

# Rafael S. de Souza, Ph.D.

Chair: The Cosmostatistics Initiative

Shanghai Astronomical Observatory, Chinese Academy of Sciences

✉ drsouza@shao.ac.cn

0000-0001-7207-4584

🌐 <https://www.rafaelsdesouza.com>

👤 RafaelSdeSouza

## Education

- 2004 – 2009 **Ph.D. Astrophysics** University of Sao Paulo.  
Thesis title: *Origin of Cosmic Magnetic Fields*.  
Advisor: Reuven Opher.
- 1999 – 2004 **B.Sc. Astronomy** Federal University of Rio de Janeiro.  
Thesis title: *Cosmic Acceleration*.  
Advisor: Ioav Waga

## Professional Experience

- 2020 – . . . **Associate Professor**, Shanghai Astronomical Observatory, CAS, Shanghai, China.
- 2017 – 2020 **Postdoctoral Fellow** University of North Carolina, Chapel Hill, NC, USA.
- 2014 – 2016 **Postdoctoral Fellow** Eötvös Loránd University, Budapest, Hungary.
- 2012 – 2014 **Postdoctoral Fellow** KASI, Daejeon, South Korea.
- 2010 – 2011 **Postdoctoral Fellow** Kavli-IPMU, Kashiwanoha, Japan.

## Awards

- 2022 **Excellence in research**, by Shanghai Astronomical Observatory.
- 2018 **Prose Award**, Best book in Cosmology and Astronomy.
- 2017 **Marie Skłodowska-Curie fellowship**, by AstroFit.
- 2016 **International Astrostatistics Association Award**, Best paper in Astrostatistics.
- 2015 **MTA fellowship**, by Hungarian Academy of Sciences.
- 2014 **Excellence in research**, by Korean Astronomy and Space Science Institute.

## Research Grants

- 2022 – 2025 **CAS Talents** Total amount: \$800,000. [PI.] Chinese Academy of Sciences
- 2021 – 2024 **MESCAL: Multidimensional Exploration of Stellar Clusters via Automated Learning** Total amount: \$32,000. [PI.] National Science Foundation of China
- 2017 – 2020 **Shanghai Talents** Total amount: \$120,000. [PI.] Shanghai Municipality
- 2016 – 2017 **FAPESP Visiting Professorship** Total amount: \$50,000. [PI.] University of Sao Paulo

## Research Areas

- Statistics **Hierarchical Bayesian Models**, non-parametric regression, mixture models, likelihood-free inference, copulas, generalized linear and non-linear models, symbolic regression, spatial models, low-rank approximations, sparse models, denoising, optimal transport and information theory.

## Research Areas (continued)

Machine Learning	■ Supervised, unsupervised and active learning, convolutional neural networks, variational auto-encoders, manifold learning, graph theory, information visualization.
Galactic Astrophysics	■ Open Clusters, young stellar objects, variable stars.
Extra-galactic Astrophysics	■ Extra-galactic Globular Clusters, Nuclear Star Clusters, Galaxy Evolution, IFS data, gravitational waves.
Cosmology	■ Type Ia Supernova Cosmology, cosmic web, large-scale structures, cosmological simulations.
Nuclear Astrophysics	■ Bayesian estimation of nuclear reaction cross sections, astrophysical S-factors.

## Coding Skills

■ R, Python, Torch, L<sup>A</sup>T<sub>E</sub>X, Stan, JAGS, SQL, Keras, TikZ ...

## Science Fiction

Apr 14, 2022 ■ *Beyond the Rainbow*, Xuenan Cao & Rafael S. de Souza – "The story reflects the daily reality of apathy, stimulant abuses, and toxic competitions." <https://www.wattpad.com/story/307604331-beyond-the-rainbow>

## In the Media

Jul 27, 2022 ■ *An interview by overleaf*, <https://www.overleaf.com/blog/an-interview-with-rafael-s-de-souza>

Aug 17, 2021 ■ *Astronomers Find a Break in One of the Milky Ways Spiral Arms*, NASA Press Release, <https://www.nasa.gov/feature/jpl/astronomers-find-a-break-in-one-of-the-milky-way-s-spiral-arms>

Dec 1, 2020 ■ *Mapping stellar nurseries in the Milky Way*, Phys.org, <https://phys.org/news/2020-12-stellar-nurseries-milky.html>

Dec 2, 2020 ■ *Mapeando viveros estelares en la Vía Láctea*, europapress, <https://www.europapress.es/ciencia/astronomia/noticia-mapeando-viveros-estelares-via-lactea-20201202111012.html>

Jun 26, 2017 ■ *Astronomia: Computação Galáctica*, Folha de S.Paulo, <https://messageirosideral.blogfolha.uol.com.br/2017/06/26/astronomia-computacao-galactica/>

Apr 28, 2015 ■ *As primeiras supernovas do Universo (The first supernovae in the Universe)*, Folha de S.Paulo, <https://messageirosideral.blogfolha.uol.com.br/2015/04/28/as-primeiras-supernovas-do-universo/>

## Professional Service

International Astrostatistics Association ■ Vice-President (2016 – ...)  
The Cosmostatistics Initiative ■ Chair (2014 – ...)

