

# Jonathan Dong

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## Experience Summary

- **EPFL** 🇨🇭 Ambizione Fellow (Present), Postdoc (2023)
- **ENS** 🇫🇷 PhD (2020), MSc (2016), BSc (2014)

## Selected Grants and Awards

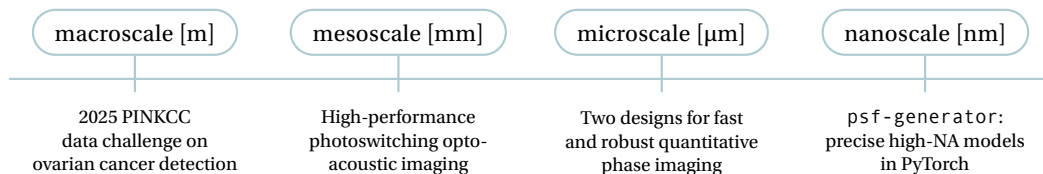
- **Ambizione Fellowship** TROPHI, 830k CHF (2023–2027)
- **EIC Pathfinder** SWOPT, 615k CHF (2021–2026)
- Silver medal at the **International Physics Olympiads** (2012)
- Bronze medal at the **International Math Olympiads** (2011)

## Selected Academic Activities

- **PhD supervisor** of Zhiyuan Hu (2024–Present)
- **PhD supervisor** of Dr. Yan Liu (2021–2026)
- **Lecturer** at EPFL for Bachelor (2022), Master (2026), and PhD (2024, 2025) classes
- **Organizer** of the PINKCC data challenges (2025, 2026), the EPFL Open Microscopy & AI workshop (2025), and "AI & Imaging/Physics" tracks at the Applied Machine Learning Days (2022, 2024, 2025)
- **Co-founder** of EPFL spin-off Segmeridian (2026)

## Research Highlights

- **40+ peer-reviewed publications** in NeurIPS, Nature Comm., Phys. Rev. X, IEEE SPM, etc.
- Review on the **phase retrieval equation**, connecting imaging modalities, algorithms, and machine learning (**JD** et al., *IEEE Signal Processing Magazine* 2023)



## Research Interests

- **Physics-based machine learning for inverse problems**  
Combine deep learning with physical models for interpretable computational imaging.
- **Phase imaging with reconstruction guarantees**  
Develop experimental designs, algorithms, and theory for robust phase retrieval.
- **Photon-efficient designs based on information theory**  
Apply Fisher Information Theory for efficient sensing in shot-noise-limited applications.
- **Automatic segmentation for biomedical imaging**  
Build complete imaging pipelines for biomedical applications such as ovarian cancer detection.

## Education

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<b>PhD</b> in Physics <i>École Normale Supérieure</i>	<i>Paris, France,</i> <i>2017—2020</i>
<b>Predoctoral year</b> in Innovation and Entrepreneurship <i>Université Paris Sciences et Lettres</i>	<i>Paris, France,</i> <i>2016—2017</i>
<b>MSc</b> in Physics <i>École Normale Supérieure</i>	<i>Paris, France,</i> <i>2014—2016</i>
<b>BSc</b> in Physics <i>École Normale Supérieure</i>	<i>Paris, France,</i> <i>2013—2014</i>

## Research Experience

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<b>Ambizione Fellow</b> <i>École Polytechnique Fédérale de Lausanne</i>	<i>Lausanne, Switzerland</i> <i>Nov 2023—Present</i>
<ul style="list-style-type: none"><li>◦ <i>Principal Investigator</i> in the Biomedical Imaging Group</li><li>◦ <i>PhD co-direction</i>: Zhiyuan Hu (2024—Present)</li><li>◦ <i>Research topics</i>:<ul style="list-style-type: none"><li>– Fast and robust phase microscopy</li><li>– Deep learning for radiology</li><li>– Robust uncertainty quantification</li></ul></li></ul>	
<b>Postdoctoral researcher</b> <i>École Polytechnique Fédérale de Lausanne</i>	<i>Lausanne, Switzerland</i> <i>Nov 2020—Oct 2023</i>
<ul style="list-style-type: none"><li>◦ <i>PhD co-direction</i>: Dr. Yan Liu (2021—2026)</li><li>◦ <i>Research topics</i>:<ul style="list-style-type: none"><li>– Phase retrieval review</li><li>– Physics-based neural networks and learning-based reconstruction</li><li>– Collaborations on many imaging modalities (opto-acoustic tomography, positron emission tomography, optical projection tomography, two-photon microscopy, iSCAT microscopy)</li></ul></li><li>◦ <i>Advisor</i>: Prof. Michael Unser</li></ul>	
<b>Graduate student</b> <i>École Normale Supérieure</i>	<i>Paris, France</i> <i>Oct 2017—Nov 2020</i>
<ul style="list-style-type: none"><li>◦ <i>Research topics</i>:<ul style="list-style-type: none"><li>– Imaging in complex media</li><li>– Optical computing</li></ul></li><li>◦ <i>Co-supervisors</i>: Prof. Sylvain Gigan and Prof. Florent Krzakala</li></ul>	
<b>Visiting student</b> <i>UC Berkeley</i>	<i>Berkeley, CA, USA</i> <i>Feb 2015—Aug 2015</i>

