# Caio L. dos Santos

clsantos@iastate.edu | cldossantos.github.io | linkedin.com/in/cldossantos/

## Summary

I am currently a Ph.D. candidate in the Department of Agronomy at Iowa State University with a Minor in Statistics. My research integrates crop physiology, digital agriculture, and statistical modeling to improve management and quantification of spatio-temporal variability in cropping systems. Much of my research has centered on physiological responses to nutrient availability, photoperiod, temperature, and genotype-by-environment interactions. I have worked extensively on tissue analysis, canopy dynamics, and phenological development in corn, soybean, and cover crops.

## Education

**Ph.D., Crop Production and Physiology** **expected Dec 2025**

- Department of Agronomy, Iowa State University, Ames, Iowa, US
- Minor in Statistics
- Major advisor: Fernando Miguez

**M.S., Crop, Soil, and Environmental Sciences** **2020**

- Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, Arkansas, US
- Major advisors: Larry Purcell and Trent Roberts
- Thesis: *Managing corn nitrogen fertility in Arkansas based on data from an unmanned aerial system*

**B.S., Agronomy** **2018**

- College of Agriculture "Luiz de Queiroz", University of Sao Paulo, Piracicaba, Sao Paulo, Brazil
- Major advisor: Jose Laercio Favarin
- Thesis: *Determination of the water potential threshold at which rice growth is impacted*

## Research experience

**Graduate research assistant** **2020 - present**

- Department of Agronomy, Iowa State University, Ames, Iowa, US
- Conducted research on methods for analyzing on-farm precision experiments, phenology modeling, and spatial analysis using crop models and remote sensing
- Developed infrastructure and analytical workflows enabling the use of precision agriculture data sets (yield monitor, satellite, weather) for agricultural experimentation
- Collaborated with agronomists, economists, soil scientists, and weed scientists on multi-institutional projects

**Graduate research assistant** **2018 - 2020**

- Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, Arkansas, US
- Conducted research on tissue testing and remote sensing methods to assess maize nitrogen status
- Developed a decision support tool for predicting soybean phenology across the Midsouth
- Designed and conducted growth chamber experiments to investigate the effect of potassium fertilization on soybean stomatal conductance
- Assisted in various experiments assessing drought-resistant soybean wild genotypes, soybean response to sulfur fertilization, soybean stomata response to potassium fertilization, and rice and cotton nitrogen fertilization
- Analyzed drone images to assess maize nitrogen status and soybean canopy temperature

**Undergraduate visiting scholar** **2017**

- Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, Arkansas, US
- Conducted research on soybean phenology and the interaction between maturity groups and planting dates in Arkansas
- Assisted with general research activities, such as grinding, field work, and experiment maintenance

**Undergraduate research fellow** **2016 - 2017**

- Deparment of Crop Production, University of Sao Paulo, Piracicaba, Sao Paulo, Brazil
- Conducted research on rice biomass response to soil water potential

## Teaching and Instructional Experience

**Precision on-farm experimentation workshop** **2025**

- Iowa State University, Ames, Iowa, US
- Workshop organized for the participants of the Horizon II grant to demonstrate the use of the `pacu` R package for analyzing yield monitor, satellite, and weather data in precision on-farm experiments
- Summary of topics covered:
  - Retrieving and analyzing satellite images
  - Processing as-applied treatment data
  - Processing yield monitor data
  - Analyzing yield response to treatments

**Guest Lecturer in Soybean Production (CSES 3322)** **2023 and 2025**

- University of Arkansas, Fayetteville, Arkansas, US
- This was an undergraduate level class with approximately 30 students
- Taught a lecture on "Soybean development response to temperature and photoperiod"

**Teaching assistant in Crop and Soil Modeling (AGRON 5250)** **2022 - 2024**

- Iowa State University, Ames, Iowa, US
- This was a graduate and undergraduate level class with approximately 15 students
- Provided office hours to help with weekly assignments
- Developed and taught lectures on:
  - Soybean development response to temperature and photoperiod
  - Process-based crop model parameter optimization

**Teaching assistant in Crop Development, Production, and Management (AGRON 2800)** **2023**

- Iowa State University, Ames, Iowa, US
- This was an undergraduate level class with approximately 70 students
- Taught a lecture on "Brazilian agriculture"
- Provided office hours to help with weekly assignments
- Graded weekly assignments