## Professional Service (continued)





---

- Panel member  PhD Defense: Czech Technical University in Prague (2021), University of Sao Paulo, (2020); MS Defense: University of Lisbon (2021), University of Houston (2017)
- Meetings  Scientific Organizing Committee: Annual COIN Residence Program (2014 – present); European Week of Astronomy and Space Science, Prague, Czech Republic (2017)
- Journal Review  Astronomy and Astrophysics; Monthly Notices of the Royal Astronomical Society; Nature; New Astronomy Reviews; Physical Review Letters; Publications of the Astronomical Society of Australia; The Astrophysical Journal; The Astrophysical Journal Letters; The Astrophysical Journal Supplement Series; Astronomy and Computing.






## (Co-) Supervision Activities

---

### Graduate Students

- MS 2022–  Mi Chen, *Project title: “Fitting galaxy profiles in GPUs”*,
- MS 2021–  Quanfeng Xu, *Project title: “ Low-rank factorization with GPU acceleration”*, Research packaged published.  
 Zhihao Mu, *Project title: “Effects of galaxy morphology on Quenching of galaxies”*.
- PhD 2016- 2020  Maria Luiza Dantas, *Thesis title: “UV bright red-sequence galaxies: a comparative study between UV upturn and UV weak systems”*.




### Undergraduate Students

- 2021–  Yash Gondhalekar, *Image segmentation and masking*, Research packaged published.  
 Peng Chen, *Low-Rank data denosing and reconstruction*, Research packaged published.
- 2019, Summer  Renan dos Santos Barbosa, *Uncertainty aware principal Components*, Research published in peer reviewed paper. [Remote student from University of Sao Paulo]  
 Tan Hong Kiat, *MCMC analysis of  ${}^7\text{Be}(n, p){}^7\text{Li}$* . Research published in peer reviewed paper. [Exchange student from University of Singapore]
- 2018, Summer  Yeoh Jun Kai, *Nucleosynthesis simulation visualizations*. [Exchange student from University of Singapore]

## Talks









---

### Selected Invited Talks




- Jun 30, 2021  *Astrostatistics and the pathway to interdisciplinarity*, National Observatories of China Colloquium, Beijing, China
- Jul 26, 2019  *The Cosmostatistics Initiative: How to Catalize Interdisciplinarity*, ESO Workshop: Artificial Intelligence in Astronomy, Garching, Germany
- Sep 02, 2018  *A review of Statistical methods in the Gaia Era* XXX IAU General Assembly, Vienna, Austria

## Talks (continued)

---

- Jul 28, 2018  *A review of Generalized Linear models in Astronomy* Joint Statistical Meetings Vancouver, Canada
- Jun 14, 2018  *Astrostatistics* MIAPP, The Extragalactic distance scale in the Gaia era, Munich, Germany
- Jun 28, 2017  *Probabilistic Approach for Galaxy Classification* European Week of Astronomy and Astrophysics Prague, Czech Republic
- Jul 26, 2015  *The Cosmostatistics Initiative* World Statistics Congress, Rio de Janeiro, Brazil
- May 07, 2014  *Analysis of Multidimensional Astronomical Datasets* Bayes Forum-Max Planck Institute for Astrophysics, Garching, Germany
- Jan 10, 2014  *Probing the Pop-III IMF* Kyung Hee University, Suwon, South-Korea
- June 09, 2013  *Detectability of the Pop-III stars* Chungnam National University, Daejeon, South-Korea
- April 19, 2011  *Cosmic Explosions* Hong Kong University, Clear Water Bay, Hong Kong

## Selected Invited Tutorials

- Dec 18 – 21 2017  *Bayesian Workshop* ESA/Estec, Noordwijk, Netherlands
- Jul 12 – 13, 2016  *Bayesian Methods for Astrophysics* Univ. Fed. Rio Grande do Sul, Porto Alegre, Brazil
- May 22 – 24, 2016  *Bayesian Methods for Astrophysics* Astronomical Data Analysis Summer School, Chania, Greece

## References

---

- Prof. Christian Iliadis  University of North Carolina at Chapel Hill  [iliadis@physics.unc.edu](mailto:iliadis@physics.unc.edu)
- Prof. Eric Feigelson  Penn State University  [e5f@psu.edu](mailto:e5f@psu.edu)
- Prof. Alan Heavens  Imperial College London  [a.heavens@imperial.ac.uk](mailto:a.heavens@imperial.ac.uk)
- Prof. Jogesh Babu  Penn State University  [babu@psu.edu](mailto:babu@psu.edu)
- Prof. Ricardo Vilalta  University of Houston  [vilalta@cs.uh.edu](mailto:vilalta@cs.uh.edu)
- Prof. Benedetta Ciardi  Max Planck Institute for Astrophysics  [ciardi@mpa-garching.mpg.de](mailto:ciardi@mpa-garching.mpg.de)

