

# TOBIAS I. LIAUDAT

Ph.D. Student

CosmoStat laboratory, Astrophysics Department, CEA Saclay

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**Webpage:** [tobias-liaudat.github.io](https://tobias-liaudat.github.io) • **Software:** [github.com/tobias-liaudat](https://github.com/tobias-liaudat)

**Nationality & date of birth:** Argentinian, 18 May 1994

## EDUCATION

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**CEA Saclay / Université Paris-Saclay**

Nov. 2019 - Present

*Ph.D. in astrophysics*

*Saclay, France*

- Topic: Data-driven point spread function modelling for the Euclid space mission.
- Supervisors: [Jean-Luc Starck](#) & [Martin Kilbinger](#).

**Université de Rennes I / Centrale Supélec / IMT Atlantique**

Aug. 2017 - Sep. 2018

*Master 2 Research - SISEA*

*Brest, France*

- Specialization in signal and image processing. Joint with IMT Atlantique engineering degree.
- Ranked 1st out of all master students.

**IMT Atlantique**

Aug. 2016 - Sep. 2018

*Telecommunications Engineering degree*

*Brest, France*

- One of France's top-engineering schools. Specialization in signal and image processing, and machine learning.
- Recipient of the Eiffel excellence scholarship for a joint degree with the University of Buenos Aires.

**Engineering School of the University of Buenos Aires**

Mar. 2012 - Sep. 2019

*Electronic Engineering degree*

*Buenos Aires, Argentina*

- Specialization in signal and image processing, electronic circuits and computer science. GPA: 9.23/10.
- Ranked 4th of 1634 students when starting the joint degree in 2016.

## PROFESSIONAL EXPERIENCE

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**École Polytechnique, Applied Mathematics Department**

Aug. 2020 - Present

*Teaching assistant*

*Palaiseau, France*

- Teaching for bachelor and MSc. students in the top ranked French engineering school.

**École Nationale de la Statistique de l'Administration Économique**

Oct. 2018 - Feb. 2019

*Research assistant*

*Palaiseau, France*

- Topic: Regularized optimal transport for signed measures. Supervisor: [Marco Cuturi](#).

**CosmoStat, CEA Saclay**

Mar. 2018 - Sep. 2018

*Research internship*

*Saclay, France*

- Topic: Distributed sparse blind source separation for very large-scale datasets. Supervisor: [Jérôme Bobin](#)

**Thales Air Systems**

Jul. 2017 - Sep. 2017

*Summer internship*

*Limours, France*

- Topic: Development of tools to evaluate civil radar performances. Supervisor: Daniel Nguyen.

## MEMBERSHIP IN SCIENTIFIC COLLABORATIONS

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**Euclid consortium**

Nov. 2019 - Present

**UNIONS/CFIS collaboration**

Nov. 2019 - Present

## TECHNICAL SKILLS

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<b>Main programming language</b>	Python (TensorFlow, Numpy, ...)
<b>Programming languages I have used</b>	MATLAB, C, Java, Shell, Assembly
<b>Other tools</b>	Git, LaTeX, HPC (SLURM, TORQUE, SMP, MPI), CI, PyPI Experience with CPU and GPU computer clusters
<b>Astronomical software</b>	PSFEx, SExtractor, GalSim, ShapePipe

## TEACHING

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**École Polytechnique, Applied Mathematics Department** Aug. 2020 - Present

Teaching assistant at France's top engineering school. MSc and bachelor students.

Year 2021-2022

- *Optimization and control* [MAP435] for MSc. students with Prof. [Grégoire Allaire](#).
- *Applied mathematics python projects* [MAP361P] for MSc. students with Prof. [Arvind Singh](#).

Year 2020-2021

- *Statistics* [MAP433] for MSc. students with Prof. [Eric Moulines](#).
- *Optimization and control* [MAP435] for MSc. students with Prof. [Grégoire Allaire](#).
- *Mathematical modelling* [MAA107] for Bachelor students with Prof. [Vincent Bansaye](#) and Prof. [Thibaut Mastrolia](#).
- *Applied mathematics python projects* [MAP361P] for MSc. students with Prof. [Arvind Singh](#).

## STUDENT INTERNSHIP SUPERVISION

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### CosmoStat, CEA Saclay

- [Ezequiel Centofanti](#), MSc. student, 6 months (2022). Topic: Joint PSF and stellar SED estimation for *Euclid*.
- [Aziz Ayed](#), MSc. student, 5 months (2021). Topic: Deep denoisers for the MCCD PSF model.
- [Jérôme Bonnin](#), MSc. student, 6 months (2019-2020). Topic: RCA for CFIS and on the MCCD PSF model.