## Awards

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<b>International Physics Olympiads</b> <i>Silver medal</i> (2nd from French delegation)	<i>Tallinn, Estonia</i> <i>2012</i>
<b>International Math Olympiads</b> <i>Bronze medal</i> (2nd from French delegation)	<i>Amsterdam, Netherlands</i> <i>2011</i>
<b>Concours général de mathématiques</b> <i>2nd prize</i> (national math competition)	<i>Paris, France</i> <i>2011</i>
<b>French National Physics Olympiads</b> <i>1st prize</i> (team research project)	<i>Paris, France</i> <i>2011</i>
<b>Concours Kangourou</b> <i>National rank: 1st (2011), 3rd (2010), 3rd (2009)</i>	<i>Paris, France</i> <i>2009—2011</i>

## Grants and Funding

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<b>Ambizione Fellowship</b> , Swiss National Science Foundation <i>Individual grant for early-career researchers</i>	830k CHF 2023—2027
<b>PINKCC Data Challenge: 2nd Edition</b> <i>Automatic segmentation of pancreatic cancer, supported by the Health Data Hub and Scaleway</i> <i>Co-organized with: Stéphanie Nougaret (ICM Montpellier)</i>	300k CHF May 2026
<b>AI Project Support</b> , EPFL Startup Launchpad <i>Early-stage AI startup project</i> <i>Co-applicant: Pablo Garcia-Amorena (EPFL)</i>	50k CHF 2026
<b>EIC Pathfinder</b> , Horizon Europe <i>Collaborative grant with HMGU Munich, UMCG Groningen, UHC Cologne, FORTH Heraklion, SONAXIS, iThera (total amount, 3.3M CHF)</i> <i>Role: EPFL coordinator (grant review, scientific supervision, review meetings)</i>	615k CHF 2021—2026
<b>PINKCC Data Challenge: 1st Edition</b> <i>Automatic segmentation of ovarian cancer, with more than 250 participants, supported by GSK and Scaleway</i> <i>Co-organized with: Stéphanie Nougaret (ICM Montpellier)</i>	40k CHF June 2025
<b>EPFL Workshop on Open Microscopy &amp; AI</b> , ETH Domain <i>Open Research Data Program, 7th Contribute Call</i> <i>Co-organized with: Laurène Donati, Eric Bezzam (EPFL)</i>	30k CHF March 2025
<b>Applied Machine Learning Days</b> , EPFL <i>AI &amp; Imaging: Next Frontiers in Image Analysis track</i> <i>Co-organized with: Virginie Uhlmann (UZH), Laurène Donati, Mathieu Salzmann (EPFL)</i>	4k CHF February 2025
<b>Applied Machine Learning Days</b> , EPFL <i>AI &amp; Physics track</i> <i>Co-organized with: Bruno Loureiro (ENS Paris), Christian Keup (EPFL)</i>	4.5k CHF March 2024
<b>Applied Machine Learning Days</b> , EPFL <i>AI &amp; Physics track</i> <i>Co-organized with: Bruno Loureiro (ENS Paris), Vittorio Erba (EPFL)</i>	4.5k CHF March 2022
<b>INRIA Startup Studio</b> , INRIA <i>Matricis.ai startup project on AI for endometriosis. For a year, I took part in this project, which then became a 2024 iLab laureate (BPI France)</i> <i>Co-founders: Raphaëlle Taub, Elise Mekkaoui</i>	100k CHF 2022—2023

