

Barbara PASCAL

Curriculum Vitæ

Nantes, France
✉ barbara.pascal@cnrs.fr
📄 <https://bpascal-fr.github.io>
GitHub: [bpascal-fr](#)
French citizen



Research

- 2022- **CNRS Researcher**, *Laboratoire des Sciences du Numérique de Nantes (LS2N)*, France.
- Oct. 2020 - **Post-doctoral researcher**, *CRISTAL*, University of Lille, France, Under the supervision of Rémi Bardenet.
- Sept. 2022 Determinantal Point Processes, zeros of Gaussian Analytic Functions and Time-Frequency transforms.
- Sept. **PhD Thesis in Signal and image processing**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France, Under the supervision of Patrice Abry and Nelly Pustelnik.
- 2020 Regularized estimation of fractal attributes *via* convex minimization for texture segmentation.
Reviewers: Bruno Torrèsani and Gabriel Peyré.
- Apr.-July 2017 **Master 2 internship in Signal and image processing**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France, Under the supervision of Patrice Abry and Nelly Pustelnik.
Multifractal analysis and convex optimisation applied to texture segmentation.
- May-July 2015 **Master 1 internship in Mathematical Physics**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France, Under the supervision of Jean-Michel Maillet and Giuliano Niccoli.
Integrable models, quantum R-matrices and links with classical integrability.
- Nov.-Dec. 2014 **Mater practical work**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France, Under the supervision of Antoine Naert, in collaboration with Juliette Monsel.
Exchanges of energy with a dissipative thermostat.
- June-July 2014 **Bachelor internship in Experimental Physics**, *Institut Lumière Matière*, Université Lyon 1, France, Under the supervision of Bruno Issenmann.
Effect of vibrations on a liquid trapped in a porous medium.

Education

- 2017-2020 **PhD Thesis in Signal and image processing**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France.
- 2016-2017 **Master of Physics, concepts and applications (Second year)**, École Normale Supérieure de Lyon, Lyon, France, *With honors* **Rank 3rd (over 27)**.
- July 2016 **Agrégation de Mathématique: highly competitive national exam to teach mathematics in high education**, École Normale Supérieure de Lyon, Option: Scientific computing – **Rank 52th (over 300)**.
- 2014-2015 **Master of Physics (First year)**, École Normale Supérieure de Lyon, Lyon, France, **Rank 2nd (over 46)**.
- 2013-2014 **Bachelor of Physics (Third year)**, École Normale Supérieure de Lyon, Lyon, France, *With honors* **Rank 7th (over 45)**.
- 2010-2013 **Classe préparatoire scientifique: two-year undergraduate intensive course in mathematics, physics and computer science**, Lycée Blaise Pascal, Clermont-Ferrand, France, Option: Computer science.
- July 2010 **Baccalauréat: general exam at the end of high school**, Lycée René Descartes, Cournon d'Auvergne, France, *With honors* – Scientific, Option: mathematics.

Scientific production

Journal articles

7. G. Fort, **B. Pascal**, P. Abry, and N. Pustelnik,
"Covid19 reproduction number: Credibility intervals by blockwise proximal Monte Carlo samplers,"
IEEE Transactions on Signal Processing, vol. 71, pp 888-900, 2023.
[hal-03611079](#)
6. C.-G. Lucas, **B. Pascal**, N. Pustelnik, and P. Abry,
"Hyperparameter selection for Discrete Mumford–Shah,"
Signal, Image and Video Processing (JCR), vol. 17, no. 5, pp 1897-1904, 2023.
[hal-03356059](#)
5. **B. Pascal**, and R. Bardenet,
"A covariant, discrete time-frequency representation tailored for zero-based signal detection,"
IEEE Transactions on Signal Processing (JCR), vol. 70, pp 2950–2961, 2022.
[hal-03553433](#)
4. **B. Pascal**, P. Abry, N. Pustelnik, S. Roux, R. Gribonval, and P. Flandrin,
"Nonsmooth convex optimization to estimate the Covid-19 reproduction number space-time evolution with robustness against low quality data,"
IEEE Transactions on Signal Processing (JCR), vol. 70, pp 2859–2868, 2022.
[hal-03348154](#)
3. **B. Pascal**, S. Vaiteer, N. Pustelnik, and P. Abry,
"Automated data-driven selection of the hyperparameters for Total-Variation based texture segmentation,"
Journal of Mathematical Imaging and Vision (JCR), pp 1-30, 2021.
[arXiv:2004.09434 \[stat.ML\]](#)
2. **B. Pascal**, N. Pustelnik, and P. Abry,
"Strongly Convex Optimization for Joint Fractal Feature Estimation and Texture Segmentation,"
Applied and Computational Harmonic Analysis (JCR), vol. 54, pp 303-322, 2021.
[arXiv:1910.05246 \[math.OC\]](#)
1. **B. Pascal**, N. Pustelnik, P. Abry, J.-C. Géminard and V. Vidal,
"Parameter-free and fast nonlinear piecewise filtering. Application to experimental physics,"
Annals of Telecommunications (JCR), vol. 75, no. 11, pp 655-671, 2020.
[arXiv:2006.03297 \[physics.data-an\]](#)