## SELECTED PRESENTATIONS AND CONFERENCES

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*Presentations within the Euclid Consortium are omitted.*

NeurIPS, Machine Learning and the Physical Sciences Workshop. (Poster)	Online. Dec. 2021
Lancement de l'axe Astrophysique de la Graduate School Physique.	Saclay, France. Nov. 2021
52èmes Journées de Statistiques de la Société Française de Statistique.	Online. Jun. 2021
Peyresq summer school on signal and image processing.	Online. Jun. 2021
2021 UNIONS CFIS/Pan-STARRS/WISHES Collaboration Meeting.	Online. Mar. 2021
SPARS conference. (Poster)	Toulouse, France. July 2019
CosmoStat seminar. Optimal transport for signed measures.	Saclay, France. Feb. 2019

## AWARDS & DISTINCTIONS

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<i>Distinguished student award</i>	University of Buenos Aires, Argentina, 2017
<i>Eiffel excellence scholarship</i>	Campus France, 2016
- Awarded to outstanding international students to do a joint degree in France.	
Gold medal award	St. Luke's College, Buenos Aires, Argentina, 2011
- Delivered to the best student of the 2011 class.	

## MISCELLANEOUS

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- Fluent in Spanish (mother tongue), English and French.
- Organizer of the [CosmoStat](#) Journal club and the laboratory's seminar.
- Organizer of a working and reading group on geometric deep learning.
- Reviewed articles for ApJ.

## REFERENCES

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- Dr. Jean-Luc Starck** CosmoStat laboratory, CEA-Saclay  
*Director of research* Saclay, France  
· Contact: [jean-luc.starck@cea.fr](mailto:jean-luc.starck@cea.fr)
- Dr. Jérôme Bobin** LILAS, CEA-Saclay  
*Permanent researcher* Saclay, France  
· Contact: [jerome.bobin@cea.fr](mailto:jerome.bobin@cea.fr)
- Dr. François Lanusse** CosmoStat laboratory, CEA-Saclay  
*CNRS Researcher* Saclay, France  
· Contact: [francois.lanusse@cea.fr](mailto:francois.lanusse@cea.fr)
- Dr. Martin Kilbinger** CosmoStat laboratory, CEA-Saclay  
*Permanent Researcher* Saclay, France  
· Contact: [Martin.Kilbinger@cea.fr](mailto:Martin.Kilbinger@cea.fr)
- Dr. Christophe Kervazo** IMAGES group, Télécom ParisTech  
*Assistant Professor* Palaiseau, France  
· Contact: [christophe.kervazo@telecom-paris.fr](mailto:christophe.kervazo@telecom-paris.fr)

## PUBLICATIONS IN PEER-REVIEWED SCIENTIFIC JOURNALS

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- Mar. 2022 **Liaudat, T.**, Starck, J.-L., Kilbinger, M., and Frugier, P.-A. (2022). *Rethinking data-driven point spread function modeling with a differentiable optical model*. Submitted. [arXiv:2203.04908](https://arxiv.org/abs/2203.04908)
- Jul. 2021 Guinot, A., Kilbinger, M., Farrens, S., Peel, A., Pujol, A., Schmitz, M., Starck, J.-L., Erben, T., Gavazzi, R., Gwyn, S. D. J., Hudson, M. J., Hildebrandt, H., **Liaudat, T.**, Miller, L., Spitzer, I., Van Waerbeke, L., Cuillandre, J.- C., Fabbro, S., McConnachie, A., and Mellier, Y. (2021). *Shapepipe: a new shape measurement pipeline and weak-lensing application to UNIONS/CFIS data*. Submitted to A&A (July 2021).
- Feb. 2021 **Liaudat, T.**, Bonnini, J.<sup>1</sup>, Starck, J.-L., Schmitz, M. A., Guinot, A., Kilbinger, M., and Gwyn, S. D. J. (2021). *Multi-ccd modelling of the point spread function*. *A&A*, 646:A27.
- Nov. 2019 Kervazo, C., **Liaudat, T.**, and Bobin, J. (2020). *Faster and better sparse blind source separation through mini-batch optimization*. *Digital Signal Processing*, 106:102827.

<sup>1</sup> MSc. student mentored by Liaudat, T.

## PUBLICATIONS IN PEER-REVIEWED CONFERENCES

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- Dec. 2021 **Liaudat, T.**, Starck, J.-L., Kilbinger, M., and Frugier, P.-A. (2021). *Rethinking the modeling of the instrumental response of telescopes with a differentiable optical model*. Fourth Workshop on Machine Learning and the Physical Sciences (NeurIPS 2021). [arXiv:2111.12541](https://arxiv.org/abs/2111.12541).
- Jun. 2021 **Liaudat, T.**, Starck, J.-L., and Kilbinger, M. (2021) *Semi-parametric wavefront modelling for the point spread function*. In [proceedings](#) of the 52ème Journées de Statistiques de la Société Française de Statistique (SFdS).
- Apr. 2019 **Liaudat, T.**, Bobin, J., and Kervazo, C. (2019). *Distributed sparse BSS for large-scale datasets*. In 2019 SPARS conference proceedings. [hal-02088466](https://hal.archives-ouvertes.fr/hal-02088466).