

# Antoine Allard

## Curriculum Vitæ

Assistant Professor  
Département de physique, de génie physique et d'optique  
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Université Laval  
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## ACADEMIC POSITIONS

**Université Laval** Québec, Canada  
Associate Professor June 2023

- ★ Sentinelle Nord Research Chair on Applications and Theory of Network Analysis
- Codirector of the [Dynamica Research Lab](#) on the structure and the dynamics of complex systems
- Board member of the [Centre Interdisciplinaire en Modélisation Mathématique de l'Université Laval \(CIMMUL\)](#)

**Université Laval** Québec, Canada  
Assistant Professor 2018–present

- ★ Sentinelle Nord Research Chair on Applications and Theory of Network Analysis
- Codirector of the [Dynamica Research Lab](#) on the structure and the dynamics of complex systems
- Board member of the [Centre Interdisciplinaire en Modélisation Mathématique de l'Université Laval \(CIMMUL\)](#)

**University of Vermont** Burlington, USA  
External faculty at the [Vermont Complex Systems Center](#) 2021–present

**Universitat de Barcelona** Barcelona, Spain  
Postdoctoral Fellow 2018

- ★ Awarded the Juan de la Cierva – Incorporación postdoctoral fellowship

**Centre de Recerca Matemàtica** Bellaterra, Spain  
Senior Research Fellow 2017

**Universitat de Barcelona** Barcelona, Spain  
Postdoctoral Fellow 2014–2016

- ★ Awarded the Fonds de recherche du Québec – Nature et Technologies postdoctoral fellowship

## EDUCATION

**Université Laval** Québec, Canada  
Ph.D. in Physics 2009–2014

- Thesis Title: *Percolation sur graphes aléatoires: Modélisation et description analytique*<sup>1</sup>
- ★ Awarded the CIHR Frederick Banting and Charles Best Canada Graduate Scholarship
- ★ Thesis added to the Board of Honour for receiving the highest overall mark

**Santa Fe Institute** Santa Fe, NM, USA  
Complex Systems Summer School 2011

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<sup>1</sup>Percolation on random graphs: Modelling and analytical description

## Université Laval

M.Sc. in Physics

Québec, Canada

2006–2008

- Thesis Title: *Modélisation Mathématique en Épidémiologie par Réseaux de Contacts: Introduction de l'Hétérogénéité dans la Transmissibilité*<sup>2</sup>

★ Thesis added to the Board of Honour for receiving the highest overall mark

## Université Laval

B.Sc. in Physics (Theoretical Physics option)

Québec, Canada

2003–2006

- ★ Rouge et Or Distinction for excellence in academic undergraduate results
- ★ Nominated 2003 AESGUL Prize for “Student of the year” (chosen by the peers)

## FUNDING AND AWARDS

### Funding

- Fonds d'accélération des collaborations en santé (co-I), *Consortium québécois sur la découverte du médicament*, 2021–2024 (15.32M\$)
- Alliance Grant (co-I), *Natural Sciences and Engineering Research Council of Canada*, 2021–2026 (481k\$)
- Sentinel North Research Project (co-I), *Canada First Research Excellence Fund*, 2020–2023 (750k\$)
- Discovery Grant (PI), *Natural Sciences and Engineering Research Council of Canada*, 2019–2024 (157k\$)
- Sentinelle Nord Research Chair (PI), *Canada First Research Excellence Fund*, 2018–2023 (500k\$)
- Juan de la Cierva – Incorporación (postdoctoral fellowship), *Ministerio de Economía, Industria y Competitividad de España*, 2017–2019
- Postdoctoral Fellowship, *Fonds de recherche du Québec – Nature et Technologies*, 2014–2016
- Frederick Banting and Charles Best Canada Graduate Scholarships - Doctoral Awards, *Canadian Institutes of Health Research*, 2009–2012
- Doctoral Research Scholarship, *Fonds de recherche du Québec – Nature et Technologies*, 2008 (declined)
- Doctoral Research Scholarship, *Fondation de l'Université Laval*, 2008 (declined)
- Undergraduate Student Research Award, *Natural Sciences and Engineering Research Council of Canada*, 2006
- Undergraduate Student Research Award, *Natural Sciences and Engineering Research Council of Canada*, 2005

### Awards

- 2022 Star Teacher Prize (based on students evaluation)
- Nominated 2022 AESGUL Prize for “Teacher of the year” (elected by the undergraduate students)
- 2021 ADEPUL Prize for “Teacher of the year” (elected by the undergraduate students)
- 2020 ADEPUL Prize for “Teacher of the year” (elected by the undergraduate students)
- Nominated 2020 AESGUL Prize for “Teacher of the year” (elected by the undergraduate students)
- 2019 Star Teacher Prize (based on students evaluation)
- 2019 ADEPUL Prize for “Teacher of the year” (elected by the undergraduate students)
- 2019 AESGUL Prize for “Teacher of the year” (elected by the undergraduate students)
- Board of Honour for a Ph.D.'s Thesis (highest distinction), Faculty of Graduate Studies, Université Laval, 2014
- Nominated 2013 AESGUL Prize for “Staff member of the year” as the Teaching Assistant of PHY-3000 Statistical Physics (elected by the undergraduate students), 2014
- Board of Honour for a Master's Thesis (highest distinction), Faculty of Graduate Studies, Université Laval, 2009
- Third Place at the Student Competition (Poster Presentation), Congress of the Canadian Association of Physicists, Quebec City, 2008
- 2006 AESGUL Prize for “Staff member of the year” as the Teaching Assistant of PHY-1002 Mathematical Physics II (elected by the undergraduate students), 2007
- Rouge et Or Distinction for excellence in academic undergraduate results, 2006
- Nominated 2003 AESGUL Prize for “Student of the year” (chosen by the peers), 2004