Proceedings of international conferences

7. P. Abry, J. Chevallier, G. Fort, and **B. Pascal**,
"Pandemic Intensity Estimation from Stochastic Approximation-based Algorithms,"
CAMSAP2023, Los Sueños, Costa Rica, December 10 - 13, 2023.
[hal-04174245](#)
6. P. Abry, G. Fort, **B. Pascal**, and N. Pustelnik,
"Proximal-Langevin samplers for nonsmooth composite posteriors: Application to the estimation of Covid19 reproduction number,"
EUSIPCO2023, Helsinki, Finlande, September 4 - 8, 2023.
[hal-03902144](#)
5. H. Artigas, **B. Pascal**, G. Fort, P. Abry, and N. Pustelnik,
"Credibility interval design for COVID19 reproduction number from nonsmooth Langevin-type Monte Carlo sampling,"
EUSIPCO2022, Belgrade, Serbia, July 29 - August, 2 2022.
[hal-03371837](#)
4. P. Abry, G. Fort, **B. Pascal**, and N. Pustelnik,
"Temporal evolution of the Covid19 pandemic reproduction number: Estimations from proximal optimization to Monte Carlo sampling,"
IEEE EMBC, Glasgow, Scotland, July 11 - 15, 2022.
[hal-03565440](#)
3. **B. Pascal**, V. Mauduit, P. Abry, and N. Pustelnik,
"Scale-free texture segmentation: Expert feature-based versus Deep Learning strategies,"

EUSIPCO2020, Amsterdam, Netherlands, January 18-22, 2021.

[hal-03058780](#)

2. **B. Pascal**, N. Pustelnik, P. Abry, M. Serres, and V. Vidal,
“**Joint estimation of local variance and local regularity for texture segmentation. Application to multiphase flow characterization,**”
IEEE ICIP, Athens, Greece, October 7-10, 2018.
[hal-01818082](#)
1. **B. Pascal**, N. Pustelnik, P. Abry, and J.-C. Pesquet,
“**Block-coordinate proximal algorithms for scale-free texture segmentation,**” *IEEE ICASSP*, Calgary, Alberta, Canada, April 15-20, 2018.
[hal-01736991](#)

Proceedings of national conferences

6. J. Du, **B. Pascal**, and P. Abry,
“**Performances comparées d’estimateurs du coefficient de reproduction de la Covid19 à l’aide de données synthétiques réalistes,**”
GRETSI, Grenoble, France, August 28 - September 1, 2023.
[hal-04032614](#)
5. **B. Pascal**, and R. Bardenet,
“**Une famille de représentations covariantes de signaux discrets et son application ‘a la détection de signaux à partir de leurs zéros,**”
GRETSI, Nancy, France, September 6 - 9, 2022.
[hal-03614725](#)
4. H. T.V. Le, **B. Pascal**, N. Pustelnik, M. Foare, and P. Abry,
“**Algorithmes proximaux rapides déroulés pour l’analyse d’images fractales homogènes par morceaux,**”
GRETSI, Nancy, France, September 6 - 9, 2022.
[hal-03621545](#)
3. P. Abry, G. Fort, **B. Pascal**, and N. Pustelnik,
“**Estimation et intervalles de crédibilité pour le taux de reproduction de la Covid19 par échantillonnage Monte Carlo Langevin proximal,**”
GRETSI, Nancy, France, September 6 - 9, 2022.
[hal-03611891](#)
2. T. Busser, **B. Pascal**, N. Pustelnik, P. Abry, M. Serres, R. Philippe, V. Vidal,
“**Écoulement gaz-liquide dans un milieu poreux confiné: caractérisation par analyse d’images,**”
Rencontres du non-linéaire, Lille, France, March 27, 2019.
[hal-02364232](#)
1. **B. Pascal**, T. Busser, N. Pustelnik, P. Abry, and V. Vidal,
“**Segmentation d’images texturées en grande dimension. Application à l’analyse d’écoulements multiphasiques,**”
GRETSI, Lille, France, August 26 - 29, 2019.
[hal-02424793](#)

