Vincent Thibeault

Dynamica Reseach Group

Université Laval

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Personal website

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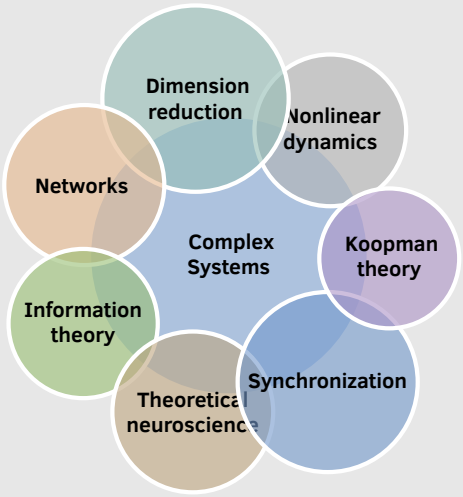
VinceThi

Google scholar

ResearchGate

Overview

Research fields



Programming & Visual Tools

- Python
- Mathematica
- Matlab
- Inkscape

Languages

- French (*Native*)
- English (*Advanced*)
- Spanish (*Intermediate*)

Education

2021 - now — **Ph.D., Physics** — Université Laval
Supervisors: Patrick Desrosiers and Antoine Allard

2017 - 2020 — **M.Sc., Physics** — Université Laval
Supervisors: Patrick Desrosiers and Louis J. Dubé
Board of Honor of the Faculty of Graduate and Postdoctoral Studies

2014 - 2017 — **B.Sc., Physics** — Université Laval

Affiliations

2015 - now — **Physics department** — Université Laval

2017 - now — **CIMMUL** (**Interdisciplinary Center for Math. Modeling**)

2021 - now — **UNIQUE** (**Unifying Neuroscience and Artificial Intelligence**)

2017 - 2023 — **Sentinelle Nord**

Work experience

2017 - 2022 — **Graduate Teaching Assistant in Physics** — Université Laval

- **Role**: Classroom problem solving, corrector and helper in different courses of physics.
- **Courses**: Nonlinear dynamics, Chaos and Complexity (2019, 2022), Statistical Physics (2019-2021), Mathematical Physics I (2017, 2018)

2019 — **Institutional data and network visualization analyst** — Université Laval

- **Role**: Analyze and visualize collaborator networks for the "Institut Nordique du Québec".
- **Tools**: Python (networkX, pandas, ...), D3.js
- **Colleague**: Edward Laurence

2016 — **Undergraduate Research Assistant in Neuroscience** — CERVO

- **Role**: Creation of a spatial CA3 neuron model with evoked and spontaneous neurotransmission
- **Keywords**: Hodgkin-Huxley model, miniature, calcium dynamics
- **Tools**: Python, NEURON, ModelDB
- **Supervisor**: Patrick Desrosiers, Simon Hardy

2015 - 2016 — **Undergraduate Tutor in Mathematical Physics** — Université Laval

- **Role**: Help undergraduate students in the first three courses of mathematical physics
- **Content** From mathematical logic to orthogonal polynomials

2015 - 2016 — **Undergraduate Research Assistant in Attosecond Physics** — COPL

- **Role**: Molecular tomography data analysis and construction of an ion detector
- **Keywords**: Attosecond physics, electronic recollision, FFT
- **Tools**: Matlab, Labview
- **Supervisor**: Julien Beaudoin-Bertrand

Scientific contribution

Refereed Publications

V. Thibeault, A. Allard, P. Desrosiers, "The low-rank hypothesis of complex systems", Nat. Phys., **20**, 294 (2024).

- ⋆ Featured in Nature Physics' News & Views.
- ⋆ Cover page of Nature Physics.

C. Murphy, *V. Thibeault*, A. Allard, P. Desrosiers, "Duality between predictability and reconstructability in complex systems", Nat. Commun., **15**, 4478 (2024).

M. Vegué, *V. Thibeault*, P. Desrosiers, A. Allard, "Dimension reduction of dynamics on modular and heterogeneous directed networks", *PNAS Nexus*, **2**, pgad150 (2023).

G. St-Onge, *V. Thibeault*, A. Allard, L. J. Dubé, and L. Hébert-Dufresne, "Social confinement and mesoscopic localization of epidemics on networks", *Phys. Rev. Lett.*, **126**, 098301 (2021).

G. St-Onge, *V. Thibeault*, A. Allard, L. J. Dubé, and L. Hébert-Dufresne, "Master equation analysis of mesoscopic localization in contagion dynamics on higher-order networks", *Phys. Rev. E*, **103**, 032301 (2021).