## Publications (70 total; 58 major contribution)

Citations: ~ 2000

h-index: 24 i10 index: 42

### Journal Articles

- 70 Zhang, Y., **de Souza, R. S.**, & Chen, Y.-C. (2022). Sconce: A cosmic web finder for spherical and conic geometries. *MNRAS*, *517*(1), 1197–1217.  
[doi](https://doi.org/10.1093/mnras/stac2504) 10.1093/mnras/stac2504. [arXiv:2207.07001](https://arxiv.org/abs/2207.07001)
- 69 Chies-Santos, A. L., **de Souza, R. S.**, Caso, J. P., Ennis, A. I., de Souza, C. P. E., Barbosa, R. S., ... Angulo, R. E. (2022). J-PLUS: A catalogue of globular cluster candidates around the M81/M82/NGC3077 triplet of galaxies. *MNRAS*, *516*(1), 1320–1338.
- 68 Dályá, G., Díaz, R., Bouchet, F. R., Frei, Z., Jasche, J., Lavaux, G., ... Raffai, P. (2022). Glade+: An extended galaxy catalogue for multimessenger searches with advanced gravitational-wave detectors. *MNRAS*, *514*(1), 1403–1411.  
[doi](https://doi.org/10.1093/mnras/stac1443) 10.1093/mnras/stac1443. [arXiv:2110.06184](https://arxiv.org/abs/2110.06184)
- 67 Delli Veneri, M., **de Souza, R. S.**, Krone-Martins, A., Ishida, E. E. O., Dantas, M. L. L., & Kennamer, N. (2022). How have astronomers cited other fields in the last decade? *Research Notes of the AAS*, *6*(6), 113.  
[doi](https://doi.org/10.3847/2515-5172/ac74c7) 10.3847/2515-5172/ac74c7
- 66 Gondhalekar, Y., **de Souza, R. S.**, & Chies-Santos, A. L. (2022). galmask: A Python package for unsupervised galaxy masking. *Research Notes of the AAS*, *6*(6), 128.  
[doi](https://doi.org/10.3847/2515-5172/ac780b) 10.3847/2515-5172/ac780b. [arXiv:2206.06787](https://arxiv.org/abs/2206.06787)
- 65 Kuhn, M. A., Saber, R., Povich, M. S., **de Souza, R. S.**, Krone-Martins, A., Ishida, E. E. O., ... Zhou, X. (2022). Spectroscopic Confirmation of a Population of Isolated, Intermediate-Mass YSOs. *AJ*, *in press*.  
[arXiv:2206.04090](https://arxiv.org/abs/2206.04090)
- 64 Chen, P., & **de Souza, R. S.** (2022b). Yonder: A python package for data denoising and reconstruction. *Research Notes of the AAS*, *6*(3), 51.  
[doi](https://doi.org/10.3847/2515-5172/ac5c57) 10.3847/2515-5172/ac5c57
- 63 **de Souza, R. S.**, Quanfeng, X., Shen, S., Peng, C., & Mu, Z. (2022b). QrPCA: A package for fast principal component analysis with gpu acceleration. *Astronomy and Computing*, *41*, 100633.  
[doi](https://doi.org/10.1016/j.ascom.2022.100633) <https://doi.org/10.1016/j.ascom.2022.100633>
- 62 **de Souza, R. S.**, Thorp, S., Galbany, L., Ishida, E. E. O., González-Gaitán, S., Schmitz, M. A., ... Peters, C. (2022). A graph-based spectral classification of type II supernovae. *A&C*, *under review*.  
[arXiv:2206.14335](https://arxiv.org/abs/2206.14335)
- 61 Moscoso, J., **de Souza, R. S.**, Coc, A., & Iliadis, C. (2021). Bayesian Estimation of the  $D(p,\gamma)^3\text{He}$  Thermonuclear Reaction Rate. *ApJ*, *923*(1), 49.  
[doi](https://doi.org/10.3847/1538-4357/ac1db0) 10.3847/1538-4357/ac1db0. [arXiv:2109.00049](https://arxiv.org/abs/2109.00049)
- 60 Zanatta, E. J. B., Sánchez-Janssen, R., Chies-Santos, A. L., **de Souza, R. S.**, & Blakeslee, J. P. (2021). A high occurrence of nuclear star clusters in faint Coma galaxies, and the roles of mass and environment. *Monthly Notices of the Royal Astronomical Society*, *508*(1), 986–998.  
[doi](https://doi.org/10.1093/mnras/stab2348) 10.1093/mnras/stab2348
- 59 Kuhn, M. A., **de Souza, R. S.**, Krone-Martins, A., Castro-Ginard, A., Ishida, E. E. O., Povich, M. S., & Hillenbrand, L. A. (2021). SPICY: The Spitzer/IRAC Candidate YSO Catalog for the Inner Galactic Midplane. *ApJS*, *254*(2), 33.  
[doi](https://doi.org/10.3847/1538-4365/abe465) 10.3847/1538-4365/abe465. [arXiv:2011.12961](https://arxiv.org/abs/2011.12961)
- 58 Moews, B., Schmitz, M. A., Lawler, A. J., Zuntz, J., Malz, A. I., **de Souza, R. S.**, ... COIN Collaboration. (2021). Ridges in the Dark Energy Survey for cosmic trough identification. *MNRAS*, *500*(1), 859–870.

