



## COLAS DROIN

### Researcher and data scientist

- 📍 Route de la Pierre 5,  
1024 Ecublens – Switzerland
- ✉️ French (Permit C)
- ⌚ 29 years old
- ✉️ colas.droin@epfl.ch
- 📞 +41 76 651 83 05

### PROFILE

PhD graduate in computational biophysics, my main interests include mathematical modelling, numerical simulations, machine learning, web development, and data science in general.

I've recently trained myself in quantum computing (using Qiskit), and I'm currently studying quantum machine learning.

### EDUCATION

#### IBM Quantum Developer certification<sup>1</sup>

2022 (online)

#### PhD in computational biophysics

École Polytechnique Fédérale de Lausanne (EPFL)

2016 – 2020

#### MSc in computer science and physics of complex systems

École Normale Supérieure (ENS) de Lyon

2015 – 2016

#### MS in biomathematics and bioinformatics

Institut National des Sciences Appliquées (INSA) de Lyon

2013 – 2015

### EXPERIENCE

#### SCIENTIFIC PROGRAMMER

April 2021 – September 2022 | Neurodevelopmental Systems Bio Lab, EPFL

I developed a set of analysis/visualization tools in the form of a Python-Dash web-application<sup>2</sup>, to explore a large dataset (~300GB) as a multidimensional atlas of rodent lipid brain composition.

#### RESEARCHER (PHD AND POST-DOC)

September 2016 – October 2020 | Computational Systems Biology Lab, EPFL

I worked on multiple computational biophysics projects having for theme *Single-cell analysis of noisy biological oscillators and their interactions*<sup>3</sup>, and was awarded the **EPFL 8% PhD Thesis Distinction**<sup>4</sup>:

- I conceived and optimized a Hidden Markov Model to better understand the non-linear dynamics of the cell-cycle and the circadian clock.<sup>5</sup>
- I studied a dataset of spatiotemporal liver mRNA expression using mixed-effect models representing the Fourier harmonics of the system.
- I optimized a RNA velocity inference method based on differential geometry to quantify cell-cycle evolution from experimental data.<sup>7</sup>

I implemented all these analyses in Python, and ran them on the EPFL HPC platform (SCITAS) when needed. All the code is open-source.

#### MASTER THESES

Spring 2015 and 2016 | IXXI (Lyon) and Dassault Systems (Paris)

- ENS MSc THESIS (2016): Extraction and analysis of information cascades in a large network graph built from a Twitter dataset. (R, Python)
- INSA MS THESIS (2015): Study and development of a hybrid system (deterministic-stochastic) for the Chemical Master Equation. (C++, R)

### PUBLICATIONS

LBAE, a web application to explore mouse lipid brain composition, C. Droin, G. La Manno, G. D'angelo. BMC bioinformatics. 2022.<sup>8</sup>

Space-time logic of liver gene expression at sublobular scale, C. Droin, J. El Kholtei, K. B. Halpen, F. Naef, S. Itzkovitz, Nature Metabolism. 2020.<sup>9</sup>

Low-dimensional Dynamics of Two Coupled Biological Oscillators, C. Droin, E. Paquet, F. Naef, Nature Physics. 2019.<sup>10</sup>

Corticostriatal response selection in sentence production: Insights from neural network simulation with reservoir computing, Hinaut, X., Lance, F., Droin, C., Pointeau, G., & Dominey, P. F., Brain and language. 2015.<sup>11</sup>

### MAIN TALKS

RNA velocity-based inference of cell cycle, Physics of living systems, Physics of living systems, EPFL, Switzerland. 17/07/2020.

Understanding the space-time logic of the mammalian liver with mixed-models, SSS, EPFL, Switzerland. 12/12/2019.

Low-dimensional Dynamics of Two Coupled Biological Oscillators, Comp-SysBio, CNRS, Aussois, France. 03/04/2019.

A reconstruction of the phase dynamics of interacting cell-cycle and circadian clock, SSBSS, Cambridge, UK. 20/07/2017.

## AWARDS

- Amongst top cited paper of<sup>12</sup> Nature Metabolism (in 2021)
- EPFL Outstanding PhD Thesis Distinction, Top 8% (2020)<sup>4</sup>
- Organizers prize, LauzHack 5.0, Lausanne (2020)
- Best poster award, DDay, CHUV Lausanne (2019)
- Best poster award, EPFL Physics days (2018)

## COURSES

Relevant PhD courses taken:

- EE-559 Deep learning
- CS-433 Machine Learning (auditor)
- COM-480 Data viz (auditor)
- Better coding practices (Swiss Institute of Bioinformatics course)
- Open Science (summer school)
- BIO-692 Symmetry and Conservation in the Cell

## LANGUAGES

🇫🇷, 🇬🇧: fluent    🇪🇸: conversational

## SOCIAL

- [linkedin.com/in/colas-droin/](https://linkedin.com/in/colas-droin/)
- [github.com/ColasDroin](https://github.com/ColasDroin)
- [tinyurl.com/snhamxbhy](https://tinyurl.com/snhamxbhy) (scholar)
- [colasdriod.github.io](https://colasdriod.github.io) (portfolio)