Communications in international conferences

5. **B. Pascal**, N. Pustelnik, S. Vaiter and P. Abry,
“**Texture segmentation based on fractal attributes using convex functional minimization with generalized Stein formalism for automated regularization parameter selection,**”
French-Italian workshop on the Mathematics of Imaging, Vision and their Applications MIA-MIVA, Sophia-Antipolis, France, September 12-14, 2022.
4. **B. Pascal**, and R. Bardenet,
“**The Kravchuk transform: a novel covariant representation for discrete signals amenable to zero-based detection**”

tests,”

Determinantal and permanental point processes, quantum physics, and signal processing, Lyon, France, May 30 - June 10, 2022.

3. **B. Pascal**, and R. Bardenet, *Invited mini-cours* (https://github.com/bpascal-fr/mini-course_SP-and-GAF)
“**Point processes and spatial statistics in time-frequency analysis**,”
Stochastic Geometry Days, Dunkerque, France, November 15-19, 2021.
[PDF material](#), [PYTHON notebooks](#) and [data](#) available online
2. **B. Pascal**, N. Pustelnik, and P. Abry,
“**Joint estimation of local variance and local regularity for texture segmentation**,”
Curves and Surfaces, Arcachon, France, June 28 - July 4, 2018.
1. **B. Pascal**, N. Pustelnik, and P. Abry,
“**Combining Local Regularity Estimation and Total Variation Optimization for Scale-Free Texture Segmentation**,”
SIAM IS, Bologna, Italy, June, 5-8, 2018.

Summer schools

2. **Harmonic and Multifractal Analyses: from Mathematics to Quantitative Neuroscience**
(Invited lecture and participation),
Montréal, Canada, July 3 - 14, 2023.
[Summer school in Harmonic and Multifractal Analyses](#)
1. **Sparsity for Physics, Signal and Learning** (Attendance),
Paris, France, June 24-27, 2019.

Softwares

4. **KRAVCHUK-TRANSFORM-AND-ITS-ZEROS**
(<https://github.com/bpascal-fr/kravchuk-transform-and-its-zeros>)
Computation of the Kravchuk transform, representation of the associated spectrogram on the “time-frequency sphere”.
Signal detection test based on the spatial statistics of the zeros of the Kravchuk spectrogram.
3. **GEOSTO-PP-FOR-TF** (<https://github.com/bpascal-fr/GeoSto-PP-for-TF>)
PYTHON demonstration notebooks and real data supporting the mini-course “*Point processes and spatial statistics in time-frequency analysis*”. Zeros of the spectrogram of: complex white gaussian noise, noisy synthetic signals and gravitational wave data. Sampling of the zeros of the planar Gaussian Analytic Function.
2. **STEIN-PIECEWISE-FILTERING** (<https://github.com/bpascal-fr/stein-piecewise-filtering>)
Toolbox for signal, multivariate signal and image denoising favoring piecewise smooth behaviors including an automated selection of hyperparameters *via* Stein-based strategies.
1. **GSUGAR** (<https://github.com/bpascal-fr/gsugar>)
Automated and data-driven hyperparameter selection based on a generalized Stein estimator of the gradient of the quadratic error for texture segmentation (2D) or fractal process segmentation (1D).

Invited seminars

21. Signal and image processing seminar, Laboratory for Integration from Material to System (IMS), Bordeaux, France
“**Proximal schemes for the estimation of the reproduction number of Covid19: From convex optimization to Monte Carlo sampling**”
October 19, 2023. Organizer: Pascal Vallet.
20. Probability and statistics seminar, Institut Élie Cartan de Lorraine (IECL), Nancy, France
“**The Kravchuk transform: a novel covariant representation for discrete signals amenable to zero-based detection**”

tests”

June 8, 2023. Organizers: Ulysse Herbach, Edouard Strickler.

