Germano M F Costa-Neto (he/him)

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EDUCATION

2021 **PhD Genetics & Plant Breeding, University of São Paulo, ESALQ, Piracicaba, São Paulo, BR**
Thesis : Enviromics, nonlinear kernels and optimized training sets for a climate-smart genomic prediction of yield plasticity in maize
Advisor: Roberto Fritsche-Neto (USP) & Jose Crossa (CIMMYT)

2017 **MS Plant Breeding, Embrapa / UFG: Goiânia, Goiás, BR**
Thesis : Integrating environmental covariates and thematic maps for the genotype-environment interaction analysis in upland rice
Adivsor: João Batista Duarte (UFG), Adriano Pereira de Castro (Embrapa)

2015 **BS Agronomy, Federal University of Goiás, UFG: Goiânia, Goiás, BR**
Thesis : On the use of crop simulation models to support environmental characterization in rice
Advisor: Alexandre Bryan Heinemann (Embrapa)

APPOINTMENTS

2021-present **Postdoctoral Research Associate**
Institute for Genomic Diversity, Cornell University, Ithaca, NY, U.S.
Maize Genetics Lab https://www.maizegenetics.net/
Objective: Develop prediction-based tools and allele mining technologies using enviromics
Manager : Edward Buckler (USDA-Cornell University)

2021-present **Associate Research (Nominated Postdoctoral)**
ARC CoE for Plant Success in Nature and Agriculture, Australia.
Web-site: https://www.plantsuccess.org/
Objective: Support the development of predictive tools merging enviromics and machine learning
Manager : Mark Cooper (Queensland University)

2021-2022 **External Consultant (CGIAR Expert)**
International Maize and Wheat Improvement Center (CIMMYT)**:** Remote
Objective: Implement envirotyping-aided approaches for optimize field trials and genomic prediction platforms
Manager : Jose Crossa (BSU/CIMMYT), Alison Bentley (whet breeding/CIMMYT)

2018-present **Remote Freelancer Consultant in Statistics for Marketing & Product Development**
Limagrain Field Seeds (Marketing Sector, as an external consultant): Londrina, Paraná, BR
Objective: Develop computational solutions to easy field-testing analysis of pre-commercial cultivars
Manager : Lee Anderson Porto (2018-2020); Leandro Santos (2020-present).

2020-2020 **Research Intern at Biometrics and Statistic Unit (BSU/CIMMYT)**
International Maize and Wheat Improvement Center (CIMMYT)**:** Texcoco, MX
Objective: International Experience
Manager : Jose Crossa (BSU/CIMMYT)

2018-2021 **Graduate Researcher (Quantitative Genetics in Maize Breeding)**
Allogamous Plant Breeding Laboratory (Prof. Roberto Fritsche-Neto' Lab): Piracicaba, São Paulo, BR
Objective: Develop data-driven tools to interplay ecophysiology and genomic selection for diverse environments

2015-2017 **Graduate Research Assistant at Rice Breeding Program**
Brazilian Agricultural Research Corporation (EMBRAPA): Santo Antônio de Goiás, Goiás, BR
Objective: Develop techniques to better use environmental data in cultivar testing and typing target regions;
Manager : Alexandre Bryan Heinemann; Adriano Pereira de Castro

2017-2017 **Lecturer in Biostatistics**
Universidade Paulista-Instituto Objetivo, Goiânia, Goiás, BR
Objective : Develop teaching and communication skills

2013-2015 **Undergraduate Research Assistant at Ecophysiology**
Brazilian Agricultural Research Corporation (EMBRAPA): Santo Antônio de Goiás, Goiás, BR
Objective : Develop programming skills for modeling biological process of plants growth and development;
Manager : Alexandre Bryan Heinemann

2011-2013 **Undergraduate Research Assistant at Agrometeorology**
Federal University of Goiás, UFG: Goiânia, Goiás, BR
Objective : Scientific Initiation Scholarship (CNPq) in Agrometeorology of soybean, maize and sugarcane
Manager : Prof. Derblai Casaroli (UFG).

2010-2011 **Undergraduate Research Assistant at Soil Physics**
Agronomy School, Federal University of Goiás, UFG: Goiânia, Goiás, BR
Objective : Volunteer Initial Scholarship in Soil Physics Modeling and Soil Fertility
Manager : Prof. Vládia Correchel & Prof. Virginia Damin.

AWARDS

2019 Winner at Rolland Vencovsky Award, III International Meeting on Plant Breeding/Corteva
2018 Finalist at Rolland Vencovsky Award, II International Meeting on Plant Breeding/Corteva
2017 Finalist at Young Talent Award, Embrapa Rice & Beans

REFEREED PUBLICATIONS

Details at: Loop: https://loop.frontiersin.org/people/541246 and Research Gate: https://www.researchgate.net/profile/Germano-Costa-Neto

Costa-Neto, G., Crossa, J., and Fritsche-Neto, R. (2021). **Enviromic Assembly Increases Accuracy and Reduces Costs of the Genomic Prediction for Yield Plasticity in Maize**. *Frontiers in Plant Science* 12. doi:10.3389/fpls.2021.717552.

Costa-Neto, G., and Fritsche-Neto, R. (2021). **Enviromics: bridging different sources of data, building one framework**. *Crop Breeding and Applied Biotechnology 21*, 393521–393533. doi:10.1590/1984.