## INTERESTS

Reading	Music	Science
Biking	Running	Writing
Cinema	Socializing	Travel

Check the online version of this CV at: [colasdriod.github.io/CV.html](https://colasdriod.github.io/CV.html)

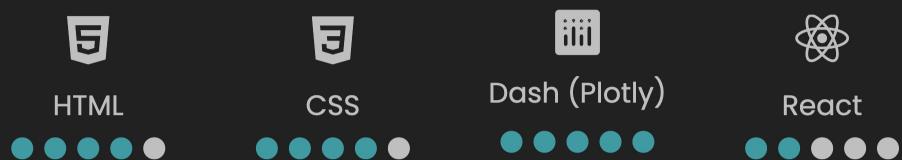
## DATA SCIENCE & PROGRAMMING SKILLS

**Summary:** My background involves a lot of statistical learning from data. I am an experienced Python developer (5y+), but also exposed to R (MS thesis), Matlab (as a TA), Julia (PhD) and C++ (MS thesis). I have used a broad spectrum of machine learning methods, and worked with large datasets.

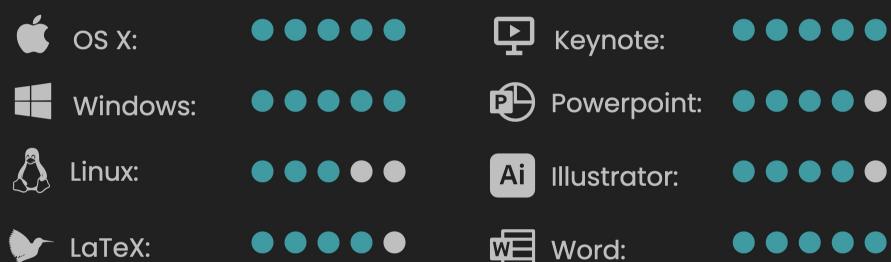
Relevant Python libraries I'm used to work with: Numpy, Scipy, Numba, Pandas, Matplotlib, Seaborn, Plotly, Dash, Scikit-learn, Pytorch, Statsmodels, ipywidgets.

I highly encourage you to check my portfolio<sup>13</sup> and my github<sup>14</sup>.

## WEB DEVELOPMENT SKILLS



## SOFTWARES



## TEACHING AND TUTORING

**Autumns 2017–2019 | Dynamical systems in biology<sup>15</sup>, EPFL:**  
As the head TA of this 3rd-year bachelor course, I was managing the exercises sessions. I rewrote the course old Matlab problems into interactive Jupyter notebooks. I participated to the conception and correction of homeworks.

**Spring 2017 | Probabilities and statistics II<sup>16</sup>, EPFL:**  
I was helping students with the exercises of this 2nd-year bachelor course.

**Autumn 2012 – Spring 2014 | General tutoring, INSA Passerelle Program:**  
I provided assistance to 1st-year bachelor students with learning disabilities.

## REFERENCES

<b>Felix Naef</b> Full professor +41 21 693 16 21 felix.naef@epfl.ch	<b>Gioele La Manno</b> ELISIR Scholar +41 21 693 84 46 gioele.lamanno@epfl.ch	<b>Giovanni D'Angelo</b> Assistant Professor +41 21 693 42 76 giovanni.dangelo@epfl.ch
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## LINKS

- 1: [tinyurl.com/f34tfvwp](https://tinyurl.com/f34tfvwp)
- 2: [tinyurl.com/f34tfvwp](https://tinyurl.com/f34tfvwp)
- 3: [tinyurl.com/f34tfvwp](https://tinyurl.com/f34tfvwp)
- 4: [tinyurl.com/y343w7eu](https://tinyurl.com/y343w7eu)
- 5: [tinyurl.com/f34tfvwp](https://tinyurl.com/f34tfvwp)
- 6: [tinyurl.com/f34tfvwp](https://tinyurl.com/f34tfvwp)
- 7: [tinyurl.com/f34tfvwp](https://tinyurl.com/f34tfvwp)
- 8: [tinyurl.com/y343w7eu](https://tinyurl.com/y343w7eu)
- 9: [tinyurl.com/4rupr436](https://tinyurl.com/4rupr436)
- 10: [tinyurl.com/ys72bez](https://tinyurl.com/ys72bez)
- 11: [tinyurl.com/5n8amsuz](https://tinyurl.com/5n8amsuz)
- 12: [tinyurl.com/2p8fbamy](https://tinyurl.com/2p8fbamy)
- 13: [colasdriod.github.io](https://colasdriod.github.io)
- 14: [tinyurl.com/yc6f28ha](https://tinyurl.com/yc6f28ha)
- 15: [tinyurl.com/2p8f9vh](https://tinyurl.com/2p8f9vh)
- 16: [tinyurl.com/4xp5b795](https://tinyurl.com/4xp5b795)