[doi](https://doi.org/10.1093/mnras/staa3204) 10.1093/mnras/staa3204. [arXiv:2005.08583](https://arxiv.org/abs/2005.08583)

- 57 **de Souza, R. S.**, Krone-Martins, A., Carruba, V., Domingos, R. C., Ishida, E. E. O., Aljbaae, S., ... Barletta, W. (2021). Probabilistic modeling of asteroid diameters from gaia dr2 errors. *Res. Notes AAS*, 5, 199.  
[doi](https://doi.org/10.3847/2515-5172/ac205e) <https://doi.org/10.3847/2515-5172/ac205e>
- 56 **de Souza, R. S.**, & S. Berger, G. (2021). Fallopian tube anatomy predicts pregnancy and pregnancy outcomes after tubal reversal surgery. *Statistical Methods in Medical Research*, 30(8), 2004–2014. PMID: 34232836.  
[doi](https://doi.org/10.1177/09622802211023543) 10.1177/09622802211023543
- 55 Feigelson, E. D., **de Souza, R. S.**, Ishida, E. E. O., & Jogesh Babu, G. (2021). 21st Century Statistical and Computational Challenges in Astrophysics. *Annual Review of Statistics and Its Application*, 8(1), 493–517.  
[doi](https://doi.org/10.1146/annurev-statistics-042720-112045) 10.1146/annurev-statistics-042720-112045
- 54 Kuhn, M. A., Benjamin, R. A., Zucker, C., Krone-Martins, A., **de Souza, R. S.**, Castro-Ginard, A., ... Hillenbrand, L. A. (2021). A high pitch angle structure in the sagittarius arm. *A&A*, 651, L10.  
[doi](https://doi.org/10.1051/0004-6361/202141198) 10.1051/0004-6361/202141198
- 53 Molino, A., Costa-Duarte, M. V., Sampedro, L., Herpich, F. R., Sodré, J., L., Mendes de Oliveira, C., ... Abramo, L. R. (2020). Assessing the photometric redshift precision of the S-PLUS survey: the Stripe-82 as a test-case. *MNRAS*.  
[doi](https://doi.org/10.1093/mnras/staa1586) 10.1093/mnras/staa1586. [arXiv:1907.06315](https://arxiv.org/abs/1907.06315)
- 52 **de Souza, R. S.**, Kiat, T. H., Coc, A., & Iliadis, C. (2020). Hierarchical Bayesian Thermonuclear Rate for the  ${}^7\text{Be}(n,p){}^7\text{Li}$  Big Bang Nucleosynthesis Reaction. *The Astrophysical Journal*, 894(2), 134.  
[doi](https://doi.org/10.3847/1538-4357/ab88aa) 10.3847/1538-4357/ab88aa
- 51 Dantas, M. L. L., Coelho, P. R. T., **de Souza, R. S.**, & Gonçalves, T. S. (2020). UV bright red-sequence galaxies: how do UV upturn systems evolve in redshift and stellar mass? *MNRAS*, 492(2), 2996–3011.  
[doi](https://doi.org/10.1093/mnras/stz3609) 10.1093/mnras/stz3609. [arXiv:1908.06775](https://arxiv.org/abs/1908.06775)
- 50 Boucaud, A., Huertas-Company, M., Heneka, C., Ishida, E. E. O., Sedaghat, N., **de Souza, R. S.**, ... Collaboration COIN. (2020). Photometry of high-redshift blended galaxies using deep learning. *MNRAS*, 491(2), 2481–2495.  
[doi](https://doi.org/10.1093/mnras/stz3056) 10.1093/mnras/stz3056. [arXiv:1905.01324](https://arxiv.org/abs/1905.01324)
- 49 Villarroel, B., Soodla, J., Comerón, S., Mattsson, L., Pelckmans, K., López-Corredoira, M., ... Ward, M. J. (2020). The Vanishing and Appearing Sources during a Century of Observations Project. I. USNO Objects Missing in Modern Sky Surveys and Follow-up Observations of a Missing Star. *AJ*, 159(1), 8.  
[doi](https://doi.org/10.3847/1538-3881/ab570f) 10.3847/1538-3881/ab570f
- 48 Kennamer, N., Ishida, E. E. O., Gonzalez-Gaitan, S., **de Souza, R. S.**, Ihler, A. e., Ponder, K., ... Galbany, L. (2020). Active learning with respect: Resource allocation for extragalactic astronomical transients. *2020 IEEE Symposium Series on Computational Intelligence (SSCI)*, 3115–3124.  
[doi](https://doi.org/10.1109/SSCI47803.2020.9308300) 10.1109/SSCI47803.2020.9308300
- 47 Mendes de Oliveira, C., Ribeiro, T., Schoenell, W., Kanaan, A., Overzier, R. A., Molino, A., ... et al., d. (2019). The Southern Photometric Local Universe Survey (S-PLUS): improved SEDs, morphologies and redshifts with 12 optical filters. *MNRAS*, 489, 241–267.  
[doi](https://doi.org/10.1093/mnras/stz1985) 10.1093/mnras/stz1985. [arXiv:1907.01567](https://arxiv.org/abs/1907.01567)
- 46 Moews, B., & **de Souza, R. S.** and Ishida, E. E. O. and Malz, A. I. and Heneka, C. and Vilalta, R. and Zuntz, J. (2019). Stress testing the dark energy equation of state imprint on supernova data. *Phys. Rev. D*, 99, 123529.  
[doi](https://doi.org/10.1103/PhysRevD.99.123529) 10.1103/PhysRevD.99.123529

