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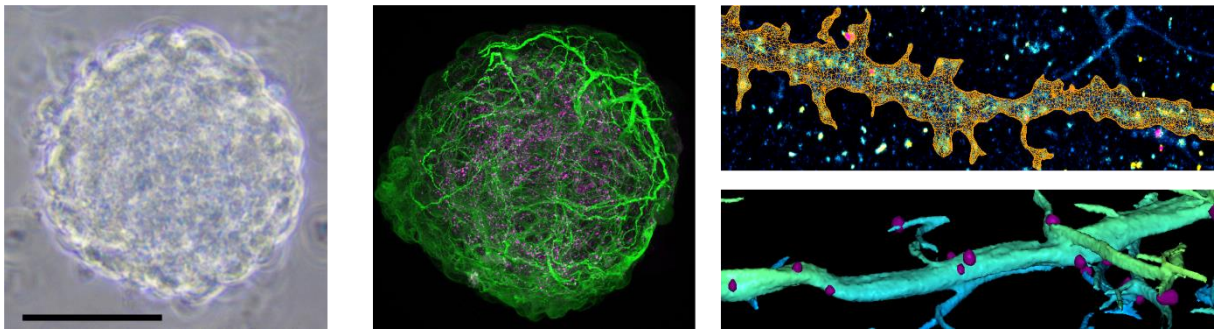
2 PhD positions available in Deep Learning, Image/Geometry Processing and Statistics at the Interdisciplinary Institute for Neuroscience (IINS, Bordeaux) and Imperial College London



Deciphering the functional architecture of neuronal proteins using 3D SMLM, artificial intelligence and robust statistics

Two fully funded PhD positions are available through the **Imperial-CNRS Joint PhD Programme** for an exciting interdisciplinary collaboration between **Imperial College London** and the **Interdisciplinary Institute of Neuroscience (IINS) in Bordeaux**. Through the use of 3D single-molecule localization microscopy (SMLM), deep-learning and statistics, this project aims to develop cutting-edge computational tools for analyzing 3D SMLM data to reveal the nanoscale topography and molecular organization of different scaffolding and adhesion proteins in axons and synapses, in the overall context of neurons formed in complex 3D cultures.

Supervised by Dr. Florian LEVET (Interdisciplinary Institute of Neuroscience, Bordeaux) and Dr. Ed COHEN (Department of Mathematics, Imperial College London), one student will be located in Bordeaux and the other in London.

To begin with, **both students** will be involved in the co-development of a novel Graph Neural Network architecture capable of segmenting dense, complex neuronal environments. This model will be specially designed to account for the stochastic blinking dynamics of photo-switching fluorophores, ensuring biologically meaningful segmentation.

The **IINS student**, supervised by Florian LEVET, will then focus on developing a high-throughput segmentation and mesh representation pipeline to process and analyze super-resolution microscopy data.

Meanwhile, the **Imperial student**, supervised by Ed COHEN, will be responsible for developing novel statistical methodology for exploring spatial dependencies between different protein types in complex 3D neuronal structures.

The project will culminate in applying these methodologies to experimentally acquired data in Bordeaux, bridging computational and statistical innovation with cutting-edge neurobiological research.

This is a unique opportunity for candidates with a background in computational biology (IINS student) or statistical methodology (Imperial student).

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Qualifications

IINS studentship

The candidates must:

- Have a MSc (Engineer) in computer science, bioinformatics, or a related field.
- And/or proven experience in developing bioimage analysis methods and/or tools.
- Knowledge and ability in one or more deep learning frameworks (Tensorflow, Keras, Torch, Caffe, etc.), preferably in Python, is required.
- Previous experience working with medical or biological images is preferred.

Imperial studentship

- Have a MSc in statistics, mathematics, or a related field.
- Proficient coding skills.
- Previous experience working with medical or biological images is preferred but not essential.

Nationality/Residency requirements

Imperial candidates must qualify for “Home” student status. This means they must be either: a UK national (meeting residency requirements); have settled status; have pre-settled status (meeting residency requirements); or have indefinite leave to remain or enter.

Scientific Environment

While located in Bordeaux or London and supervised by F. LEVET or E. COHEN, both students will be embedded in a strong collaborative setup with common tools, bi-monthly remote meetings and bi-annual physical meetings.