**Teaching assistant in Soil Fertility (CSES 5114)** **2020**

- University of Arkansas,Fayetteville, Arkansas, US
- This was a graduate level class with approximately 30 students
- Provided office hours to help with weekly assignments
- Developed and taught lectures on:
  - History of soil fertility and crop growth
  - Plant essential nutrients
  - Nutrient mobility, solubility, and deficiency
  - Soil pH, salts, and lime requirement
  - Soil sampling methods
  - Plant and soil analysis
  - Soil test extraction methods
  - Fertilizer correlation and calibration

# Publications

## Peer-reviewed

1. Pessotto, M.V., Roberts, T.L., **dos Santos**, C.L., Hoegenauer, K., Bertucci, M., Ross, J., & Savin, M. (2025). Use of growing degree days to predict aboveground biomass and total nitrogen accumulation of winter cover crops. Agrosystems, Geosciences & Environment. [IN-PRESS].

2. **dos Santos**, C.L. & Miguez, F.E. (2025). Comparative study of yield monitor data processing methods for on-farm agronomic trials. Agronomy Journal, 117, 5.

3. Carvalho-Moore, P., Norsworthy, J. K., Porri, A., **dos Santos**, C.L., Barber, T., Sudhakar, S., Meiners, I, & Lerchl, J. (2025). Distribution of glufosinate resistance and glutamine synthetase copy number variation among Palmer amaranth (*Amaranthus palmeri*) accessions in northeast Arkansas. Weed Science, 73, e62.

4. **dos Santos**, C.L., & Miguez, F.E. (2024). PACU: Precision Agriculture Computational Utilities. SoftwareX, 28, 101971.

5. Pessotto, M. V., Roberts, T.L., Bertucci, M., **dos Santos**, C., Ross, J., & Savin, M. (2023). Determining cardinal temperatures for eight cover crop species. Agrosystems, Geosciences & Environment, 6, e20393.

6. **dos Santos**, C.L., Miguez, F.E., King, K.A., Ruiz, A., Sciarresi, C., Baum, M.E., Danalatos, G. J.N., Stellman, M., Wiley, E., Pico, L.O., Thies, A., Puntel, L. A., Topp, C.N., Trifunovic, S., Eudy, D., Mensah, C., Edwards, J.W., Schnable, P.S., Lamkey, K.R., Vyn, T.J. , & Archontoulis, S.V. (2023). Accelerated leaf appearance and flowering in maize after four decades of commercial breeding. Crop Science, 1–13.

7. Ruiz, A., Trifunovic, S., Eudy, D.M., Sciarresi, S. C., Baum, M., Danalatos, G.J.N., Elli, E.F., Kalogeropoulos,G., King, K., **dos Santos**, C.L., Thies, A., Pico, L.O., Castellano, M.J., Schnable, P.K., Topp, C., Graham, M., Lamkey, K.R., Vyn, T.J., & Archontoulis, S.V. (2023). Harvest Index has increased over the last 50 years of maize breeding. Field Crops Research, 300, 10900.

8. **dos Santos**, C.L.; Abendroth, L.J.; Coulter, J.A.; Nafziger, E.D.; Suyker, A.; Yu, J.; Schnable, P.S.; Archontoulis, S.V. (2022). Maize leaf appearance rates: a synthesis from the United States corn belt. Frontiers in Plant Science, 13.

9. **dos Santos**, C.L., T.L. Roberts, & L.C. Purcell. (2021). Leaf nitrogen sufficiency level guidelines for midseason fertilization in corn. Agronomy Journal, 113, 1974-1980.

10. **dos Santos**, C.L., T.L. Roberts, L.C. Purcell. (2020). Canopy greenness as a midseason nitrogen management tool in corn production. Agronomy Journal. 112, 5279-5287.

11. **dos Santos**, C.L., M. Salmeron, & L.C. Purcell. (2019). Soybean phenology prediction tool for the Midsouth. Agricultural and Environmental Lettters, 4, 190036.

12. **dos Santos**, C.L., A.F. De Borja Reis, P. Mazzafera, J.L. Favarin. (2018). Determination of the water potential threshold at which rice growth is impacted. Plants 7, 48.

