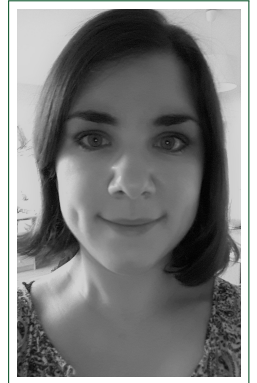


# Barbara PASCAL

## Curriculum Vitæ

Lille, France  
✉ [barbara.pascal@univ-lille.fr](mailto:barbara.pascal@univ-lille.fr)  
📄 <http://perso.ens-lyon.fr/barbara.pascal>  
GitHub: [bpascal-fr](#)  
French citizen  
Born on December, 12 1992



## Recherche

- Oct. 2020 - **Post-doctoral researcher**, *CRISAL*, University of Lille, France, Under the supervision of Rémi Bardenet.  
Determinantal Point Processes, zeros of Gaussian Analytic Functions and Time-Frequency transforms.
- Sept. 2017 **PhD Thesis in Signal and image processing**, *Laboratoire de Physique*, École Normale Supérieure de  
-Sept. 2020 Lyon, France, Under the supervision of Patrice Abry and Nelly Pustelnik..  
Regularized estimation of fractal attributes *via* convex minimization for texture segmentation.  
Reviewers: Bruno Torrèsani and Gabriel Peyré
- Apr.-July **Master 2 internship in Signal and image processing**, *Laboratoire de Physique*, École Normale  
2017 Supérieure de Lyon, France, Under the supervision of Patrice Abry and Nelly Pustelnik.  
Multifractal analysis and convex optimisation applied to texture segmentation.
- May-July **Master 1 internship in Mathematical Physics**, *Laboratoire de Physique*, École Normale Supérieure  
2015 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. **Master practical work**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France, Under the  
2014 supervision of Antoine Naert, in collaboration with Juliette Monsel.  
Exchanges of energy with a dissipative thermostat.
- June-July **Bachelor internship in Experimental Physics**, *Institut Lumière Matière*, Université Lyon 1, France,  
2014 Under the supervision of Bruno Issenmann.  
Effect of vibrations on a liquid trapped in a porous medium.

## Supervision

- May-July **École Polytechnique 3<sup>rd</sup> year internship**, *Institut de Mathématiques de Toulouse*, Hugo Artigas ,  
2021 co-supervised with Gersende Fort, Nelly Pustelnik and Patrice Abry.  
Intervals of credibility for the Covid-19 Reproduction rate.
- Avril-Août **Final year engineer intership**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France,  
2021 Baptiste Desnos , co-supervised with Nelly Pustelnik and Patrice Abry.  
Unfolded proximal algorithms for deep learning texture segmentation.
- July-Sept. **Master 2 research internship**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France,  
2020 Charles-Gérard Lucas, co-supervised with Patrice Abry and Nelly Pustelnik.  
Multivariate interface detection using Mumford-Shah-like functionals.
- June-July **Engineer intership**, *Laboratoire de Physique*, École Normale Supérieure de Lyon, France, Loris Helmlinger,  
2019 co-supervised with Nelly Pustelnik.  
Texture segmentation on temporal series of multiphasic flow images: attribute-oriented approaches v.s. deep learning.

## Education

- 2016-2017 **Master of Physics, concepts and applications (Second year)**, *École Normale Supérieure de Lyon*,  
Lyon, France, *With honors* – Rank 3<sup>rd</sup> (over 27).
- Sep. 2015 - **Agrégation de Mathématique: highly competitive national exam to teach mathematics in high**  
July 2016 **education**, *École Normale Supérieure de Lyon*, Option: Scientific computing – Rank 52<sup>th</sup> (over 300).

- 2014-2015 **Master of Physics (First year)**, *École Normale Supérieure de Lyon*, Lyon, France, Rank 2<sup>nd</sup> (over 46).
- 2013-2014 **Bachelor of Physics (Third year)**, *École Normale Supérieure de Lyon*, Lyon, France, *With honors* – Rank 7<sup>th</sup> (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*, Courmoult d'Auvergne, France, *With honors* – Scientific, Option: mathematics.

## Teaching

### École Centrale Lille

#### *Core training of 1<sup>st</sup> year (Bachelor in engineering)*

- **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 practical exercises ..... **6h+1h30**
- From the lecture notes of Nelly Pustelnik

### École Normale Supérieure de Lyon

#### *Master of Physics, concepts and applications*

- **Signal and image processing - (First year of master)** ..... 2017-2018, 2018-2019, 2019-2020
- Practical and numerical exercises ..... **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<sup>A</sup>T<sub>E</sub>X- (Third year of bachelor)** ..... 2017-2018, 2018-2019, 2019-2020
- Exercises and implementation ..... **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

#### *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**

## Scientific communication and participation to initiatives for the wide audience

- 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 *Révisé 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.*

## 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)		

## Publications, communications and softwares

### Journal articles

2. B. Pascal, N. Pustelnik, and P. Abry,  
“**Strongly Convex Optimization for Joint Fractal Feature Estimation and Texture Segmentation,**”  
To appear in *Applied and Computational Harmonic Analysis* (JCR), 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), 2020. [arXiv:2006.03297](#) [physics.data-an]

### Prepublications

1. B. Pascal, S. Vaiter, N. Pustelnik, and P. Abry,  
“**Automated data-driven selection of the hyperparameters for Total-Variation based texture segmentation,**”  
Under revision process *Journal of Mathematical Imaging and Vision* (JCR), 2020. [arXiv:2004.09434](#) [stat.ML]

### International conferences

4. 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.
3. 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.
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, P. Abry, and J.-C. Pesquet,  
**"Block-coordinate proximal algorithms for scale-free texture segmentation,"**  
*IEEE ICASSP*, Calgary, Alberta, Canada, April 15-20, 2018.

## National conferences

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 multi-phasiques,"**  
*GRETSI*, Lille, France, Août 26 - 29, 2019.

## International workshops

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

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

4. 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"**  
 4 février 2021. Organizers: Stéphane Jaffard and Stéphane Seuret.
3. Séminaire Signal and Image, Institut de Mathématiques de Marseille (I2M), France  
**"Texture segmentation based on fractal attributes using convex functional minimization with generalized Stein formalism for automated regularization parameter selection."**  
 27 novembre 2020. Organizer: Caroline Chaux.
2. Séminaire Image, Optimisation and Probabilités (IOP), Institut de Mathématiques de Bordeaux, France  
**"How scale-free texture segmentation turns out to be a strongly convex optimization problem?"**  
 12 mars 2020. Organizers: Arthur Leclaire and Camille Male.
1. Séminaire de l'équipe SIGMA, CRISAL Lille, France  
**"How scale-free texture segmentation turns out to be a strongly convex optimization problem?"**

3 mars 2020. Organizers: Pierre-Antoine Thouvenin and Vincent Itier.

### Scientific animation and participation in the life of scientific team

- Lecture group "**Determinantal Point Processes: theoretical bases and applications**"  
SIGMA team. Co-organization with Arnaud Poinas.
- **PhD students and post-doctoral researchers seminar**  
SIGMA team. Co-organization with Quentin Mayolle.

2020 -

2021 -