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<sup>2</sup>Mathematical modelling in contact networks for epidemiology: Introduction of heterogeneity in transmissibility.

## TEACHING

### Université Laval

Québec, Canada

#### Teacher

- PHY-7053 Theory of Complex Systems and Networks 2020–2022
- PHY-3500 Computational Physics 2020, 2023
- PHY-2502 Nonlinear Dynamics, Chaos and Complexity 2019, 2022
- PHY-7008 Deep Learning: Theory and applications 2019
- PHY-3000 Statistical Physics 2018–2022
- ★ Awarded the Star Teacher prize (based on students evaluation) 2019, 2022
- ★ Awarded the AESGUL prize for “Teacher of the year” (elected by the undergraduate students) 2019
- ★ Awarded the ADEPUL prize for “Teacher of the year” (elected by the undergraduate students) 2019, 2020, 2021
- ★ Nominated for the AESGUL prize for “Teacher of the year” (elected by the undergraduate students), 2020, 2022

## MENTORING<sup>3</sup>

### Postdoctoral researchers

- Azénor Bideault<sup>‡</sup>, *Université Laval*, 2022–present
- Ilhem Bouderbala, *Université Laval*, 2020–2022
- Chantal Hutchison, *Université Laval*, 2020
- Marina Vegué Llorente, *Université Laval*, 2020–2022

### Ph.D. students

- Simon Lizotte, *Université Laval*, 2022–present
- Charles Murphy, *Université Laval*, 2018–present
- Zahra Yazdani Najafabadi<sup>‡</sup>, *Université Laval*, 2022–present
- François Thibault, *Université Laval*, 2022–present
- Vincent Thibeault, *Université Laval*, 2020–present
- Guillaume St-Onge, *Université Laval*, 2020–2022 

### M.Sc. students

- Heikel Jarras<sup>‡</sup>, *Université Laval*, 2021–present
- Jérémie Lesage, *Université Laval*, 2022–present
- Simon Lizotte, *Université Laval*, 2020–2022 
- Olivier Ribordy, *Université Laval*, 2020–2022
- François Thibault, *Université Laval*, 2020–2022
- Béatrice Désy, *Université Laval*, 2019–2022
- Francis Normand<sup>‡</sup>, *Université Laval*, 2019–2022 
- Charles Murphy<sup>‡</sup>, *Université Laval*, 2016–2017 

### B.Sc. interns

- Olivier Lapointe-Gagné, *Université Laval*, Summer 2021
- Pierre-Luc Larouche, *Université Laval*, Summer 2021
- Jérémie Lesage, *Université Laval*, Summer 2021
- Bastian Raulier, *Université Laval*, Summer-Fall 2020
- Olivier Ribordy, *Université Laval*, Summer 2019
- François Thibault, *Université Laval*, Summer 2019

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<sup>3</sup>Acting/acted as co-advisor denoted by <sup>‡</sup>.

## Bachelor's thesis

- Émile Baril, *Université Laval*, 2022–present
- Simon Lizotte, *Université Laval*, 2020
- François Thibault, *Université Laval*, 2020
- Marta Cavero Lázaro<sup>‡</sup>, *Universitat Autònoma de Barcelona*, 2018

## ORGANIZING ACTIVITIES

### Complex Networks Winter Workshop (CNWW)

Codirector

Québec, Canada

January 2021

- In collaboration with [Sentinelle Nord](#) and the [Vermont Complex Systems Center](#)

### Complex Networks Winter Workshop (CNWW)

Codirector

Québec, Canada

December 2019

- In collaboration with [Sentinelle Nord](#) and the [Vermont Complex Systems Center](#)

### International School and Conference on Network Science (NetSci 2019)

School, Poster Session, and Satellite Co-chair

Burlington VT, USA

May 2019

- Organized by the [Vermont Complex Systems Center](#)

### Complex Networks Winter Workshop (CNWW)

Codirector

Québec, Canada

December 2018

- In collaboration with [Sentinelle Nord](#), the [Vermont Complex Systems Center](#) and the [Network Science Institute](#)

### Contagion & Networks (ContNet2018)

Co-organizer

Paris, France

June 2018

- Satellite symposium of the International School and Conference on Network Science (NetSci 2018)
- In collaboration with B. M. Althouse, L. Hébert-Dufresne and S. V. Scarpino