19. ANR Mistic workshop, Mathématiques Appliquées à Paris 5, France
“**Texture segmentation based on fractal attributes**” April 7, 2023. Organizers: Jonathan Vacher, Mariem Abaach.
18. Data and randomness: theory and applications seminar, Laboratoire Jean Kuntzmann (LJK), Grenoble, France
“**Proximal schemes for the estimation of the reproduction number of Covid19: From convex optimization to Monte Carlo sampling**”
April 6, 2023. Organizer: Kévin Polisano.
17. Applied mathematics seminar, Laboratoire de Mathématiques Jean Leray (LMJL), Nantes, France
“**The Kravchuk transform: a novel covariant representation for discrete signals amenable to zero-based detection tests**”
November 29, 2022. Organizer: Aymeric Stamm.
16. Probability, statistics and applications seminar, Laboratoire de Mathématiques et Applications, (LMA) Poitiers, France
“**The Kravchuk transform: a novel covariant representation for discrete signals amenable to zero-based detection tests**”
November 24, 2022. Organizers: Farida Enikeeva, Sandrine Dallaporta.
15. Probability and statistics team seminar, Laboratoire J.-A. Dieudonné, Nice, France
“**The Kravchuk transform: a novel covariant representation for discrete signals amenable to zero-based detection tests**”
October 18, 2022. Organizer: Damien Garreau.
14. Machine learning and signal processing seminar, Laboratoire de Physique de l’ENS Lyon, France
“**Generalized time-frequency transforms and their zeros**”
September 28, 2022. Organizer: Titouan Vayer.
13. SIMUL team seminar, Centre de Recherche en Automatique de Nancy (CRAN), France
“**The Kravchuk transform: a novel covariant representation for discrete signals amenable to zero-based detection test**”
July 12, 2022. Organizer: Julien Flamant.
12. Signal and Machine Learning seminar, Institut de Mathématiques de Marseille (I2M), France
“**The Kravchuk transform: a novel covariant representation for discrete signals amenable to zero-based detection tests.**”
18 March 2022. Organizer : Caroline Chaux
11. Workshop on Point Processes and Applications, CRIStal & Laboratoire Paul Painlevé, University of Lille
“**The Kravchuk transform: a novel covariant representation for discrete signals amenable to zero-based detection tests.**”
11 March 2022. Organizers : Mylène Maida and Michaël Fanuel.
10. Seminar of the Image team, Mathématiques Appliquées à Paris 5 (MAP5), University of Paris
“**Analyse de données non stationnaires : représentations, théorie, algorithmes et applications.**”
7 March 2022. Organizer : Rémy Abergel.
9. Seminar of the Géométrie, Apprentissage, Information, Algorithmes (GAIA) pole, GISPA-Lab, Grenoble
“**Processing nonstationary data: representations, theory, algorithms and applications.**”
December 16, 2021. Organizer: Guillaume Becq.
8. Seminar of the Signal IMage et Son (SIMS) team, LS2N, Nantes
“**Processing nonstationary data: representations, theory, algorithms and applications.**”
December 10, 2021. Organizer: Clément Huneau.
7. Statistics and Optimization seminar, Institut de Mathématiques de Toulouse
“**Texture segmentation based on fractal attributes using convex functional minimization with generalized Stein formalism for automated regularization parameter selection**”
October 12 2021. Organizers: Mélisande Albert, Adrien Mazoyer, Pierre Weiss.
6. Workshop on Point Processes and Application,s CRIStal & Laboratoire Paul Painlevé, University of Lille
“**A link between Majorana Stellar representation of pure spin states and Coulomb gas on the sphere**”
May 28, 2021. Organizer: Mylène Maida.

5. Séminaire Cristolien d'Analyse Multifractale (SCAM), Centre de Mathématiques, Créteil, France
"Segmentation de textures à partir d'attributs fractals par minimisation de fonctionnelle, with réglage automatique des hyperparamètres"
 February 4, 2021. Organizers: Stéphane Jaffard and Stéphane Seuret.
4. Signal and Image seminar, Institut de Mathématiques de Marchéille (I2M), France
"Texture segmentation based on fractal attributes using convex functional minimization with generalized Stein formalism for automated regularization parameter selection."
 November 27, 2020. Organizers: Caroline Chaux.
3. Image, Optimization and Probabilities (IOP) seminar, Institut de Mathématiques de Bordeaux, France
"How scale-free texture segmentation turns out to be a strongly convex optimization problem?"
 March 12, 2020. Organizers: Arthur Leclaire and Camille Male.
2. Seminar of the SIGMA team, CRISTAL Lille, France
"How scale-free texture segmentation turns out to be a strongly convex optimization problem?"
 March 3, 2020. Organizers: Pierre-Antoine Thouvenin and Vincent Itier.
1. Image and Signal Processing Seminars, ICTEAM, Université Catholique de Louvain
"How scale-free texture segmentation turns out to be a strongly convex optimization problem?"
 December 10, 2020. Organizer: Laurent Jacques.

