Victor **Boussange**

Engineer in Energy & Environmental Systems
Ph.D candidate in Environmental Sciences

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Zürich, Switzerland Born 1995 (age 27) | France Citizen

Education

October 2022 (expected) – September 2018

Ph.D in Environmental Sciences, Swiss Federal Institute for Forest, Snow and Landscape (WSL | Swiss Federal Institute of Technology Zurich, ETH), Switzerland

"*Forward and inverse modelling of eco-evolutionary processes*". Under the guidance of Prof. Dr. Loïc Pellissier.

computational biology | mathematical modeling | scientific machine learning | complex systems | complexity economics

June 2017 – September 2016

Full year academic exchange, University of New South Wales (UNSW Sydney), Australia

computational methods for finance | electrical energy | chemical reaction engineering

June 2017 – February 2017

Master thesis in theoretical geomechanics, UNSW Sydney | CSIRO, Australia

"*Numerical continuation and bifurcation analysis for unconventional geomechanics*". Under the guidance of Dr. Thomas Poulet.

theoretical geomechanics | numerical continuation | bifurcation analysis

August 2018 – September 2013

B.S./ M.S. in Energy and Environmental Engineering, Institut National Des Sciences Appliquées de Lyon (INSA Lyon), France

- Two-year undergraduate intensive course in mathematics and physics. Ranking : 21/650 students.
- Three-year undergraduate engineering course in Energy and Environmental Systems, focused on Advanced Energy Systems and Efficiency.

fluid mechanics | thermodynamics | electrical networks and optimisation | energy markets

Professional appointments

August 2018 – March 2018

R&D intern, Compagnie National du Rhône (CNR), France

Development of an Energy Management System based on various optimisation techniques for optimal production of renewable resources. Applications to EU sponsored projects :

- Jupiter1000 (power-to-gas)
- Move in pure (vehicle-to-grid)
- Marie-Galante island (micro-grid)

software development | mathematical optimisation | energy trading

Publications

Peer-reviewed

- **Boussange, V.** & Pellissier, L., *Eco-evolutionary model on spatial graphs reveals how habitat structure affects phenotypic differentiation*. Commun Biol 5, 668 (2022). [bioRxiv]

Preprints

- **Boussange, V.**, Vilimelis-Aceituno, P., Pellissier, L., *Mini-batching ecological data to improve ecosystem models with machine learning* [bioRxiv] (2022), 46 pages. In review.
- **Boussange, V.**, Becker, S., Jentzen, A., Kuckuck, B., Pellissier, L., *Deep learning approximations for non-local nonlinear PDEs with Neumann boundary conditions*. [arXiv] (2022), 59 pages. Revision requested from Partial Differential Equations and Applications.

Proceedings

- Poulet, T., Alevizos, S., Veveakis, M., **Boussange, V.**, Regenauer-Lieb, K., *Episodic mineralising fluid injection through chemical shear zones*, ASEG Extended Abstracts (2018), 5 pages.

In preparation

- **Boussange, V.**, Sornette, D., Lischke, H., Pellissier, L., *Quantifiying eco-evolutionary dynamics in economic system*.

Talks

July 2022	Speaker, **HighDimPDE.jl** *: A Julia package for solving high-dimensional PDEs*, JuliaCon2022, online. [video]
June 2022	Speaker, *Interpretable machine learning for forecasting dynamical processes in ecosystems*, World Biodiversity Forum, Davos, Switzerland.
June 2022	Invited speaker, *Investigating empirical patterns of biodiversity with mechanistic eco-evolutionary models*, Seminar at the Theoretical Ecology and Evolution group, Universität Bern.
November 2021	Invited speaker, *Numerical approximations of solutions of highly dimensional, non-local nonlinear PDEs*, StAMBio seminar, St Andrews, UK.
October 2021	Speaker, *Graph topology and habitat assortativity drive phenotypic differentiation in an eco-evolutionary model*, Conference on Complex Systems, Lyon, France.
October 2021	Speaker, *Using graph-based metrics to assess the effect of landscape topography on diversification*, ECBC, Amsterdam, Netherlands.
September 2021	Speaker, *Solving non-local nonlinear Partial Differential Equations in high dimensions with HighDimPDE.jl*, International Conference on Computational Methods in Systems Biology, Bordeaux, France.
April 2021	Speaker, *Responses of neutral and adaptive diversity to complex geographic population structure*, Mathematical Population Dynamics, Ecology and Evolution, CIRM Marseille, France.