Costa-Neto, G., R. Fritsche-Neto, and Crossa, J. (2020) **Nonlinear kernels, dominance, and envirotyping data increase the accuracy of genome-based prediction in multi-environment trials**. *Heredity* (Edinb) https://doi.org/10.1038/s41437-020-00353-1

Costa-Neto, G., Galli, G., Carvalho, H. F., Crossa, J., and Fritsche-Neto, R. (2021). **EnvRtype: a software to interplay enviromics and quantitative genomics in agriculture**. *G3 Genes|Genomes|Genetics*. doi:10.1093/g3journal/jkab040.

Costa-Neto, G., O. P. Morais-Júnior, A. B. Heinemann, A. P. de Castro, and J. B. Duarte (2020) **A novel GIS-based tool to reveal spatial trends in reaction norm: upland rice case study**. *Euphytica* 216: 1–16. https://doi.org/10.1007/s10681-020-2573-4

Fritsche-Neto, R., Galli, G., Costa-Neto, G., Borges, K. L. R., Alves, F. C., Sabadin, J.F., Lyra, D. H., Morais, P.P.P., Andrade, L.R.B., Granato, I., and Crossa, J. **Optimizing genomic-enabled prediction in small-scale maize hybrid breeding** programs: a roadmap review *Frontiers in Plant Science* doi: 10.3389/fpls.2021.658267

Crossa, J., Fritsche Neto, R., Montesinos-López, O.A., Costa-Neto, G., Dreisigacker, S., Montesinos-López, A., and Bentley, A.R. **The modern plant breeding triangle: optimizing the use of genomics, phenomics and enviromics data**. *Frontiers in Plant Science* doi:10.3389/fpls.2021.651480

Gervatovsky, R., Carvalho, H. F., Costa-Neto, G., Montesinos-López, O.A., Crossa, J. and Fritsche-Neto, J. **Enviromic-based Kernels Optimize Resource Allocation with Multi-trait Multi-environment Genomic Prediction for Tropical Maize**. *Article* (Bioxv publication – under review at Theoretical and applied Genetics)

Heinemann, A. B., Costa-Neto, G. and da-Matta, D. H. **Enviromic prediction is useful in defining the limits of climate adaptation for dry beans in Brazil** (pre-print – under review at Field Crops Research)

Heinemann, A. B., Costa-Neto, G. and da-Matta, D. H. **Data-driven machine learning-based prediction of environmental clusters in rice using climatic variables and historical yield testing data** (in preparation)

Galli, G., Sabadin, J.F., Costa-Neto, G. and Fritsche-Neto, R. (2020) **A novel way to validate UAS-based high-throughput phenotyping protocols using in silico experiments for plant breeding purposes**. *Theoretical and Applied Genetics*. https://doi.org/10.1007/s00122-020-03726-6

Costa-Neto, G., Duarte, J. B., de Castro, A. P., and Heinemann, A. B. (2020) *Uso de Informações Ambientais na Modelagem e Interpretação da Interação Genótipo × Ambiente*. Embrapa Rice & Beans Boletin, Santo Antônio de Goiás [Portuguese for '**Use of environmental information in modeling and interpreting G×E**']

Costa-Neto, G., Galli, G and Fritsche-Neto, R. (2019) **Genomic × envirotyping kernels drive to a better prediction and understanding of maize yield plasticity**, III International Meeting in Plant Breeding (conference-poster)

Costa-Neto, G., Galli, G. and Fritsche-Neto, R. (2019) **Ecophysiological models improve prediction accuracy in genomics-assisted maize breeding**. 10th Brazilian Congress in Plant Breeding (conference-poster)

Heinemann, A. B., J. Ramirez-Villegas, J., Rebolledo, M. C., Costa Neto, G., and Castro, A. P. (2019) **Upland rice breeding led to increased drought sensitivity in Brazil**. F. Crop. Res. 231: 57–67. https://doi.org/10.1016/j.fcr.2018.11.009

Costa-Neto, G. and Heinemann, A. B., (2018) **Envirotyping for identifying regional impacts in upland rice breeding strategies over the last 30 years in Brazil**. II International Meeting in Plant Breeding (conference-poster)

INVITED TALKS

- Enviromics: the good, the bad and the ugly (11th Brazilian Congress of Plant Breeding, December 2021).
- EnvRtype: tutorial for implementing an envirotyping pipeline in R, *Workshop*, UFS, 2021 (remote)
- Corteva PhD student Seminar, North America / LATAM, Remote, 2021
- Modeling GxE using phenotypic, genomics and enviromics. *Workshop EuGeM, UFG*, 2021
- On the use of environmental data in plant breeding. Tropical Melhoramento & Genetica (TMG), Remote, 2021
- Envirotyping-informed tools for G×E analysis. *I Intergen, Plant Science Symposia Series*, Brazil, 2020
- Envirotype-to-phenotype modeling in genomic prediction across multiple environments. *ESALQ Seminars,* 2020
- Genotypic adaptation by factorial regression and geographical covariates. *VII International Symposium on Genetics and Breeding*, 2016

SOFTWARE

Skill tools in R (advanced), Python (intermediate), C/C++ & FORTRAN (elementary).

I develop the following open-source software packages:

- EnvRtype (interplay enviromics and genomics in agriculture) *R package*, https://github.com/allogamous/EnvRtype
- frGIS (with thematic maps for crop adaptation diagnosis) *R package,* available at: https://github.com/gcostaneto/frGIS
- E2PA (envirome-phenome association analysis, under development) *R package*