F. LEVET (IINS, Bordeaux) heads the computing activity of the Quantitative Imaging of the Cell (QIC) team and has an internationally recognized expertise in computer science applied to advanced microscopy, including computer graphics (point clouds, meshes, etc.), segmentation and software development [1-5]. Building on more than 15 years of experience, he recently released Point Cloud Analyst (PoCA) [2], a powerful open-source software designed to facilitate the manipulation and quantification of multicolour and multidimensional SMLM point cloud data.

E. COHEN, (Imperial College London) leads a team that develops state-of-the-art statistical machinery for the analysis of signals and images; working at the interface of mathematics, statistics, the natural sciences and engineering. He has championed the integration of rigorous statistical frameworks in bioimage analysis, advancing models for fluorophore photo-switching that enable precise molecular counting in dense environments and pioneering statistical methods for spatial analysis on complex structures and manifolds [3, 5-10].

This project represents a unique opportunity for the 2 PhD students to be part of an interdisciplinary CNRS-Imperial cohort and to advance the quantitative analysis of 3D SMLM data, with a clear objective of making all those methods available to life scientists.

Contact

Send your CV and motivation letter to florian.levet@u-bordeaux.fr and e.cohen@imperial.ac.uk

References

1. Galindo*, X., Barry*, T., Guyot, P., Rivière, C., Galland, R., **Levet, F**. (2024) 3D Nuclei Segmentation by Combining GAN Based Image Synthesis and Existing 3D Manual Annotations. In proceedings of Bioimaging 2024, **best paper award**.
2. **Levet, F**. & Sibarita, J.-B. PoCA: a software platform for point cloud data visualization and quantification. Nature Methods 2023 1–2 (2023).
3. Nieves, D.J., Pike, J.A., **Levet, F**., Williamson, D.J., Baragilly, M., Oloketuyi, S., de Marco, A., Griffié, J., Sage, D., **Cohen, E.A.K.**, Sibarita, J.-B., Heilemann, M. & Owen, D.M. A framework for evaluating the performance of SMLM cluster analysis algorithms. Nature Methods 2023 202 20, 259–267 (2023).

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4. **Levet, F.**, Tonnesen, J., Närgel, V., Sibarita, J.B. (2020) SpineJ: A software tool for quantitative analysis of nanoscale spine morphology. Methods.
5. **Levet, F.**, Julien, G., Galland, R., Butler, C., Beghin, A., Chazeau, A., Hoess, P., Ries, J., Giannone, G., Sibarita, JB. A tessellation-based colocalization analysis approach for single-molecule localization microscopy. Nature Communications, Article number: 2379 (2019).
6. S. Ward, **E. A. K. Cohen,** and N. M. Adams. Functional summary statistics and testing for independence in marked point patterns on the surface of three-dimensional convex shapes. Spatial Statistics, 2025.
7. M. A. Boland, J. P. E. Lightley, C. Dunsby, M. Q. Lin, S. Kumar, S. Flaxman, M. A. A. Neil, P. French and **E. A. K. Cohen**. Model-free machine learning-based 3D single molecule localisation microscopy. BioRxiv:2024/618179. 2024.
8. S. Kumar, P. Inns, S. Ward, V. Lagage, J. Wang, R. Kaminska, S. Uphoff, **E. A. K. Cohen**, G. Mamou and C. Kleanthous. Immobile lipopolysaccharides and outer membrane proteins differentially segregate in growing Escherichia coli. Proceedings of the National Academy of Sciences, 122 (10), 2025.
9. S.F. Mersmann, E. Johns, T. Young, W.A. McEwan, L.C. James, **E.A.K. Cohen***, and J.Grove*. A novel and robust method for counting components within bio-molecular complexes using fluorescence microscopy and statistical modelling. Scientific Reports, Vol. 12, 2022.
10. L. Patel, D. Williamson, D. Owen and **E.A.K. Cohen**. Blinking statistics and molecular counting in direct stochastic reconstruction microscopy. Bioinformatics, Vol. 37, 2021.
11. **E.A.K. Cohen**, A. V. Abraham, S. Ramakrishnan and R.J. Ober. Resolution limit of image analysis algorithms. Nature Communications, Vol. 10., Article Number 793, 2019.