Softwares

MiniBatchInference.jl 2022

github.com/vboussange/MiniBatchInference.jl documentation

A Julia package for maximum likelihood estimation and model selection of strongly nonlinear dynamical models.

Julia

HighDimPDE.jl 2021

github.com/vboussange/HighDimPDE.jl documentation

A Julia package that breaks down the curse of dimensionality in solving non local, non linear PDEs.

Julia

EvoId.jl 2019 - 2021

github.com/vboussange/EvoId.jl documentation

Evolutionary individual based modelling, mathematically grounded.

Julia

OptiVPP 2018

confidential

Energy Management System for Virtual Power Plants.

Python GAMS

Open Source contributions

SciML, DiffEqFlux.jl, CUDA.jl, Flux.jl, LightGraphs.jl.

</> Programming

Programming languages	**Julia**, **Python**, **C++**, Java, Matlab, R, Bash, VBA
Libraries	Flux.jl, DifferentialEquations.jl, DiffEqFlux.jl, CUDA.jl, LightGraphs.jl, TensorFlow, ArchGDAL, matplotlib

Teaching and Supervision

December 2020 – September 2020 — **701-3001-00L Environmental Systems Data Science, ETH Zürich, D-USYS, Switzerland**
Undergraduate course. In charge of the unit *Supervised Deep Learning - Application*.

June 2020 – April 2020 — **262-0100-00L Lab rotation, ETH Zürich, D-BSSE, Switzerland**
Supervision of Cecilia Valenzuela Agui in the frame of her MS in *Computational Biology and Bioinformatics* : *How Climatic Conditions shape Biodiveristy Patterns ?*

December 2020 – September 2020 — **Taste of research internship, Polytech Nice-Sophia, France**
Supervision of Nicolas Demolin for his research internship in the frame of his MS in *Applied Mathematics and Modeling* : *Dynamical modelling of the Product Space.*

Reviews

Journal of Open Source Software, Journal of Theoretical Biology

Languages

French ●●●●● English ●●●●●
Spanish ●●●○○ German ●●○○○

Hobbies

- Ski touring, ski mountaineering. **Major achievements** : Graubünden Haute Route, 6 days, group leader, 2021 | Hausstock 3158m, S ridge, 38° / D, 2021 | Stucklistock 3313m, S ridge, 40° / D, 2021.
- Alpinism. **Major achievements** : Spaghetti tour, 6 days, group leader, AD, 2021 | Mönch 4017m, Normal route, AD, 2020 | Piz Palü 3882m, traverse W-E from Rifugi dals Chamuotschs-Fortezza, PD 2c, 2020.
- Rock climbing, alpine climbing. **Major achievements** : Sewenstock 2820m, “Amarone”, 10 pitches, 7 pitches in 6a+, 2021 | Hannibalturm 2920m, “Conquest of Paradise”, 6 pitches, 6b, 2020 | Brüggler, “Sonntagweg”, 7 pitches, 6a+, 2020.
- Enduro mountainbiking, bikepacking. **Major achievements** : ”From the first to the last droplet of the Rhone river”, Furkapass to Marseille, 11 days, group leader, 2018-2020 | Tour du Mont Blanc, 5 days, group leader, 2019.
- Surfing.

References

Prof. Dr. Loïc Pellissier
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Prof. Dr. Arnulf Jentzen
, University of Münster
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Dr. Thomas Poulet
Deep Earth Imaging, CSIRO
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