- 45 Cantat-Gaudin, T., Krone-Martins, A., Sedaghat, N., Farahi, A., **de Souza, R. S.**, R. S., ... Trindade, A. M. M. (2019). Gaia DR2 unravels incompleteness of nearby cluster population: new open clusters in the direction of Perseus. *A&A*, 624, A126.  
doi 10.1051/0004-6361/201834453. [arXiv:1810.05494](#)
- 44 Hattab, M. W., **de Souza, R. S.**, Ciardi, B., Paardekooper, J.-P., Khochfar, S., & Dalla Vecchia, C. (2019). A case study of hurdle and generalized additive models in astronomy: the escape of ionizing radiation. *MNRAS*, 483, 3307–3321.  
doi 10.1093/mnras/sty3314. [arXiv:1805.07435](#)
- 43 **de Souza, R. S.**, Iliadis, C., & Coc, A. (2019a). Astrophysical S-factors, thermonuclear rates, and electron screening potential for the  ${}^3\text{He}(\text{d},\text{p}){}^4\text{He}$ . *ApJ*, 872(1), 75.  
doi 10.3847/1538-4357/aafda9. [arXiv:1809.06966](#)
- 42 **de Souza, R. S.**, Boston, R. S., Coc, A., & Iliadis, C. (2019b). Thermonuclear fusion rates for tritium + deuterium using bayesian methods. *Phys. Rev. C*, 99, 014619.  
doi 10.1103/PhysRevC.99.014619
- 41 González-Gaitán, **de Souza, R. S.**, Krone-Martins, A., Cameron, E., Coelho, P., Galbany, L., ... for the COIN collaboration. (2019). Spatial field reconstruction with INLA: Application to IFU galaxy data. *MNRAS*, 482(3), 3880–3891.  
doi 10.1093/mnras/sty2881. [arXiv:1802.06280](#)
- 40 Ishida, E. E. O., Beck, R., Gonzalez-Gaitan, S., **de Souza, R. S.**, Krone-Martins, A., Barrett, J. W., ... for the COIN collaboration. (2019). Optimizing spectroscopic follow-up strategies for supernova photometric classification with active learning. *MNRAS*, 483(1), 2–18.  
doi 10.1093/mnras/sty3015. [arXiv:1804.03765](#)
- 39 Dálya, G., Galgóczi, G., Dobos, L., Frei, Z., Heng, I. S., Macas, R., ... **de Souza, R. S.** (2018). GLADE: A galaxy catalogue for multimessenger searches in the advanced gravitational-wave detector era. *MNRAS*, 479, 2374–2381.  
doi 10.1093/mnras/sty1703. [arXiv:1804.05709](#)
- 38 Long, J. P., & **de Souza, R. S.** (2018). Wiley statsref: Statistics reference online, 1–11.  
doi 10.1002/9781118445112.stat07996. [arXiv:1707.05834](#)
- 37 Vilalta, R., Ishida, E. E. O., Beck, R., Sutrisno, R., **de Souza, R. S.**, & Mahabal, A. (2017). Photometric redshift estimation: An active learning approach. *2017 IEEE Symposium Series on Computational Intelligence (SSCI)*, 1–8.  
doi 10.1109/SSCI.2017.8285192
- 36 Beck, R., Lin, C.-A., Ishida, E. E. O., Gieseke, F., **de Souza, R. S.**, Costa-Duarte, M. V., ... Krone-Martins, A. (2017). On the realistic validation of photometric redshifts. *MNRAS*, 468, 4323–4339.  
doi 10.1093/mnras/stx687
- 35 **de Souza, R. S.**, Dantas, M. L. L., Costa-Duarte, M. V., Feigelson, E. D., Killedar, M., Lablanche, P.-Y., ... Gieseke, F. (2017). A probabilistic approach to emission-line galaxy classification. *MNRAS*, 472(3), 2808–2822.  
doi 10.1093/mnras/stx2156. [arXiv:1703.07607](#)
- 34 Ripple, W. J., Wolf, C., Newsome, T. M., Galetti, M., Alamgir, M., Crist, E., ... **de Souza, R. S.**, ( (2017). World scientists warning to humanity: A second notice. *BioScience*, 67(12), 1026–1028.  
doi 10.1093/biosci/bix125
- 33 Gupta, K. D., Pampana, R., Vilalta, R., Ishida, E. E. O., & **R. S. de Souza**. (2016). Automated supernova Ia classification using adaptive learning techniques. *2016 IEEE Symposium Series on Computational Intelligence (SSCI)*, 1–8.  
doi 10.1109/SSCI.2016.7849951



