

# Germano Costa-Neto (he/him)

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## EDUCATION

- 2021** PhD Quantitative Genetics & Plant Breeding, University of São Paulo, ESALQ, Piracicaba, São Paulo, Brazil  
**2017** MS Plant Breeding, UFG / Brazilian Corporation of Agricultural Research (EMBRAPA): Goiânia, Goiás, Brazil  
**2015** BS Agronomy, major in ecophysiology, Federal University of Goiás, UFG: Goiânia, Goiás, Brazil

## EXPERIENCE

- 2021-date** Postdoctoral Researcher in Genomics, Institute for Genomic Diversity, Cornell University, Ithaca, NY, U.S.  
**2021-date** Associate Researcher (Nominated Postdoctoral), ARC CoE for Plant Success in Nature and Agriculture, Australia.  
**2021-2022** Remote External Consultant (CGIAR Expert), Envirotyping Analytics, CIMMYT's Wheat Breeding program  
**2018-2021** Remote Freelancer Consultant in Statistics for Marketing & Product Development, Limagrain seeds LATAM  
**2020-2020** Graduate Research Intern at Biometrics and Statistic Unit (BSU/CIMMYT)  
**2018-2021** Graduate Researcher (Quantitative Genetics in Maize Breeding), AB Lab, Piracicaba, São Paulo, BR  
**2017-2017** Lecturer in Biostatistics, Universidade Paulista-Instituto Objetivo, Goiânia, Goiás, Brazil  
**2016-2017** Volunteer Coordinator of the EUGEM Genetics Study Group, UFG  
**2015-2017** Graduate Research Assistant at Rice Breeding Program, EMBRAPA, Brazil  
**2013-2015** Undergraduate Research Assistant at Ecophysiology, EMBRAPA, Brazil  
**2011-2013** Undergraduate Research Assistant at Agrometeorology  
**2011-2012** Volunteer Representant of the Agronomy Students of the Goias State on CREA/GO  
**2010-2011** Volunteer Undergraduate Research Assistant at Soil Physics

## 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

## PUBLICATIONS

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

- Costa-Neto, G. and da-Matta, D. H. Heinemann, A. B., **Data-driven machine learning for pattern recognition supports environmental quality prediction for irrigated rice in Brazil** (Biorxiv, 2022)
- Costa-Neto, G., Cossa, 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 Cossa, 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., Cossa, 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* (BioRxiv 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)
- 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 Boletim, 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)

## TALKS

- Enviromics enhances a climate-smart approach for adaptive allele mining and predictive breeding (CROPS Genome 2022, Huntsville, AL).
- Enviromics: the good, the bad and the ugly (Zea Evolution Seminar, 2022).
- Enviromics: the good, the bad and the ugly (11<sup>th</sup> 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 G×E using phenotypic, genomics and enviromics. *Workshop EuGeM, UFG*, 2021
- On the use of environmental data in plant breeding. Tropical Melhoramento & Genética (TMG), Remote, 2021
- Envirotyping-informed tools for G×E analysis. *I Interagen, 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*