## Full list of publications

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### 2025

- [40] M. Zach, K. Shen, R. Cao, M. Unser, L. Waller, **JD**  
*Perturbative Fourier Ptychographic Microscopy for Fast Quantitative Phase Imaging*  
Optics Express
- [39] Y. Liu, V. Stergiopoulou, J. Chuah, E. Bezzam, G.-J. Both, M. Unser, D. Sage, **JD**  
*Revisiting PSF models: unifying framework and high-performance implementation*  
Journal of Microscopy
- [38] Z. Hu, J. Tachella, M. Unser, **JD**  
*Structured Random Model for Fast and Robust Phase Retrieval*  
IEEE ICASSP
- [37] G.A. D’Inverno, **JD**  
*Comparison of Reservoir Computing topologies using the Recurrent Kernel approach*  
Neurocomputing
- [36] Y. Liu, J. Chuah, A.C. Stiel, M. Unser, **JD**  
*Model-based temporal unmixing towards quantitative photo-switching optoacoustic tomography*

## Optics Letters

[35] M. Allain, S. Aslan, W. Coene, S. Dirksen, **JD**, J. Flamant, M. Iwen, F. Kraemer, T. van Leeuwen, *et al.*

*Phasebook: a survey of selected open problems in phase retrieval*  
Sampling Theory, Signal Processing, and Data Analysis

[34] S. H elage, C. Laponche, M. Homps, **JD**, L. Riv ere, F. Pr eaux, P.-A. Just, N. Aflak, J.-N. Buy, E. Dion  
*The H otel-Dieu MRI Classification of Uterosacral Ligament Involvement in Endometriosis: A Pictorial Guide to Clinical Use*

Diagnostics

## 2024

[33] Y. Liu, **JD**, J.A. Maya, F. Balzarotti, M. Unser

*Point-spread-function engineering in MINFLUX: optimality of donut and half-moon excitation patterns*  
Optics Letters

[32] S. Lin, Y. Wang, **JD**, S. Ni

*Detection and Positive Reconstruction of Cognitive Distortion sentences: Mandarin Dataset and Evaluation*  
Association of Computational Linguistics (Findings)

[31] A. Boquet-Pujadas, J. Saidi, M. Vicente, L. Paolozzi, **JD**, *et al.*

*A Silicon-Pixel Paradigm for PET*

IEEE Transactions on Radiation and Plasma Medical Sciences

[30] S. Zhao, B. Rauer, L. Valzania, **JD**, R. Liu, F. Li, S. Gigan, H.B. de Aguiar

*Single-pixel transmission matrix recovery via two-photon fluorescence*

Science Advances

## 2023

[29] **JD**, L. Valzania, A. Maillard, T. Pham, S. Gigan, M. Unser

*Phase retrieval: From computational imaging to machine learning*

IEEE Signal Processing Magazine

## 2022

[28] **JD**, E. B orve, M. Rafayelyan, M. Unser,

*Asymptotic Stability in Reservoir Computing*

IEEE International Joint Conference on Neural Networks

[27] Y. Liu, **JD**, T. Pham, F. Marelli, M. Unser

*Mechanical artifacts in optical projection tomography: classification and automatic calibration*

Optics Continuum

[26] A. d'Arco, F. Xia, A. Boniface, **JD**, S. Gigan

*Physics-based neural network for non-invasive control of coherent light in scattering media*

Optics Express

[25] Y. Liu, **JD**, C. Schmidt, A. Boquet-Pujadas, J. Extermann, M. Unser

*Artifacts in optical projection tomography due to refractive-index mismatch: model and correction*

Optics Letters

[24] P. Bohra, T. Pham, **JD**, M. Unser

*Bayesian inversion for nonlinear imaging models using deep generative priors*

IEEE Transactions on Computational Imaging

## 2021

[23] **JD**, D. Maestre, C. Conrad-Billroth, T. Juffmann

*Fundamental bounds on the precision of iSCAT, COBRI and dark-field microscopy for 3D localization and mass photometry*

