğrul, Tiago Paixão, Gasper Tkacik, Nicholas H. Barton , “*Dynamics of transcription factor binding site evolution*” **PLoS Genetics** 11(11): e1005639
31. 2015* Tiago Paixão, Golnaz Badkobeh, Nick Barton, Doğan Çörüş, Duc-Cuong Dang, Tobias Friedrich, Per Kristian Lehre, Dirk Sudholt, Andrew M. Sutton, Barbora Trubenová , “*Toward a Unifying Framework for Evolutionary Processes*” **Journal of Theoretical Biology** 383:28–43
32. 2015 Tiago Paixão, Jorge Pérez Heredia, Dirk Sudholt, and Barbora Trubenová , “*First Steps Towards a Runtime Comparison of Natural and Artificial Evolution*” **Proceedings of the Genetic and Evolutionary Computation Conference (GECCO 2015)** 1455–1463
33. 2015 Mirco Giacobbe, Calin C. Guet, Ashutosh Gupta, Thomas A. Henzinger, Tiago Paixão, Tatjana Petrov, “*Model Checking Gene Regulatory Networks*” **Proceedings of the 21st International Conference on Tools and Algorithms for the Construction and Analysis of Systems - TACAS 2015** 469–483 *Best Paper Award*
34. 2014 Sujal S Phadke, Tiago Paixão, T Pham, S Pham, and Rebecca A. Zufall, “*Genetic background alters dominance relationships between mat alleles in the ciliate Tetrahymena thermophila*” **Journal of Heredity** 105(1) 130–135
35. 2013 Hong-An Long, Tiago Paixão, Ricardo B. R. Azevedo, and Rebecca A. Zufall, “*Accumulation of Spontaneous Mutations in the Ciliate Tetrahymena thermophila*” **Genetics** 195(2)527–540
36. 2013* Tiago Paixão and Nicholas H Barton, “*A Variance Decomposition Approach to the Analysis of Genetic Algorithms*” **Proceedings of the 15th Annual Conference on Genetic and Evolutionary Computation (GECCO 2013)** 845–852
37. 2013 Nicholas H Barton and Tiago Paixão, “*Can Quantitative and Population Genetics Help us Understand Evolutionary Computation?*” **Proceedings of the 15th Annual Conference on Genetic and Evolutionary Computation (GECCO 2013)** 1573–1580
38. 2011* Tiago Paixão, Sujal Phadke, Ricardo BR Azevedo and Rebecca Zufall, “*Sex ratio evolution under probabilistic sex determination*” **Evolution** 65(7)2050–2060
39. 2010 Tiago Paixão and Ricardo BR Azevedo, “*Redundancy and the evolution of cis-regulatory element multiplicity*” **PLoS Computational Biology** 6(7):e1000848

40. 2010 Tim F Cooper, Tiago Paixão and Jack A Heinemann, “*Within-host competition selects for plasmid-encoded toxin-antitoxin systems*” **Proceedings of the Royal Society B** 277(1697): 3149–55
41. 2007* Tiago Paixão, Tiago P Carvalho, Dinis P Calado, Jorge Carneiro, “*Quantitative insights into stochastic monoallelic expression of cytokine genes*” **Immunology and Cell Biology** 85: 315–322.
42. 2007 Jorge Carneiro, Kalet Leon, Íris Caramalho, Carline van den Dool, Rui Gardner, Vanessa Oliveira, Marie-Louise Bergman, Nuno Sepúlveda, Tiago Paixão, José Faro, Jocelyne Demengeot, “*When three is not a crowd: a Crossregulation Model of the dynamics and repertoire selection of regulatory CD4+ T cells*” **Immunological Reviews** 216(1): 48–68
43. 2006 Dinis P Calado, Tiago Paixão, Dan Holmberg and Matthias Haury, “*Stochastic Monoallelic Expression of IL-10 in T Cells*” **The Journal of Immunology** 177:5358–5364
44. 2005 Jorge Carneiro, Tiago Paixão, Dejan Milutinovic, João Sousa, Kalet Leon, Rui Gardner and José Faro, “*Immunological Self-Tolerance: Lessons from mathematical models*” **Journal of Computational and Applied Mathematics** 184: 77–100

Preprint & Opinion publications

45. 2015 Tiago Paixão, Kevin E. Bassler and Ricardo BR Azevedo, “*Emergent Speciation by Multiple Dobzhansky–Muller Incompatibilities*” **bioRxiv** doi:10.1101/008268
46. 2014 Nicholas H. Barton, Sebastian Novak, and Tiago Paixão, “*Diverse forms of selection in evolution and computer science*” **PNAS** 111(29)10398–10399 *Commentary on Chastain et al (2014) Algorithms, games, and evolution*
47. 2008 Ricardo BR Azevedo, Rolf Lohaus and Tiago Paixão, “*Networking Networks*” **Evolution and Development** 10(5): 514–515 *Letter*