Lucas F. Secco

☎ +1 (267) 916-2973 • ✉ secco@uchicago.edu • 🖥 lfsecco.com • **in** linkedin.com/in/seccol/

Education

Ph.D. in Physics & Astronomy
University of Pennsylvania (Philadelphia) — *2015–2020*

M.Sc. in Physics
University of São Paulo (Brazil) — *2013–2015*

B.Sc. in Physics
Federal University of Rio Grande do Sul (Brazil) — *2009–2013*

Research and Analysis Experience

University of Chicago
Postdoctoral Fellow at Kavli Institute for Cosmological Physics — *2020–present*

- Analyzed correlations of 500 million galaxies in Python with Monte Carlo sampling and Bayesian statistics, fitting model parameters with 2% accuracy ($2\times$ improvement over state-of-the-art) leading to publication with over 140 citations.
- Extracted faint non-Gaussian signals on galaxy shapes by optimally engineering features, thereby obtaining the first-ever detection of an effect predicted 20 years prior; invited to communicate findings at prestigious institutions.
- Optimized predictive models by selectively cleaning parts of the data that failed core assumptions via comparison with simulations; reduced model biases by 75%, enhanced interpretability of results and enabled 5 impactful publications.
- Collaboratively wrote version-controlled Python and SQL scripts to query, process and clean astronomical images and datasets in supercomputing clusters; created data visualizations that enabled identification and removal of data anomalies.

University of Pennsylvania
Research Assistant (Dark Energy Survey Collaboration) — *2015–2020*

- Led large ($>$20) and small ($<$5) teams of physicists, astronomers and data scientists in processing/maintaining large astronomical datasets; rewarded with exclusive data access rights to one of the largest astronomical surveys in the world.
- Translated complex mathematical and statistical models into Python code using Scipy, Numpy, Jupyter to forecast capabilities of future experiments; helped optimize the strategy of upcoming multi-billion dollar cosmological surveys.
- Created thousands of simulated datasets incorporating complex models of physical and observational error covariances to quantify risks and uncertainties in upcoming surveys, with results featured in more than 6 high impact publications.

University of São Paulo (Brazil)
Research Scholar — *2013–2015*

- Improved extraction of information from noisy data sets by analytically minimizing uncertainty factors, forecasting a ten-fold improvement of experimental sensitivity; awarded scholarship granted to top 3% of all STEM students in Brazil.

Technical Skills

Statistics: Bayesian statistics, Monte Carlo simulation, likelihood inference, statistical significance evaluation, bootstrapping, analytical modeling, empirical uncertainty and covariance estimation, exploratory data analysis, hypothesis testing.

Data Science: Covariance-aware data augmentation, data manipulation, machine learning (linear & logistic regression, neural networks, random forests), data visualization, high-performance parallel computing, large-scale data analytics.

Computing: Python (incl. Pandas, Numpy, Matplotlib, Scipy, Jupyter, Scikit-Learn), Git/Github, Linux/Unix, Bash, SQL.

Honors & Awards

Kavli Postdoctoral Fellowship (University of Chicago) — *2020-2023*
Dark Energy Survey Collaboration Data Rights (University of Pennsylvania) — *2019*
São Paulo Research Agency FAPESP Scholarship (Brazil) — *2013-2015*

Selected Publications

Complete list with 50 publications as main or contributing author in: `https://lfsecco.com/publications`

1. **L. F. Secco**, T. Karwal, W. Hu, E. Krause (2022)
   The Role of the Hubble Scale in the Weak Lensing vs. CMB Tension (arXiv:2209.12997)

2. K. Hoffmann, **L. F. Secco**, J. Blazek et al. (2022)
   Modeling intrinsic galaxy alignment in the MICE simulation (PRD 106,12351)

3. **L. F. Secco**, M. Jarvis, B. Jain, C. Chang et al. (2022)
   Dark Energy Survey Year 3 Results: Three-Point Shear Correlations and Mass Aperture Moments (PRD 105,103537)

4. Z. Zhang, C. Chang, P. Larsen, **L. F. Secco** et al. (2022)
   Transitioning from Stage-III to Stage-IV: cosmology from galaxy×CMB lensing and shear×CMB lensing (MNRAS 514,2181)

5. **L. F. Secco**, S. Samuroff, E. Krause, B. Jain et al. (2022)
   Dark Energy Survey Year 3 Results: Cosmology from Cosmic Shear and Robustness to Modeling Uncertainty (PRD 105,023515)

6. E. Krause, X. Fang, S. Pandey, **L. F. Secco** et al. (2021)
   Dark Energy Survey Year 3 Results: Multi-Probe Modeling Strategy and Validation (arXiv:2105.13548)

7. Dark Energy Survey Collaboration et al. (incl. **L. F. Secco**) (2021)
   Dark Energy Survey Year 3 Results: Cosmological Constraints from Galaxy Clustering and Weak Lensing (PRD 105,023520)

8. Dark Energy Survey Collaboration et al. (incl. **L. F. Secco**) (2019)
   Dark Energy Survey Year 1 Results: Constraints on Extended Cosmological Models (PRD 99,123505)

9. **L. F. Secco**, A. Farah, B. Jain, et al. (2018)
   Probing Self-interacting Dark Matter with Disk Galaxies in Cluster Environments (ApJ 860,32)

10. L. R. Abramo, **L. F. Secco**, A. Loureiro (2016)
    Fourier analysis of multitracer cosmological surveys (MNRAS 455,3871)

Selected Invited Seminars & Conferences

1. Inconsistencies in the Growth of Structure Conference - **Sesto Center for Astrophysics**, Sesto, Italy (Jul 25th 2022)

2. APEC Seminar - **Kavli IPMU Tokyo University**, Tokyo, Japan (Jun 29th 2022)

3. Gravity Conference - **Yukawa Institute for Theoretical Physics**, Kyoto, Japan (Jun 23rd 2022)

4. HEP/Astro Seminar, **University of Michigan**, Ann Arbor, MI (Oct 11th 2021)

5. CosmoStatistics Q&A Seminar (virtual) - **CEA Paris-Saclay**, Paris, France (July 2nd 2021)

6. Cosmology Seminar (virtual) - **Max Planck Institute for Astrophysics**, Garching, Germany (June 22nd 2021)

7. Astronomy Seminar - **Columbia University**, New York NY (Jan 23rd 2020)

8. BCCP Cosmology Seminar, **UC Berkeley**, Berkeley, CA (Oct 15th 2019)

9. KIPAC Cosmology Seminar, **Stanford university**, Stanford, CA (Oct 14th 2019)

Communication Skills

Teaching (2015-2017)
Taught 2 semesters of Physics 101 for over 80 undergraduates (University of Pennsylvania); taught series of weekend lectures on high school level physics and maths to adult Brazilian immigrants living in NY & NJ who did not possess a Brazilian secondary education degree at the Legion of Good Will (New York, NY)

Public Speaking (2016–2022)
Frequent invited academic seminars at prestigious institutions; outreach talks and live demonstrations of physics experiments given to general audiences on numerous occasions, including the Sulzer Public Library (Chicago IL) and the Philadelphia Science Festival (Philadelphia PA).

Organization of Seminars (2013–2022)
Founded and ran for two years a student-aimed Cosmology Journal Club at the University of São Paulo (2013–2015), organized weekly KICP seminars for the Astronomy and Cosmology groups at UChicago (2021–2022).