

Research Experience

Sept. 2020	Postdoctorate Research Fellow <i>Under the supervision of Pascal Mamassian and Ruben Coen-Cagli.</i> Laboratoire des Systèmes Perceptifs, École Normale Supérieure, PSL Research University, Paris, France.
2017–2020	Postdoctorate Research Fellow <i>Under the supervision of Ruben Coen-Cagli and Pascal Mamassian.</i> Department of Comp. Biology, Albert Einstein College of Medicine, New-York, USA.
2013–2017	PhD under the supervision of G. Peyré and C. Monier <i>Applied Mathematics and Neurosciences. Dynamic Textures Synthesis for Probing Vision in Psychophysics and Electrophysiology.</i> 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 <i>Texture synthesis: the Portilla-Simoncelli algorithm.</i> 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 <i>Project: Experimental Design of a Visual Task to Study the Aperture Problem.</i> Laboratoire des Systèmes Perceptifs, École Normale Supérieure, Paris. <i>Co-supervisor: Pascal Mamassian</i>
Jun. – Jul. 2020	Elliot Kim <i>Project: Comparing mixture models trained on neural activity vs natural image stimuli.</i> Department of Comp. Biology, Albert Einstein College of Medicine, New-York, USA. <i>Co-supervisor: Ruben Coen-Cagli</i>
Mar. – Apr. 2020	Alexander Ferrena <i>Project: Studying the possibility to use Generative Adversarial Networks to generate image from neural activity and vice-versa.</i> Department of Comp. Biology, Albert Einstein College of Medicine, New-York, USA. <i>Co-supervisor: Ruben Coen-Cagli</i>

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 (under review – Neural Networks journal)* [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* 33, 22146-22157, 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* 28, 1918-1926, 2015 [Link](#)

Unpublished Reports

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

Participation in Conferences and Seminars

Upcoming

None

Past

Dec. 2021	Probing Visual Perception using Synthetic Textures	<i>Séminaire de l'équipe MLMDA, Centre Borelli</i> Link
Nov. 2021	Measuring Human Probabilistic Segmentation Maps	<i>Séminaire de l'équipe Parietal, INRIA Saclay</i> Link
Oct. 2021	Unifying Different Psychometric Methods : Theory and Experiment	<i>GDR Vision, Lille</i> Link
Oct. 2021	Probing Visual Perception using Synthetic Textures	<i>NeuroSpin Conferences</i> Link
Sep. 2021	Flexibly Regularized Mixture Models and Application to Image Segmentation	<i>Séminaire IMAGES team, Telecom Paris</i> Link
Aug. 2021	Flexibly Regularized Mixture Models and Application to Image Segmentation	<i>Journée Modélisation Aléatoire et Statistique de la SMAI. Session: Statistique et Image</i> Link
Jun. 2021	Texture Interpolation for Probing Visual Perception	<i>Congrès de la SMAI, Minisymposia: Transport Optimal pour l'Inférence Statistique</i> Link
Jun. 2021	Texture Interpolation for Probing Visual Perception	<i>Séminaire de l'ANR Mystic</i> Link
May 2021	Texture Interpolation for Probing Visual Perception	<i>Séminaire Images Optimisation et Probabilités de l'Institut de Mathématiques de Bordeaux</i> Link
Dec. 2020	Poster and spotlight presentation: Texture Interpolation for Probing Visual Perception	<i>Neural Information Processing Systems (NeurIPS)</i> Link

Dec. 2020	Understanding visual perception using natural texture models	<i>Vision Team Seminar at INCC</i> Link
Nov. 2020	Understanding visual perception using natural texture models	<i>Image Team Seminar at MAP5</i> Link
Nov. 2020	Variability and Bias in Psychometric Estimation of Monitor Gamma	<i>GDR Vision</i> Link
June. 2020	Poster: Measuring and Modeling Human Probabilistic Segmentation Maps	<i>Vision Science Society (VSS) 2020</i> Link
Feb. 2020	Poster: Measuring Human Probabilistic Segmentation Maps	<i>Computational and Systems Neuroscience (Cosyne) 2020</i> Link
Aug. 2019	Talk: An ideal observer model for grouping and contour integration in natural images	<i>European Conference on Visual Perception</i> Link
June 2016	Poster: Supervised Learning Estimation of Functional Maps from VSD Imaging	<i>International Conference on Mathematical NeuroScience (ICMNS)</i> Link
Dec. 2015	Poster and spotlight presentation: Biologically Inspired Dynamic Textures for Probing Motion Perception	<i>Neural Information Processing Systems (NeurIPS)</i> Link
June 2015	Talk: Dynamic Texture Synthesis for Probing Visual Perception	<i>7e Biennale Française des Mathématiques Appliquées et Industrielles (SMAI 2015)</i> Link
June 2015	Poster: A Mathematical Account of Dynamic Texture Synthesis for Probing Visual Perception	<i>International Conference on Mathematical NeuroScience (ICMNS)</i> Link
Oct. 2014	Poster: Dynamic Textures for Probing Visual Perception	<i>Workshop on Geometrical Models in Vision</i> 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” <i>Certificate delivered by the European Commission, as the institution managing Horizon 2020, the EU Framework Programme for Research and Innovation 2014-2020</i> Link
2012–2013	Excelence Master’s Scholarship <i>Funding (10 000 euros) from the Fondation de Mathématiques Jacques Hadamard (FMJH)</i> 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 measurements, extracellular cortical recordings, brain optical imaging
Open Source Code	Dynamic Textures: Motion Clouds, Drifting Gratings (https://github.com/JonathanVacher/dyntex under update reikna \rightarrow 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 <i>Oral exam training. Two hours a week. High level students. Classes Préparatoires aux Grandes Écoles, Louis-le-Grand high school, Paris.</i>
Oct. 2016	French tenured civil servant as teacher in mathematics <i>Availability for postdoctoral research.</i>
2013–2015	Lecturer in Analysis, Linear Algebra, Differential Calculus <i>Three hours a week. Mid to high level students. Dauphine University, Paris.</i>
July 2013	Highest French competitive exam in mathematics for academic teaching <i>Agrégation de mathématiques.</i>
2011–2013	Examiner in mathematics <i>Oral exam training. Two hours a week. High level students. Classes Préparatoires aux Grandes Écoles, Janson de Sailly high school, Paris.</i>

Academic Background

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

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).