Fundings, projects

Oct. 2023 - Mar. 2027 PRC **OptiMoCSI**: *Optimization and Monte Carlo Sampling Intertwined*
 Funding from the generic call of ANR (french national research funding agency).

300 k€

- Scientific manager for the Nantes partner (LS2N).
- Coordinator of WP3 : *Automated data-driven parameter selection*.

PhD Students

Sept. 2022 - **Juliana Du**, *Laboratoire de Physique de l'ENS Lyon and Laboratoire des Sciences du Numérique de Nantes*,
 Supervision: Patrice Abry (40%, LPENSL), Barbara Pascal (40%, LS2N) and Éric Guichard (20%, Triangle).
 An interdisciplinary contribution to monitoring the temporal and spatial evolution of the Covid-19 epidemic.

Internship supervision

- Apr.-Aug. 2023 **Second year of École Centrale Nantes, major in Applied Mathematics**, *Laboratoire des Sciences du Numérique de Nantes*, Anass El Moubarak, co-supervised with Gwenaél Samain and Sébastien Bourguignon.
 Strong piecewise linearity regularization based on the l_0 -norm. Application to the estimation of the Covid19 reproduction number.
- May-July 2021 **École Polytechnique 3rd year internship**, *Institut de Mathématiques de Toulouse*, Hugo Artigas, co-supervised with Gersende Fort, Nelly Pustelnik and Patrice Abry.
 Intervals of credibility for the Covid-19 Reproduction rate.
- Apr.-Aug. 2021 **Final year engineer intership**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France, Baptiste Desnos, co-supervised with Nelly Pustelnik and Patrice Abry.
 Unfolded proximal algorithms for deep learning texture segmentation.
- July-Sept. 2020 **Master 2 research internship**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France, Charles-Gérard Lucas, co-supervised with Patrice Abry and Nelly Pustelnik.
 Multivariate interface detection using Mumford-Shah-like functionals.
- June-July 2019 **Engineer intership**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France, Loris Helmlinger, co-supervised with Nelly Pustelnik.
 Texture segmentation on temporal series of multiphasic flow images: attribute-oriented approaches v.s. deep learning.

Commitments to the scientific community

- PhD jury

December 14, 2023 Member of the jury of Thu-Le Tran, IRMAR, Rennes, France.

September 12, 2023 Member of the jury of Hashem Ghanem, Laboratoire J.-A. Dieudonné, Nice, France.

- Scientific seminar SIMS team & LS2N

Monthly team seminars: presentation from an external invited scientific followed by questions and discussions.

August 2023 - **Organizer.**

Oct. 2022 - July 2023 **Participant.**

- Peer reviewing

- *SIAM Journal of Imaging Sciences.*
- *IEEE Transactions on Image Processing.*
- *IEEE Transactions on Signal Processing.*
- *IEEE Signal Processing Letters.*
- *IEEE ICASSP.*
- *Inverse Problems and Imaging.*
- *Springer Journal of Mathematical Imaging and Vision.*

- Reading group SIMS Team & LS2N

"Machine learning and applications"

Monthly sessions around recent contributions in machine learning.

Oct. 2022 - **Presentation and regular attendance.**

- Reading groupe SIGMA team at CRISAL

"Determinantal Point Processes: theoretical bases and applications"

Réunions bi-mensuelles en mode hybride sur d'un article de recherche présenté par un membre du groupe.

Maintien d'une archive des séances passées (articles, présentation, résumés, notes) à destination du groupe.

Sept. 2021 - **Organizer.**

Oct. 2020 - July 2021 **Co-organizer** with Arnaud Poinas.

- Working group CRISAL & Paul Painlevé laboratory

"Point processes and applications"

Weekly meetings to discuss major results in stochastic geometry and their applications.

