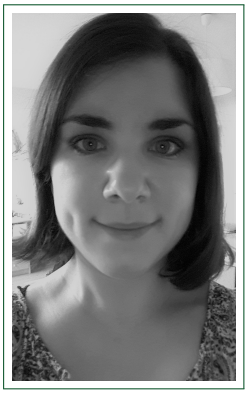

Barbara PASCAL

Curriculum Vitæ

Lille, France
barbara.pascal@univ-lille.fr
https://bpascal-fr.github.io
GitHub: bpascal-fr
French citizen
Born on December, 12th 1992

Education

2020- **Post-doctoral researcher**, *CRIStAL*, University of Lille, France.

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.

Research

Oct. 2020 - **Post-doctoral researcher**, *CRIStAL*, University of Lille, France, Under the supervision of Rémi Bardenet.
Determinantal Point Processes, zeros of Gaussian Analytic Functions and Time-Frequency transforms.

Sept. 2017-Sept. 2020 **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.
Regularized estimation of fractal attributes *via* convex minimization for texture segmentation. Reviewers: Bruno Torrésani 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.

Scientific production

Journal articles

3. **B. Pascal**, S. Vaiter, 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 fitering. Application to experimental physics,**"
Annals of Telecommunications (JCR), vol. 75, no. 11, pp 655-671, 2020.
`arXiv:2006.03297 [physics.data-an]`

Prepublications

6. G. Fort, **B. Pascal**, P. Abry, and N. Pustelnik,
"**Covid19 Reproduction Number: Credibility Intervals by Blockwise Proximal Monte Carlo Samplers,**"
Submitted, 2022.

5. 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,**"
Submitted, 2022. `hal-03565440`

4. **B. Pascal**, and R. Bardenet, "**A covariant, discrete time-frequency representation tailored for zero-based signal detection,**"
Submitted, 2022. `hal-03553433`

3. **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,**"
Accepted under minor revisions.
IEEE Transactions on Signal Processing, 2021. `hal-03348154`

2. 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,**"
Submitted, 2021. `hal-03371837`

1. C.-G. Lucas, **B. Pascal**, N. Pustelnik, and P. Abry,
"**Hyperparameter selection for the Discrete Mumford-Shah functional,**"
Submitted, 2021. `hal-03356059`

Proceedings of international conferences

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.

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.

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.

Proceedings of national conferences

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 27th 2019.

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.

Communications in international conferences

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

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

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 16th 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 10th 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 12th 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 28th 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 4th 2021. Organizers: Stéphane Jaffard and Stéphane Seuret.

4. Signal and Image seminar, Institut de Mathématiques de Marcheille (I2M), France
"**Texture segmentation based on fractal attributes using convex functional minimization with generalized Stein formalism for automated regularization parameter selection.**"
November 27th 2020. Organizers: Caroline Chaux.

3. Image, Optimization and Probabilites (IOP) seminar, Institut de Mathématiques de Bordeaux, France
"**How scale-free texture segmentation turns out to be a strongly convex optimization problem?**"
March 12th 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 3rd 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 10th 2020. Organizer: Laurent Jacques.

Internship supervision

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

Activité de *peer reviewing*

- *IEEE Transactions on Signal Processing.*
- *IEEE Signal Processing Letters.*

Groupe de lecture Équipe SIGMA du CRIStAL

"**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**.

0ct. 2020 - July 2021 **Co-organizer** with Arnaud Poinas.

Working group CRIStAL & 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, CRIStAL

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 Informaticiennes *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 *Révise 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

École Centrale Lille

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 LaTeX- (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	*Read, written, spoken*
Spanish	Rudiments	

Programming and office automation skills

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