## Under review

1. Cleveringa, A., **dos Santos**, C.L., & Miguez, F.E. (2025). Introducing the quadratic-plateau-quadratic function: capturing the ups and downs. Agricultural & Environmental Letters.

2. **dos Santos**, C.L., Puntel, A. L., Bullock, S.D., & Miguez, F.E. (2025). Improving crop phenology detection through nonlinear modeling of satellite vegetation indices. Agronomy Journal.

### Extension publications

1. Purcell, L.C., **dos Santos**, C.L., & Salmerón, M. (2021). Soybean development stage predictions. Cooperative Extension Service, University of Arkansas.

2. Hoegenauer, K. A., Roberts, T. L., Kelley, J. P., Morgan, R. B., & **dos Santos**, C. L. (2020). Investigating corn response to magnesium on a deficient soil in Arkansas. Arkansas Soil Fertility Studies, 38.

3. **dos Santos**, C.L., Roberts, T.L., & Purcell, L.C.(2020). Dark Green Color Index as a midseason nitrogen management tool in corn production systems. In N.A.Slaton (eds.). Wayne E. Sabbe Arkansas Soil Fertility Studies 2019, (In press). Arkansas Agricultural Experiment Station, University of Arkansas Division of Agriculture, Fayetteville.

4. **dos Santos**, C.L., Roberts, T.L., & Purcell, L.C. (2020). Nitrogen sufficiency level guidelines for pretassel fertilization in Arkansas. In N.A.Slaton (eds.). Wayne E. Sabbe Arkansas Soil Fertility Studies 2019, (In press). Arkansas Agricultural Experiment Station, University of Arkansas Division of Agriculture, Fayetteville.

5. **dos Santos**, C.L., Purcell, L.C., & Ross, W.J. (2018). Developing a new staging system for soybean. In: J.D. Ross (eds.). Arkansas Soybean Research Series 2016. (In press). Arkansas Agricultural Experiment Station, University of Arkansas Division of Agriculture, Fayetteville.

## Fellowships, Honors, and Awards

**Research Excellence Award** **2025**
- Graduate College, Iowa State University

**3rd Place in the PhD Poster Competition** **2024**
- Precision Agriculture Systems Community, CANVAS, San Antonio, Texas, US

**Preparing Future Faculty Fellow** **2024**
- Graduate College, Iowa State University

**Agronomy Teaching Fellowship** **2023**
- Department of Agronomy, Iowa State University

**Outstanding Master's Student** **2020**
- Department of Crop, Soil, and Environmental Sciences, University of Arkansas

**2nd Place in the master's division at Gamma Sigma Delta Student Competition** **2019**
- Fayetteville, Arkansas, US

**Undergraduate Research Fellowship** **2017**
- The São Paulo Research Foundation (FAPESP)
  *Research title: Determination of the water potential threshold at which rice growth is impacted*

## Software and research tools

**pacu: Precision Agriculture Computational Utilities** **2024**
- https://github.com/cldossantos/pacu
- R package for working with precision agriculture data, such as yield monitor, satellite, and weather.

**nlraa: Nonlinear Regression for Agricultural Applications** **2023**
- https://cran.r-project.org/package=nlraa
- Authored the functions "SScard3" and "SSscard3" to fit cardinal temperature responses

**Soystage – Online decision support tool for the Midsouthern U.S.** **2019**
- http://soystage.uark.edu
- Webtool that predicts timing of lifecyle events for soybeans grown in the Midsouthern US.

## Professional service and leadership

**Member of the Curriculum Committee of the Crop, Soil, and Environmental Sciences Major** **2019**
- University of Arkansas, Fayetteville, Arkansas, US

**President of the Crop, Soil, and Environmental Sciences Graduate Student Club** **2019**
- University of Arkansas, Fayetteville, Arkansas, US

**Vice president of the Crop, Soil, and Environmental Sciences Graduate Student Club** **2018**
- University of Arkansas, Fayetteville, Arkansas, US

## Professional Memberships

| | |
|---|---|
| American Society of Agronomy (ASA) | **2018 - present** |
| Crop Science Society of America (CSSA) | **2018 - present** |
| Soil Science Society of America (SSSA) | **2018 - present** |
| International Society of Precision Agriculture | **2024 - present** |

## Languages

English - Fluent
Portuguese - Native

## Programming languages

R, Python, C#, and JavaScript