Jonathan Vacher
E-mail : jonathan.vacher@ens.fr
Website : jonathanvacher.github.io

Laboratoire des systèmes perceptifs (UMR 8248)
École normale supérieure
PSL University & CNRS
75005 Paris, France

Research Experience

Sept. 2020	**Postdoctorate Research Fellow** *Under the supervision of Pascal Mamassian and Ruben Coen-Cagli.* Laboratoire des Systèmes Perceptifs, École Normale Supérieure, PSL Research University, Paris, France.
2017–2020	**Postdoctorate Research Fellow** *Under the supervision of Ruben Coen-Cagli and Pascal Mamassian.* Department of Comp. Biology, Albert Einstein College of Medicine, New-York, USA.
2013–2017	**PhD under the supervision of G. Peyré and C. Monier** *Applied Mathematics and Neurosciences. Dynamic Textures Synthesis for Probing Vision in Psychophysics and Electrophysiology.* Dauphine University, PSL Research University, Paris, France. Unité Neuroscience, Information et Complexité (now NeuroPsi), Gif-sur-Yvette, France.
2011–2012	**Research internship under the supervision of J-M. Morel and B. Coll** *Texture synthesis: the Portilla-Simoncelli algorithm.* Universitat de les Illes Balears, Palma de Mallorca, Spain. Centre de Mathématiques et de Leurs Applications, Cachan, France.

Research Supervision

Jul. – Sept. 2021	**Matteo Dutertre** *Project: Experimental Design of a Visual Task to Study the Aperture Problem.* Laboratoire des Systèmes Perceptifs, École Normale Supérieure, Paris. *Co-supervisor: Pascal Mamassian*
Jun. – Jul. 2020	**Elliot Kim** *Project: Comparing mixture models trained on neural activity vs natural image stimuli.* Department of Comp. Biology, Albert Einstein College of Medicine, New-York, USA. *Co-supervisor: Ruben Coen-Cagli*
Mar. – Apr. 2020	**Alexander Ferrena** *Project: Studying the possibility to use Generative Adversarial Networks to generate image from neural activity and vice-versa.* Department of Comp. Biology, Albert Einstein College of Medicine, New-York, USA. *Co-supervisor: Ruben Coen-Cagli*

List of Contributions

Pre-prints

Vacher J., Launay C., Coen-Cagli R., Flexibly Regularized Mixture Models and Application to Image Segmentation, *arXiv 1905.10629, 2021 (submitted to Neural Networks journal)* Link

Vacher J., Mamassian P., Coen-Cagli R., Probabilistic Model of Visual Segmentation, *arXiv 1806.00111, 2019* Link

Journals

Vacher J., Briand T., The Portilla-Simoncelli Texture Model: Towards Understanding the Early Visual Cortex, *Image Processing On Line 11, 170–211, 2021* Link

Le Coënt A., Fribourg L., Vacher J., Wisniewski, R., Probabilistic reachability and control synthesis for stochastic switched systems using the tamed Euler method, *Nonlinear Analysis: Hybrid Systems, 2020* Link

Roggerone V., Vacher J., Tarlao C., Guastavino C., Auditory motion perception emerges from successive sound localizations integrated over time, *Scientific Reports, 2019* Link

Vacher J., Meso A. I., Perrinet L. U., Peyré G., Bayesian Modeling of Motion Perception using Dynamical Stochastic Textures, *Neural Computation, 2018* Link

Briand T., Vacher J., How to Apply a Filter Defined in the Frequency Domain by a Continuous Function ?, *Image Processing On Line 6, 183-211, 2016* Link

Briand T., Vacher J., Galerne B., Rabin J., The Heeger-Bergen Pyramid Based Texture Synthesis Algorithm, *Image Processing On Line 4, 276–299, 2014* Link

Conferences

Vacher J., Davila A., Kohn A., Coen-Cagli R., Texture Interpolation for Probing Visual Perception, *Advances in Neural Information Processing Systems, -, 2020* Link

Le Coënt A., Fribourg L., Vacher J, Control synthesis for stochastic switched systems using the tamed euler method, *IFAC Conference on Analysis and Design of Hybrid Systems, 2018* Link

Vacher J., Meso A. I., Perrinet L. U., Peyré G., Biologically Inspired Dynamic Textures For Probing Motion Perception, *Advances in Neural Information Processing Systems, 1918-1926, 2015* Link

Participation in Conferences and Seminars

Upcoming

Dec. 2021 — *Séminaire de l'équipe MLMDA, Centre Borelli* Link

Past

Nov. 2021 Measuring Human Probabilistic Segmentation Maps *Séminaire de l'équipe Parietal, INRIA Saclay* Link

Oct. 2021 Unifying Different Psychometric Methods : Theory and Experiment *GDR Vision, Lille* Link

Oct. 2021 Probing Visual Perception using Synthetic Textures *NeuroSpin Conferences* Link

Sep. 2021 Flexibly Regularized Mixture Models and Application to Image Segmentation *Séminaire IMAGES team, Telecom Paris* Link

Aug. 2021 Flexibly Regularized Mixture Models and Application to Image Segmentation *Journée Modélisation Aléatoire et Statistique de la SMAI. Session: Statistique et Image* Link

Jun. 2021 Texture Interpolation for Probing Visual Perception *Congrés de la SMAI, Minisymposia: Transport Optimal pour l'Inférence Statistique* Link

Jun. 2021 Texture Interpolation for Probing Visual Perception *Séminaire de l'ANR Mistic* Link

May 2021 Texture Interpolation for Probing Visual Perception *Séminaire Images Optimisation et Probabilités de l'Institut de Mathématiques de Bordeaux* Link

