# Simon Gazagnes

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## Research Interest

I develop original computational approaches to interpret massive astronomical data sets, with the aim of studying astrophysical processes. I use these tools to investigate the physical processes governing the formation and evolution of the first galaxies and their contribution to cosmic reionization.

## Education

2017-2021 **Ph.D.** – *Vast and Fast data in the era of large astrophysics and particle physics experiments* – University of Groningen (Netherlands) – Awarded with the *cum laude* distinction.

2016-2017 **Master's degree in Astrophysics, Space science, and Planetary science** University of Toulouse III (France)

2011-2016 **Double Master's degree in Electrical Engineering and Image and Signal Processing** National Institute of Applied Sciences of Lyon & University of Lyon I (France)

## Research Experience

**Today – October 2021** | **Harlan J. Smith Fellowship, University of Texas at Austin, United States**
In progress. **Supervisor** : Prof. Danielle Berg.

**September 2021 – September 2017** | **Ph.D. [VF]ast DATA, University of Groningen, The Netherlands**
- Novel algorithms to process vast and fast data sets.
- Morphological properties of the ionized regions during reionization.
- Charged-particles track reconstruction for high-intensity accelerator experiments.

**Supervisors** : Prof. Léon V.E. Koopmans, Dr. Michael H.F. Wilkinson, Prof. Nasser Kalantar-Nayestanaki, Dr. Johan Messchendorp

C/C++ | Python | ROOT | Parallel and High-performance computing | Mathematical morphology | Bayesian statistics | Cosmology | 21-cm experiments | Particle collisions

**July 2017 – March 2017** | **Research internship, Geneva Observatory, Switzerland**
- Analysis of UV spectroscopic observations of Lyman continuum emitters.

**Supervisors** : Prof. John Chisholm, Prof. Daniel Schaerer, Prof. Anne Verhamme

IDL | Least square methods | Spectroscopic observations | Cosmology | Astrophysics of galaxies

**August 2016 – February 2016** | **Research internship, Laboratory I3S, France**
- Inverse problems and optimization of non-convex and non-smooth criteria.

**Supervisors** : Dr. Laure Blanc-Férand, Dr. Emmanuel Soubies

Matlab | Optimization algorithms | Regularized problems | Biomedical imaging

## Teaching Experience

- **Introduction to Computer Science –** Teaching assistant – 2018, 2019 – groups of 16 students – Computer Science course for first-year students including tutorials on inter-cultural communication.
- **Computer Vision –** Teaching assistant – 2017, 2018, 2019 – 60 to 80 students – Computer Science course for fourth-year students.
- **Numerical Methods –** Teaching assistant – 2018 – 40 students – Computational Astrophysics course for second-year students.
- **Bachelor Projects –** Design/supervision of two research projects (4 months) for third-year students.

## Programming skills

C/C++ (including MPI/OpenMP parallelization techniques) – Python – IDL – Matlab – ROOT.

## Publications

Peer-reviewed – First author

- **Gazagnes S.**, Koopmans L. V. E, & Wilkinson M. H. F. 2021. Inferring the astrophysics of reionization using the morphological spectra of the ionized regions. *MNRAS*, 502.
- **Gazagnes S.**, & Wilkinson M. H. F. Distributed Connected Component Analysis and Filtering. 2021. *IEEE Transactions on Image Processing*, 30.
- **Gazagnes S.**, Chisholm J., Schaerer D., Verhamme A., & Izotov Y. 2020. The origin of the escape of Lyman $\alpha$ and ionizing photons in Lyman continuum emitters. *A&A*, 639, A85.
- **Gazagnes S.**, & Wilkinson M. H. F. 2019. Distributed component forests in 2-D : hierarchical image representations suitable for tera-scale images. *Int. Journal of Pattern Recognition and Artificial Intelligence*, 33(11).
- **Gazagnes S.**, Chisholm J., Schaerer D., [and 3 others]. 2018. Neutral gas properties of Lyman continuum emitting galaxies : Column densities and covering fractions from UV absorption lines. *A&A*, 616, A29.

Peer-reviewed – Co-authored

- Chisholm J., Prochaska X., Schaerer D., **Gazagnes S.**, Henry A. 2020. Optically thin spatially resolved Mg II emission maps the escape of ionizing photons. *MNRAS*, 498.
- Ghara R., Giri S.K., Mellema G., [and 19 others, including **Gazagnes S.**]. 2020. Constraining the intergalactic medium at z$\approx$ 9.1 using LOFAR Epoch of Reionization observations. *MNRAS*, 493(4).
- Mertens F. G., Mevius M., Koopmans L. V. E., [and 23 others, including **Gazagnes S.**]. 2020. Improved upper limits on the 21 cm signal power spectrum of neutral hydrogen at z $\approx$ 9.1 from LOFAR. *MNRAS*, 493(2).
- Chisholm J., **Gazagnes S.**, Schaerer D., [and 6 others]. 2018. Accurately predicting the escape fraction of ionizing photons using rest-frame ultraviolet absorption lines. *A&A*, 616, A30.

Conference proceedings

- **Gazagnes S.**, Soubies E., & Blanc-Féraud L. 2017. High density molecule localization for super-resolution microscopy using CEL0 based sparse approximation. *$14^{th}$ IEEE Int. Symp. on Biomedical Imaging*.

## Selected talks

5 of 15 (complete list available at simongazagnes.weebly.com/about-me.html)

1. **Recorded talk** – *Inferring the properties of the sources of reionization using the morphology of the ionized regions* – SAZERAC sip on 21cm on January 29$^{rd}$, 2021.
2. **Seminar talk** – *Exploring the properties of the reionization sources with spectroscopic and 21-cm observations* – CGI seminar at UC Santa Cruz (Stanford, USA) on November 23$^{rd}$, 2020.
3. **Seminar talk** – *Inferring the properties of the sources of reionization using the morphology of the ionized regions* – SKA EoR/CD SWG seminar on November 12$^{th}$, 2020.
4. **Colloquium** – *The origin of the escape of Lyman $\alpha$ and ionizing photons* – Kapteyn Astronomical Institute (Groningen, The Netherlands) on July 20$^{th}$, 2020.
5. **Contributed talk** – *The origin of the escape of Ly$\alpha$ and ionizing photons* – Conference SAZERAC, July 2020.