- 32 **de Souza, R. S.**, Dantas, M. L. L., Krone-Martins, A., Cameron, E., Coelho, P., Hattab, M. W., ... COIN Collaboration. (2016). Is the cluster environment quenching the Seyfert activity in elliptical and spiral galaxies? *MNRAS*, *461*, 2115–2125.  
[doi](https://doi.org/10.1093/mnras/stw1459) 10.1093/mnras/stw1459. [arXiv](https://arxiv.org/abs/1603.06256):1603.06256
- 31 Sasdelli, M., Ishida, E. E. O., Vilalta, R., Agüena, M., Busti, V. C., Camacho, H., ... Mazzali, P. A. (2016). Exploring the spectroscopic diversity of Type Ia supernovae with DRACULA: a machine learning approach. *MNRAS*, *461*, 2044–2059.  
[doi](https://doi.org/10.1093/mnras/stw1228) 10.1093/mnras/stw1228. [arXiv](https://arxiv.org/abs/1512.06810):1512.06810
- 30 Ishida, E. E. O., Vitenti, S. D. P., Penna-Lima, M., Cisewski, J., **de Souza, R. S.**, Trindade, A. M. M., ... COIN Collaboration. (2015). COSMOABC: Likelihood-free inference via Population Monte Carlo Approximate Bayesian Computation. *Astronomy and Computing*, *13*, 1–11.  
[doi](https://doi.org/10.1016/j.ascom.2015.09.001) 10.1016/j.ascom.2015.09.001. [arXiv](https://arxiv.org/abs/1504.06129):1504.06129
- 29 **de Souza, R. S.**, Hilbe, J. M., Buelens, B., Riggs, J. D., Cameron, E., Ishida, E. E. O., ... Killedar, M. (2015). The overlooked potential of generalized linear models in astronomy - III. Bayesian negative binomial regression and globular cluster populations. *MNRAS*, *453*, 1928–1940.  
[doi](https://doi.org/10.1093/mnras/stv1825) 10.1093/mnras/stv1825. [arXiv](https://arxiv.org/abs/1506.04792):1506.04792
- 28 **de Souza, R. S.**, Cameron, E., Killedar, M., Hilbe, J., Vilalta, R., Maio, U., ... Riggs, J. D. (2015). The overlooked potential of Generalized Linear Models in astronomy, I: Binomial regression. *Astronomy and Computing*, *12*, 21–32.  
[doi](https://doi.org/10.1016/j.ascom.2015.04.002) 10.1016/j.ascom.2015.04.002. [arXiv](https://arxiv.org/abs/1409.7696):1409.7696
- 27 **de Souza, R. S.**, & Ciardi, B. (2015a). AMADA-Analysis of multidimensional astronomical datasets. *Astronomy and Computing*, *12*, 100–108.  
[doi](https://doi.org/10.1016/j.ascom.2015.06.006) 10.1016/j.ascom.2015.06.006. [arXiv](https://arxiv.org/abs/1503.07736):1503.07736
- 26 Elliott, J., **de Souza, R. S.**, Krone-Martins, A., Cameron, E., Ishida, E. E. O., & Hilbe, J. (2015). The overlooked potential of Generalized Linear Models in astronomy-II: Gamma regression and photometric redshifts. *Astronomy and Computing*, *10*, 61–72.  
[doi](https://doi.org/10.1016/j.ascom.2015.01.002) 10.1016/j.ascom.2015.01.002. [arXiv](https://arxiv.org/abs/1409.7699):1409.7699
- 25 Koopmans, L., Pritchard, J., Mellema, G., Aguirre, J., Ahn, K., Barkana, R., ... Trott, C. (2015). The Cosmic Dawn and Epoch of Reionisation with SKA. *Advancing Astrophysics with the Square Kilometre Array (AASKA14)*, *1*. [arXiv](https://arxiv.org/abs/1505.07568):1505.07568
- 24 Krone-Martins, A., Ishida, E. E. O., & **de Souza, R. S.** (2014). The first analytical expression to estimate photometric redshifts suggested by a machine. *MNRAS*, *443*, L34–L38.  
[doi](https://doi.org/10.1093/mnrasl/slu067) 10.1093/mnrasl/slu067. [arXiv](https://arxiv.org/abs/1308.4145):1308.4145
- 23 **de Souza, R. S.**, Ishida, E. E. O., Whalen, D. J., Johnson, J. L., & Ferrara, A. (2014). Probing the stellar initial mass function with high-*z* supernovae. *MNRAS*, *442*, 1640–1655.  
[doi](https://doi.org/10.1093/mnras/stu984) 10.1093/mnras/stu984. [arXiv](https://arxiv.org/abs/1401.2995):1401.2995
- 22 **de Souza, R. S.**, Maio, U., Biffi, V., & Ciardi, B. (2014). Robust PCA and MIC statistics of baryons in early minihaloes. *MNRAS*, *440*, 240–248.  
[doi](https://doi.org/10.1093/mnras/stu274) 10.1093/mnras/stu274. [arXiv](https://arxiv.org/abs/1308.6009):1308.6009
- 21 Ishida, E. E. O., Abdalla, F. B., & **de Souza, R. S.** (2014). Improved KPCA for supernova photometric classification. *306*, 326–329.  
[doi](https://doi.org/10.1017/S1743921314010928) 10.1017/S1743921314010928
- 20 Hilbe, J. M., Riggs, J., Wandelt, B. D., **de Souza, R. S.**, Ishida, E. E. O., Cisewski, J., ... Impey, C. (2014). Life, the universe, and everything. *Significance*, *11*(5), 48–75.  
[doi](https://doi.org/10.1111/j.1740-9713.2014.00785.x) 10.1111/j.1740-9713.2014.00785.x