V. Thibeault, G. St-Onge, L. J. Dubé, and P. Desrosiers, "Threefold way to the dimension reduction of dynamics on networks: An application to synchronization", *Phys. Rev. Research*, **2**, 043215 (2020).

Preprints

V. Thibeault, B. Claveau, A. Allard, P. Desrosiers, "Kuramoto meets Kooman: Constants of motion, symmetries and network motifs", arXiv, (2025).

C. Murphy, S. Lizotte, F. Thibault, *V. Thibeault*, P. Desrosiers, A. Allard, "On the reconstructability of complex networks from dynamics", arXiv (2025).

E. Laurence, C. Murphy, G. St-Onge, X. Roy-Pomerleau, and *V. Thibeault*, "Detecting structural perturbations from time series with deep learning", arXiv (2020).

Invited seminars

V. Thibeault, Title to be determined, Santa Fe Institute, Santa Fe, New-Mexico (USA), 12/01/2026.

V. Thibeault, "The low-rank hypothesis of complex systems", Northwestern University, Chicago, Illinois (USA), 05/06/2025.

V. Thibeault, "The low-rank hypothesis of complex systems", University of Oxford Mathematical Institute, Oxford, England, 20/02/2024.

V. Thibeault, "The low-rank hypothesis of complex systems", Network Science Institute, Boston, Massachusetts (USA), 31/01/2024.

V. Thibeault, "The low-rank hypothesis of complex systems", Centre Interdisciplinaire de Modélisation Mathématique de l'Université Laval (CIMMUL), Québec, Québec (Canada), 19/04/2024.

Invited talks

V. Thibeault, "On the dimensionality of dynamics on complex networks: from exact reductions to approximate ones", SIAM Conference on Uncertainty Quantification, Minneapolis, Minnesota (USA), 03/2026.

V. Thibeault, "Kuramoto meets Koopman: Constants of motion, symmetries, and network motifs", Northwestern University, Chicago, Illinois (USA), 06/06/2025.

Contributed talks

V. Thibeault, "Koopman's approach to partial integration of the Kuramoto-Sakaguchi model on heterogeneous graphs", SIAM Conference on Applications of Dynamical Systems, Denver, Colorado (USA), 13/05/2025

V. Thibeault, "Low-rank nature of connectomes and reducibility of recurrent neural networks", Montreal AI and Neuroscience (MAIN), Montreal, Québec (Canada), 23/10/2024.

V. Thibeault, "Revisiting the Kuramoto model on graph: integrals of motion, motifs, and symmetries", 19th International School and Conference on Network Science (NetSci), Québec, Québec (Canada), 20/06/2024.

V. Thibeault, "The Low-Rank Hypothesis of Complex Systems – From Empirical and Theoretical Evidence to the Emergence of Higher-Order Interaction", SIAM Applications in Dynamical Systems, Portland, Oregon (USA), 2023.

V. Thibeault, "The low-dimension hypothesis implies higher-order interactions in complex systems", Fourth Northeast Regional Conference on Complex Systems (NERCCS), Buffalo, New York (USA), 2022.

V. Thibeault, "Dimension reduction of high-dimensional dynamics on networks with adaptation", Networks: A Joint Sunbelt and Netsci Conference, Bloomington, Indiana (USA), 2021.

V. Thibeault, "Dimension reduction of high-dimensional dynamics on networks with adaptation", SIAM Applications in Dynamical Systems, Portland, Oregon (USA), 2021.

V. Thibeault, "Dimension reduction of high-dimensional dynamics on networks with adaptation", Fourth Northeast Regional Conference on Complex Systems (NERCCS), Buffalo, New York (USA), 2021.

V. Thibeault, "Réduire la dimension des systèmes complexes: un regard sur l'émergence de la synchronisation", Centre Interdisciplinaire de Modélisation Mathématique de l'Université Laval, Québec, Québec (Canada), 2020.

V. Thibeault, B. Klein, B. Case, and F. Normand, "Network analysis of collective motion", Complex Networks Winter Workshop (CNWW), Québec, Québec (Canada), 2019.

V. Thibeault, "Predicting synchronization regimes with spectral dimension reduction on graphs", 14th International School and Conference on Network Science (NetSci), Burlington, Vermont (United States), 2019.

V. Thibeault, "Predicting synchronization regimes with reduced dimensional dynamics on modular graphs", Mediterranean School of Complex Networks (MSCx), Salina, Sicily (Italie), 2018.

Thesis

V. Thibeault, "Réduire la dimension des systèmes complexes: un regard sur l'émergence de la synchronisation", Master's thesis, Université Laval (2020).

Posters

B. Claveau, *V. Thibeault*, A. Allard, P. Desrosiers, "Deciphering large-scale dynamics in complex systems through Koopman operator theory", Réunion annuelle Sentinelle Nord, Québec, Québec (Canada), 2025.