Journal of Physics D: Applied Physics

[22] **JD**, L. Valzania, S. Gigan

*Accelerating ptychographic reconstructions using spectral initializations*

Optics Letters

## 2020

[21] **JD**, D. Bouchet, D. Maestre, T. Juffmann

*Fundamental bounds on the precision of classical phase microscopes*  
Physical Review Applied

[20] A. Boniface, **JD**, S. Gigan  
*Non-invasive focusing and imaging in scattering media with a fluorescence-based transmission matrix*  
Nature Communications

[19] **JD**  
*A computational tour on random matrices: imaging through complex media and optical computing*

[18] **JD**, R. Ohana, M. Rafayelyan, F. Krzakala  
*Reservoir Computing meets Recurrent Kernels and Structured Transforms*  
Advances in Neural Information Processing Systems, (**Oral, top 5.5%**)

[17] R. Ohana, J. Wacker, **JD**, S. Marmin, F. Krzakala, M. Filippone, L. Daudet  
*Kernel computations from large-scale random features obtained by optical processing units*  
IEEE ICASSP

[16] T. Wu, **JD**, S. Gigan  
*Non-invasive single-shot recovery of a point-spread function of a memory effect based scattering imaging system*  
Optics Letters

[15] M. Rafayelyan, **JD**, Y. Tan, F. Krzakala, S. Gigan  
*Large-scale optical reservoir computing for spatiotemporal chaotic systems prediction*  
Physical Review X

## 2019

[14] A. Boniface, B. Blochet, **JD**, S. Gigan  
*Noninvasive light focusing in scattering media using speckle variance optimization*  
Optica

[13] **JD**, M. Rafayelyan, F. Krzakala, S. Gigan  
*Optical reservoir computing using multiple light scattering for chaotic systems prediction*  
IEEE Journal of Selected Topics in Quantum Electronics

[12] **JD**, F. Krzakala, S. Gigan  
*Spectral method for multiplexed phase retrieval and application in optical imaging in complex media*  
IEEE ICASSP

[11] F. Soldevila, **JD**, E. Tajahuerce, S. Gigan, H.B. de Aguiar  
*Fast compressive Raman bio-imaging via matrix completion*  
Optica

## 2018

[10] **JD**, S. Gigan, F. Krzakala, G. Wainrib  
*Scaling up echo-state networks with multiple light scattering*  
IEEE Statistical Signal Processing Workshop

## 2017

[9] T. Wu, **JD**, Xiaopeng Shao, S. Gigan  
*Imaging through a thin scattering layer and jointly retrieving the point-spread-function using phase-diversity*  
Optics Express

## 2016

[8] A. Shanker, A. Wojdyla, G. Gunjala, **JD**, M. Benk, A. Neureuther, K. Goldberg, L. Waller  
*Off-axis aberration estimation in an EUV microscope using natural speckle*  
Imaging Science and Applications

## 2015

[7] L. Yeh, **JD**, J. Zhong, L. Tian, M. Chen, G. Tang, M. Soltanolkotabi, L. Waller  
*Experimental robustness of Fourier ptychography phase retrieval algorithms*  
Optics Express

## Preprints

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- [6] Y. Liu, J. Chuah, M. Unser, **JD**  
*A global inverse-problem approach to quantitative photo-switching optoacoustic mesoscopy*
- [5] Z. Hu, F. Mammadova, J. Tachella, M. Unser, **JD**  
*Structured Random Phase Retrieval using Optical Diffusers*
- [4] F. Hitzelhammer, **JD**, U. Hohenester, T. Juffmann  
*Fundamental Bounds for Off-Axis Illumination in Interferometric and Rotating Coherent Scattering Microscopy*
- [3] S. Ducotterd, Z. Hu, M. Unser, **JD**  
*Undersampled Phase Retrieval with Image Priors*
- [2] G.A. D’Inverno, Z. Hu, M. Unser, G. Rozza, **JD**  
*Revisiting Deep Information Propagation: Fractal Frontier and Finite-size Effects*
- [1] J. Tachella, M. Terris, S. Hurault, A. Wang, D. Chen, M.-H. Nguyen, M. Song, T. Davies, L. Davy, **JD**, et al.  
*Deepinverse: A python package for solving imaging inverse problems with deep learning*