- 19 **de Souza, R. S.**, Ishida, E. E. O., Johnson, J. L., Whalen, D. J., & Mesinger, A. (2013). Detectability of the first cosmic explosions. *MNRAS*, *436*, 1555–1563.  
[doi](https://doi.org/10.1093/mnras/stt1680) 10.1093/mnras/stt1680. [arXiv:1306.4984](https://arxiv.org/abs/1306.4984)
- 18 **de Souza, R. S.**, Mesinger, A., Ferrara, A., Haiman, Z., Perna, R., & Yoshida, N. (2013). Constraints on warm dark matter models from high-redshift long gamma-ray bursts. *MNRAS*, *432*, 3218–3227.  
[doi](https://doi.org/10.1093/mnras/stt674) 10.1093/mnras/stt674. [arXiv:1303.5060](https://arxiv.org/abs/1303.5060)
- 17 Ishida, E. E. O., & **de Souza, R. S.** (2013). Kernel PCA for Type Ia supernovae photometric classification. *MNRAS*, *430*, 509–532.  
[doi](https://doi.org/10.1093/mnras/sts650) 10.1093/mnras/sts650. [arXiv:1201.6676](https://arxiv.org/abs/1201.6676)
- 16 **de Souza, R. S.**, Ciardi, B., Maio, U., & Ferrara, A. (2013). Dark matter halo environment for primordial star formation. *MNRAS*, *428*, 2109–2117.  
[doi](https://doi.org/10.1093/mnras/sts181) 10.1093/mnras/sts181. [arXiv:1209.0825](https://arxiv.org/abs/1209.0825)
- 15 **de Souza, R. S.**, Krone-Martins, A., Ishida, E. E. O., & Ciardi, B. (2012). Searching for the first stars with the Gaia mission. *A&A*, *545*, A102.  
[doi](https://doi.org/10.1051/0004-6361/201118746) 10.1051/0004-6361/201118746. [arXiv:1112.6270](https://arxiv.org/abs/1112.6270)
- 14 **de Souza, R. S.**, & Opher, R. (2011). Origin of intense magnetic fields near black holes due to non-minimal gravitational-electromagnetic coupling. *Physics Letters B*, *705*, 292–293.  
[doi](https://doi.org/10.1016/j.physletb.2011.10.045) 10.1016/j.physletb.2011.10.045. [arXiv:0804.4895](https://arxiv.org/abs/0804.4895)
- 13 Ishida, E. E. O., & **de Souza, R. S.** and Ferrara, A. (2011). Probing cosmic star formation up to  $z=9.4$  with gamma-ray bursts. *MNRAS*, *418*, 500–504.  
[doi](https://doi.org/10.1111/j.1365-2966.2011.19501.x) 10.1111/j.1365-2966.2011.19501.x. [arXiv:1106.1745](https://arxiv.org/abs/1106.1745)
- 12 **de Souza, R. S.**, Yoshida, N., & Ioka, K. (2011). Populations III.1 and III.2 gamma-ray bursts: constraints on the event rate for future radio and X-ray surveys. *A&A*, *533*, A32.  
[doi](https://doi.org/10.1051/0004-6361/201117242) 10.1051/0004-6361/201117242. [arXiv:1105.2395](https://arxiv.org/abs/1105.2395)
- 11 **de Souza, R. S.**, Rodrigues, L. F. S., Ishida, E. E. O., & Opher, R. (2011). The effect of a single supernova explosion on the cuspy density profile of a small-mass dark matter halo. *MNRAS*, *415*, 2969–2973.  
[doi](https://doi.org/10.1111/j.1365-2966.2011.18916.x) 10.1111/j.1365-2966.2011.18916.x. [arXiv:1104.2850](https://arxiv.org/abs/1104.2850)
- 10 Ishida, E. E. O., & **de Souza, R. S.** (2011). Hubble parameter reconstruction from a principal component analysis: minimizing the bias. *A&A*, *527*, A49.  
[doi](https://doi.org/10.1051/0004-6361/201015281) 10.1051/0004-6361/201015281. [arXiv:1012.5335](https://arxiv.org/abs/1012.5335)
- 9 **de Souza, R. S.**, Rodrigues, L. F. S., & Opher, R. (2011). Random primordial magnetic fields and the gas content of dark matter haloes. *MNRAS*, *410*, 2149–2155.  
[doi](https://doi.org/10.1111/j.1365-2966.2010.17588.x) 10.1111/j.1365-2966.2010.17588.x. [arXiv:1005.0639](https://arxiv.org/abs/1005.0639)
- 8 **de Souza, R. S.**, & Ishida, E. E. O. (2010). An analytical approach to the dwarf galaxies cusp problem. *A&A*, *524*, A74.  
[doi](https://doi.org/10.1051/0004-6361/201015330) 10.1051/0004-6361/201015330. [arXiv:1012.5336](https://arxiv.org/abs/1012.5336)
- 7 **de Souza, R. S.**, & Opher, R. (2010a). Are the magnetic fields of millisecond pulsars  $\sim 10^8$  G? *Ap&SS*, *330*, 267–271.  
[doi](https://doi.org/10.1007/s10509-010-0411-1) 10.1007/s10509-010-0411-1. [arXiv:1004.2976](https://arxiv.org/abs/1004.2976)
- 6 Rodrigues, L. F. S., **de Souza, R. S.**, & Opher, R. (2010). Suppression of small baryonic structures due to a primordial magnetic field. *MNRAS*, *406*, 482–485.  
[doi](https://doi.org/10.1111/j.1365-2966.2010.16677.x) 10.1111/j.1365-2966.2010.16677.x. [arXiv:1003.2829](https://arxiv.org/abs/1003.2829)
- 5 **de Souza, R. S.**, & Opher, R. (2010b). Origin of magnetic fields in galaxies. *Phys. Rev. D*, *81*(6), 067301.  
[doi](https://doi.org/10.1103/PhysRevD.81.067301) 10.1103/PhysRevD.81.067301. [arXiv:0910.5248](https://arxiv.org/abs/0910.5248)