V. Thibeault, G. St-Onge, L.J. Dubé and P. Desrosiers, "Threefold way to the dimension reduction of dynamics on networks: an application to synchronization", 15th International School and Conference on Network Science (NetSci), Rome (Italy), 2020.

V. Thibeault, X. Roy-Pomerleau, G. St-Onge, J-G. Young, and P. Desrosiers, "Synchronization dynamics on the stochastic block model", Réunion annuelle Sentinelle Nord, Québec, Québec (Canada), 2018.

V. Thibeault, X. Roy-Pomerleau, G. St-Onge, J-G. Young, L.J. Dubé and P. Desrosiers, "Synchronization dynamics on the stochastic block model", 13th International School and Conference on Network Science (NetSci), Paris (France), 2018.

J. Poirier, N. Fabre, L. Prévost, A. Pappathomas, P. Lamarche, X. Roy-Pomerleau, *V. Thibeault*, J. Beaudoin-Bertrand, "Generation, detection and usage of attosecond pulses", 5th International Conference on attosecond physics (ATTO), Ottawa, Ontario (Canada), 2015.

Research impact and outreach

News coverage

J. Gao, "Intrinsic simplicity of complex systems", Nat. Phys. News & Views, 2024.

T. Gururaj, "Validating the low-rank hypothesis in complex systems", Phys.org, 2024.

M. De Domenico, "Complexity Thoughts: Issue #25, 2024.

D. Mackanzie, "How large a gathering is too large during the coronavirus pandemic?", ScienceNews, 2020.

T. Pueyo, "Coronavirus: Prevent Seeding and Spreading", Medium, 2020.

Popular science article

G. St-Onge, *V. Thibeault*, A. Allard, L.J. Dubé, L. Hébert-Dufresne, "COVID-19: Cancel your next large event, and tell your friends to cancel theirs", Medium, 2020.

Academic service

Student supervision

Benjamin Claveau, Physics Student, 2023-now

Pierre-Luc Larouche, Physics Student, Summer 2021

Peer-review activities

Articles in Nature Physics, Physical Review Letters, Nature Communications, Physical Review E, and Journal of Physics: Complexity have been reviewed.

Applications for the International School and Conference on Network Science (NetSci) in 2024, 2025, 2026.

Other activities

Presided the session Data and Koopman Analysis at SIAM Dynamical Systems, 2025.

Awards

2025 **Louis-Berlinguet Rising Star Award for "The low-rank hypothesis of complex systems"**
Fonds de recherche Nature et technologies (FRQNT)
1500$

2024 **Nature Physics' Cover Feature**
Springer Nature

2023 **Academic Achievement Scholarship**
Faculty of Graduate and Postdoctoral Studies, Université Laval
1000$

2021 **Desjardins Excellence Scholarship**
Caisses Desjardins
2000$

2021 **Publication Award for "Threefold way to the dimension reduction of dynamics on networks: an application to synchronization"**
CIMMUL
500$

2019 - 2025 **Graduate Research Award**
Fonds de recherche Nature et technologies (FRQNT)
114 667$

2020 **Master's Thesis on the Board of Honor**
Faculty of Graduate and Postdoctoral Studies, Université Laval

2018 - 2019 **Graduate Research Award**
Bourse d'études supérieures du Canada Alexander-Graham-Bell
17 500$/year

2017 - 2018 **Graduate Research Award**
Fonds de recherche Nature et technologies (FRQNT)
15 000$/year

2016 **Baseball Scholarship**
Ligue de baseball junior élite du Québec
500$

2015-2016 **Undergraduate Research Award in Physics and Bioinformatics**
Faculté des sciences et de génie de l'Université Laval
8 000$

Volunteering and Involvement

2021 - now **Founder of a philosophy discussion group** Université Laval
In the group *PEPN*, we talk about Montaigne, Camus, Plutarque, Orwell, Nietzsche, Marcus Aurelius, Alain, Pascal, Cioran, Hesse, etc.

2016 - 2020 **Co-founder of a mathematical circle for physicists** Université Laval
In the mathematical circle *Nicole Bourbaki*, we talk about logic, combinatorics, graphs, geometry, etc.

2018 **Sustainable development** Université Laval
Member of a group promoting the reduction of red meat consumption in the cafeterias of the university.

2014 - 2021 **Photonic Games** Université Laval
Promotion of physics for high school students through optics games.

2015 **Welcome Day of Physics** Université Laval

2014 **Tutor in Integral Calculus** Cégep Sainte-Foy

2007 - 2012 **High school socio-environmental involvement** Neufchâtel High School
Local river cleaning, clothing donation program supporting families in Congo, etc.