## Mentoring

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- PhD supervisor of Zhiyuan Hu**, in co-supervision with Prof. Michael Unser 2024—Present  
*Harnessing randomness for single-shot quantitative phase imaging*
- PhD supervisor of Dr. Yan Liu**, in co-supervision with Prof. Michael Unser 2021—2026  
*Physics-based modeling and inverse problems in optical imaging*
- Supervision of 13 Master projects  
*4 published papers, 1 in preparation*

## Teaching

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- Lecturer** 2026  
*Master-level class with Prof. Dimitri Van de Ville and Michael Unser (EPFL), Image Processing*
- Lecturer** 2024—2025  
*Doctoral class with Prof. Manuel Guizar (EPFL), Physical Optics and Advanced Imaging*
- Lecturer** Fall 2022  
*Bachelor class with Prof. Michael Unser (EPFL), Signals and Systems*
- Teaching assistant** 2021—2024  
*Bachelor class with Prof. Michael Unser (EPFL), Signals and Systems*
- Teaching assistant** Fall 2018  
*Bachelor class at Université Paris 1 Panthéon-Sorbonne, Statistics*

## Selected Presentations

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- Focus on Microscopy (FOM) conference**, Taipei, Taiwan April 2025  
*Perturbative FPM for Fast Quantitative Phase Imaging*  
*Revisiting PSF models: theory and implementation*
- Mathematics and Image Analysis (MIA) conference**, Paris, France January 2025  
**Invited Speaker**  
*(Random) Phase Retrieval: Theory and Applications*
- Phase retrieval in mathematics and applications**, Leiden, Netherlands August 2024  
**Invited Speaker**  
*Open Questions on Structured Random Phase Retrieval*
- SPIE Photonics Europe**, Strasbourg, France April 2024  
*Fast quantitative phase imaging with an LED array microscope using a perturbative approach*
- Biomedical Photonics Network (BMPN)**, Bern, Switzerland December 2023  
*Phase Retrieval: from Computational Imaging to Machine Learning*
- Journées Imagerie Optique Non Conventiennelle**, Paris, France March 2023

## Invited Speaker

*Phase Retrieval: from Computational Imaging to Machine Learning*

**IEEE World Congress on Computational Intelligence**, Padua, Italy

July 2022

*Asymptotic Stability in Reservoir Computing*

**GDR Complexe**, Paris, France

December 2021

## Invited Speaker

*Double transmission matrix model for non-invasive focusing and imaging in scattering media*

**IEEE International Conference on Computational Photography (ICCP)**

May 2021

*Fluorescence-based transmission matrix for non-invasive imaging*

**Neural Information Processing Systems (NeurIPS)**

December 2020

**Oral Presentation (top 5.5%)**

*Reservoir Computing meets Recurrent Kernels and Structured Transforms*

**Optical Fiber Communications (OFC) Conference**, San Diego, CA, USA

March 2020

## Invited Speaker

*Multiple Light Scattering for Optical Computing*

**IEEE ICASSP**, Brighton, UK

May 2019

*Multiplexed Phase Retrieval: spectral method for complex media imaging*

**Photonics Europe**, Strasbourg, France

April 2018

*Scaling up Reservoir Computing with multiple light scattering*

## Other Professional Experience

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**Co-founder** of the startup Segmeridian

2026—Present

**Board member** of the startup Radiologs

2024—Present

**Consultant** at the startup LightOn

2017—2019

*IPO in November 2024*

**Reviewer** for scientific venues

- *Generalist*: Nature Communications, Science Advances
- *Computer Science*: NeurIPS, IEEE SPM, TNNLS, TCI, TMI, JSTQE, IJCNN, ISBI, ICASSP
- *Physics*: PRL, PRA, Optica, Optics Express, Optics Letters, Applied Optics, J. of Biophotonics

## Others

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### Violin

- *Diplôme d'Études Musicales*, semi-professional degree
- Orchestra tours in China, Bulgaria, Italy
- Orchestras in Paris, Lausanne

### Languages

- *French*: Native speaker
- *English*: Full professional proficiency
- *Chinese*: Intermediate level (HSK 4)
- *German*: Basic level (A2)

## References

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Michael Unser (EPFL), michael.unser@epfl.ch

Sylvain Gigan (LKB), sylvain.gigan@lkb.ens.fr

Florent Krzakala (EPFL), florent.krzakala@epfl.ch