Oct. 2020 - **Regular attendance.**

- PhD students and post-doctoral researchers seminar SigMA Team, CRISAL

Monthly meetings, in hybrid mode if necessary, for a presentation on a scientific or academic topic of broad interest.

Sept. 2021 - **Co-organizer** with Pierre Palud.

Jan. 2020 - July 2021 **Co-organizer** with Quentin Mayolle.

Scientific communication and initiatives toward the wide audience

- Scientific trainer for the Rendez-vous des Jeunes Mathématiciennes et Informatiennes Inria Lille (October, 16-17 2021). *Workshops in mathematics and data science for high school girls willing to embrace an ambitious scientific graduate studies projet.*

- Guide for the [Académie des Sciences à Lyon, Musée des Confluences](#) (February, 13-14 2020).
Accompaniment of high school classes through different scientific workshops.
- Participation to the *Réviser ton bac with la BmL !* program, in partnership with the association [ENSeigner](#) (April - June 2019). *Workshops to prepare the baccalauréat (high school final exam) proposed in Lyon public libraries.*

Teaching

Centrale Nantes (engineering school)

DATASIM major

- **Nonsmooth convex optimization** 2023-2024
Lecture 4h
- **Signal and image processing projects** 2023-2024
Audio inpainting in the time-frequency domain using a probabilistic diffusion model co-supervised with M. Lagrange
Unbalanced optimal transport for time series comparison applied to epidemiology. co-supervised with J. Idier
- **Epidemic surveillance: Estimation of the reproduction number of Covid-19** 2022-2023
Lecture 2h
Lab session 4h
- **Signal and image processing projects** 2022-2023
Description *versus* generation in metric learning co-supervised with M. Lagrange
Learning sound signal representations that are robust to the acquisition modality co-supervised with V. Lostanlen
Point processes for statistical learning co-supervised with V. Lostanlen

Master 2 CORO Signal and Image Processing

- **Nonsmooth convex optimization** 2022-2023
Lecture 4h
Lab session 2h

Centrale Lille (engineering school)

Core training of engineering degree (3rd year of bachelor)

- **Measure theory and Lebesgue integration** 2021-2022
Practical exercises 14h

Université Claude Bernard Lyon 1

Master of Applied Mathematics and Statistics

- **Nonsmooth convex optimization - (Second year of master)** 2018-2019, 2020-2021
Lectures and numerical implementation (PYTHON) 6h+1h30
From the lecture notes of Nelly Pustelnik

École Normale Supérieure de Lyon

Formation à l'Enseignement, Agrégation et Développement Professionnel: Master degree for teaching in high school

- **Préparation à l'agrégation de mathématiques: intensive preparation to the french examination for becoming high school teacher** 2017-2018, 2018-2019, 2019-2020
Correction of lessons during the training for final oral examination 16h
– Training for oral exam – Supervision and evaluation of the preparation and presentation of lessons

Classes préparatoires à l'enseignement supérieur (CPES)

- **Mathematics** 2017-2018, 2018-2019, 2019-2020
Colles (oral examinations) **28h**

Master of Physics, concepts and applications

- **Signal and image processing - (First year of master)** 2017-2018, 2018-2019, 2019-2020
Practical and numerical implementation (MATLAB) **8h**
 - Autoregressive processes, spectral v.s. parametric estimation
 - Optimal filtering
 - Non-stationary signals
 - Deconvolution and image processing

Bachelor of Physics

- **Signal processing - (Third year of bachelor)** 2018-2019, 2019-2020
Practical exercises **8h**
 - Random variables
 - Spectral estimation
 - Random processes and estimation
 - Statistical tests
- **Introduction to L^AT_EX- (Third year of bachelor)** 2017-2018, 2018-2019, 2019-2020
Exercises and implementation (TEXMAKER, ZOTERO) **6h**
 - Create a document
 - Insert tables, figures and mathematical formula
 - Using BibTeX to generate a bibliography

Master Complex Systems - IXXI

- **Statistical physics - (Second year of master)** 2017-2018, 2018-2019, 2019-2020
Practical exercises **8h**
 - Statistical ensembles
 - Phase transitions
 - Disordered systems

Linguistic skills

French Mother language
English Professional level
Spanish Rudiments

Read, written, spoken

Programming and office automation skills

Matlab	Deep knowledge	Pyhton	Numpy, Scipy, Keras
Latex	Deep knowledge, TikZ	Inkscape	Standard use
OS	Windows, macOS, Linux (Basics)		