Dec. 2020 Poster and spotlight presentation: Texture Interpolation for Probing Visual Perception *Neural Information Processing Systems (NeurIPS)* Link

Dec. 2020 Understanding visual perception using natural texture models *Vision Team Seminar at INCC* Link

Nov. 2020 Understanding visual perception using natural texture models *Image Team Seminar at MAP5* Link

Nov. 2020 Variability and Bias in Psychometric Estimation of Monitor Gamma *GDR Vision* Link

June. 2020	Poster: Measuring and Modeling Human Probabilistic Segmentation Maps *Vision Science Society (VSS) 2020* Link
Feb. 2020	Poster: Measuring Human Probabilistic Segmentation Maps *Computational and Systems Neuroscience (Cosyne) 2020* Link
Aug. 2019	Talk: An ideal observer model for grouping and contour integration in natural images *European Conference on Visual Perception* Link
June 2016	Poster: Supervised Learning Estimation of Functional Maps from VSD Imaging *International Conference on Mathematical NeuroScience (ICMNS)* Link
Dec. 2015	Poster and spotlight presentation: Biologically Inspired Dynamic Textures for Probing Motion Perception *Neural Information Processing Systems (NeurIPS)* Link
June 2015	Talk: Dynamic Texture Synthesis for Probing Visual Perception *7e Biennale Française des Mathématiques Appliquées et Industrielles (SMAI 2015)* Link
June 2015	Poster: A Mathematical Account of Dynamic Texture Synthesis for Probing Visual Perception *International Conference on Mathematical NeuroScience (ICMNS)* Link
Oct. 2014	Poster: Dynamic Textures for Probing Visual Perception *Workshop on Geometrical Models in Vision* Link

Participation in Review Committees

Conferences

Neural Information Processing Systems 2019–2020 (NeurIPS): Website
International Conference on Machine Learning 2020 (ICML): Website
International Conference on Learning Representations 2020–2021 (ICLR): Website
Limited Labeled Data workshop @ICLR 2018–2019: Website
Computational and Systems Neuroscience 2020 (Cosyne): Website

Journals

Image Processing On Line Journal (IPOL): Website
IEEE Transactions on Visualization and Computer Graphics: Website
Vision Research: Website

Professional Society Membership

since 2015	**Société de Mathématiques Appliquées et Industrielles** Link
since 2019	**Vision Science Society** Link

Awards and Scholarships

March 2019	**Seal of Excellence for the project "Decompose the hierarchical process of human visual segmentation"** *Certificate delivered by the European Commission, as the institution managing Horizon 2020, the EU Framework Programme for Research and Innovation 2014-2020* Link
2012–2013	**Excelence Master's Scholarship** *Funding (10 000 euros) from the Fondation de Mathématiques Jacques Hadamard (FMJH)* Link

Computer Science

Operating systems	Linux, Windows

Languages	Python (parallel/GPU computing, scikit-learn, deep learning with PyTorch), Matlab (including PsychToolbox for psychophysics), basic knowledge in C/C++, basic knowledge in JavaScript (jspsych for online psychophysics)
Data knowledge	natural images, psychometric results, extracellular recordings, brain optical imaging
Open Source Code	Dynamic Textures: Motion Clouds, Drifting Gratings (`https://github.com/JonathanVacher/dyntex` under update reikna → pytorch) Texture Interpolation: Optimal transport of Deep Neural Network activation distributions (`https://github.com/JonathanVacher/texture-interpolation`) Reproduction of the Portilla-Simoncelli texture algorithm (IPOL: `http://www.ipol.im/pub/pre/324/portilla_simoncelli_1.00.zip`) Reproduction of the Heeger-Bergen texture algorithm (IPOL: `http://www.ipol.im/pub/art/2014/79/heegerbergen_1.00.tgz`) Various examples for teaching purposes (`https://github.com/JonathanVacher/projects`)

Teaching Activities

2021–2022	**Examiner in mathematics** *Oral exam training. Two hours a week. High level students.* Classes Préparatoires aux Grandes Écoles, Louis-le-Grand high school, Paris.
Oct. 2016	**French tenured civil servant as teacher in mathematics** *Availability for postdoctoral research.*
2013–2015	**Lecturer in Analysis, Linear Algebra, Differential Calculus** *Three hours a week. Mid to high level students.* Dauphine University, Paris.
July 2013	**Highest French competitive exam in mathematics for academic teaching** *Agrégation de mathématiques.*
2011–2013	**Examiner in mathematics** *Oral exam training. Two hours a week. High level students.* Classes Préparatoires aux Grandes Écoles, Janson de Sailly high school, Paris.

Academic Background

2013–2017	**PhD in Applied Mathematics** Dauphine University (Paris Sciences Lettres), Paris.
2011–2013	**Master's degree in mathematics** *Mathematics, Vision and Learning. Graduated with honours.* École Normale Supérieure de Cachan.
2010–2011	**Bachelor's degree in mathematics** *Applied Mathematics. Graduated with honours.* École Normale Supérieure de Cachan.

Languages

French: native / English: fluent / Spanish: basic understanding

Interests and Other Activities

Sports: rock climbing/bouldering, biking, hiking, tennis, table tennis, handball...
Video/Board Games: hearthstone, megawatt, smallworld, 7 wonders, terra mystica, king domino, ...
Music, cinema, sciences, social sciences, economy, politics, ...

President of the association "Les sENS de l'Art" in 2012: in charge of the organization of the annual art and music festival of ENS Cachan (budget: 40 000 euros).