- 4 **de Souza, R. S.**, & Opher, R. (2010c). Origin of  $10^{15}$ - $10^{16}$  G magnetic fields in the central engine of gamma ray bursts. *J. Cosmology Astropart. Phys.*, 2, 022.  
doi 10.1088/1475-7516/2010/02/022. [arXiv:0910.5258](#)
- 3 Laganá, T. F., **de Souza, R. S.**, & Keller, G. R. (2010). On the influence of non-thermal pressure on the mass determination of galaxy clusters. *A&A*, 510, A76.  
doi 10.1051/0004-6361/200911855. [arXiv:0911.0647](#)
- 2 **de Souza, R. S.**, & Opher, R. (2008). Origin of primordial magnetic fields. *Phys. Rev. D*, 77(4), 043529.  
doi 10.1103/PhysRevD.77.043529. [arXiv:0607181](#)
- 1 Freaza, M. P., **de Souza, R. S.**, & Waga, I. (2002). Cosmic acceleration and matter creation. *Phys. Rev. D*, 66(10), 103502.  
doi 10.1103/PhysRevD.66.103502

## Books

- 1 Hilbe, J. M., **de Souza, R. S.**, & Ishida, E. E. O. (2017). *Bayesian Models for Astrophysical Data Using R, JAGS, Python, and Stan*, Cambridge University Press.  
doi 10.1017/CB09781316459515

## Books Chapters

- 2 Delli Veneri, M., Desdoigts, L., Schmitz, M. A., Krone-Martins, A., Ishida, E. E. O., Tuthill, P., ... Picariello, A. (2021). *Periodic Astrometric Signal Recovery Through Convolutional Autoencoders*.  
doi 10.1007/978-3-030-65867-0\_8
- 1 El Boucheffy, K., & **de Souza, R. S.** (2020). *Chapter 12 - learning in big data: Introduction to machine learning from knowledge discovery in big data from astronomy and earth observation*.  
doi <https://doi.org/10.1016/B978-0-12-819154-5.00023-0>

## Software

- 7 Chen, P., & **de Souza, R. S.** (2022a). Yonder: Data denoising and reconstruction. Astrophysics Source Code Library, record ascl:2208.025. ascl: 2208.025
- 6 **de Souza, R. S.**, Quanfeng, X., Shen, S., Peng, C., & Mu, Z. (2022a). qrpca: QR-based Principal Components Analysis. Astrophysics Source Code Library, record ascl:2208.002. ascl: 2208.002
- 5 **de Souza, R. S.**, & Hilbe, J. (2016). LOGIT: Functions, Data and Code for Binary and Binomial Data. CRAN.
- 4 Agüena, M., Busti, V. C., Camacho, H., Sasdelli, M., Ishida, E. E. O., Vilalta, R., ... Mazzali, P. A. (2015). DRACULA: Dimensionality Reduction And Clustering for Unsupervised Learning in Astronomy. Astrophysics Source Code Library. ascl: 1512.009
- 3 Ishida, E. E. O., Vitenti, S. D. P., Penna-Lima, M., Trindade, A. M., Cisewski, J., M., ... Busti, V. C. (2015). cosmoabc: Likelihood-free inference for cosmology. Astrophysics Source Code Library. ascl: 1505.013
- 2 **de Souza, R. S.**, & Ciardi, B. (2015b). AMADA: Analysis of Multidimensional Astronomical DATasets. Astrophysics Source Code Library. ascl: 1503.006
- 1 **de Souza, R. S.**, Elliott, J., Krone-Martins, A., Ishida, E. E. O., Hilbe, J., & Cameron, E. (2014). CosmoPhotoz: Photometric redshift estimation using generalized linear models. Astrophysics Source Code Library. ascl: 1408.018