### Contagion & Networks (ContNet2017)

Co-organizer

Indianapolis IN, USA

June 2017

- Satellite symposium of the International School and Conference on Network Science (NetSci 2017)
- In collaboration with B. M. Althouse, L. Hébert-Dufresne and S. V. Scarpino

## REVIEWING ACTIVITIES

### Grant review

- OPUS Grants, *National Science Center, Poland*, 2020
- Discovery Grants, *Natural Sciences and Engineering Research Council of Canada*, 2020

### Program committee

- French Regional Conference on Complex Systems (FRCCS) 2021, 2023
- Complex Data Blocks: Data Science and Complexity on the Blockchain (CDB 2022)
- International Conference on Complex Networks and their Applications (Complex Networks) 2016–2019, 2021, 2022
- Conference on Complex Systems (CCS 2022)
- International School and Conference on Network Science (NetSci) 2018–2020, 2022
- International Conference on Complex Networks (CompleNet) 2020, 2021
- 10th Conference on Network Modeling and Analysis (MARAMI 2019)
- Mapping Complexity: Foundations and Applications of Network Geometry workshop (MACFANG-17)

### Thesis jury

- Boris Gbeasor (Master's thesis, *Université Laval*, 2022)
- Geneviève Boudreau (Master's thesis, *Université Laval*, 2022)

- Marianne Gratton (Master's thesis, *Université Laval*, 2022)
- Xavier Roy-Pomerleau (Master's thesis, *Université Laval*, 2020)
- Vincent Thibeault (Master's thesis, *Université Laval*, 2020)
- Charles Joachim-Paquet (Master's thesis, *Université Laval*, 2020)
- Edward Laurence (PhD thesis, *Université Laval*, 2020)
- Guillaume St-Onge (PhD exam, *Université Laval*, 2019)
- Edward Laurence (PhD seminar, *Université Laval*, 2018)
- Edward Laurence (PhD exam, *Université Laval*, 2017)
- Jaume Palmer Real (Master's thesis, *Universitat Autònoma de Barcelona*, 2017)

## Scholarships

- Byron-T. Darling graduate scholarship, *Université Laval*, 2020
- Larkin Kerwin undergraduate scholarship, *Université Laval*, 2019

## Scientific journals

Applied Network Science, Bioinformatics, BMC Medicine, Communications Physics, Discrete Dynamics in Nature and Society, Europhysics Letters, IEEE's Transactions on Network Science and Engineering, Nature Communications, Network Neuroscience, Physica A, Physical Review E, Physical Review Letters, Physical Review Research, Physical Review X, PLOS Computational Biology, PLOS ONE, PNAS, Science Advances, Scientific Reports

## COMMUNITY SERVICES AND ADMINISTRATIVE ACTIVITIES

Centre Interdisciplinaire en Modélisation Mathématique ( <a href="#">CIMMUL</a> ) Board member	Université Laval 2020–present
Reconditioning of the research facilities in the Alexandre-Vachon building Consulting committee member	Université Laval 2020

## PUBLICATIONS AND PRESENTATIONS

### Submitted manuscripts and preprints<sup>4,5</sup>

- *Dimension matters when modeling network communities in hyperbolic spaces*, B. Déry, P. Desrosiers and **A. Allard**, [arXiv:2209.09201](#)
- *NBS-SNI, an extension of the Network-based statistic: Investigating differences in functional connections between important structural actors in case-control studies*, F. Normand, D. C. Côté and **A. Allard**, [bioRxiv](#)
- *Long-term effect of forest harvesting on boreal species assemblages under climate change*, I. Bouderbala, G. Labadie, J.-M. Leblanc, J. A. Tremblay, Y. Boulanger, C. Hébert, P. Desrosiers, **A. Allard** and D. Fortin, [bioRxiv](#)
- *Hypergraph reconstruction from noisy pairwise observations*, S. Lizotte, J.-G. Young and **A. Allard**, [arXiv:2208.06503](#)
- *The low-rank hypothesis of complex systems*, V. Thibeault, **A. Allard** and P. Desrosiers, [arXiv:2208.04848](#)
- *Dimension reduction of dynamics on modular and heterogeneous directed networks*, M. Vegué, V. Thibeault, P. Desrosiers and **A. Allard**, [arXiv:2206.11230](#)
- *Duality between predictability and reconstructability in complex systems*, C. Murphy, V. Thibeault, **A. Allard** and P. Desrosiers, [arXiv:2206.04000](#)
- *Network Onion Divergence: Network representation and comparison using nested configuration models with fixed connectivity, correlation and centrality patterns*, L. Hébert-Dufresne, J.G. Young, A. Daniels and **A. Allard**, [arXiv:2204.08444](#)
- *Hierarchical team structure and multidimensional localization (or siloing) on networks*, L. Hébert-Dufresne, G. St-Onge, J. Meluso, J. P. Bagrow and **A. Allard**, [arXiv:2203.00745](#)
- *Effects of global change on animal biodiversity in boreal forest landscape: an assemblage dissimilarity analysis*, I. Bouderbala,

<sup>4</sup>Students or postdoctoral researchers who worked under my supervision are underlined.

<sup>5</sup>Equal contributions are denoted by \*.

G. Labadie, J.-M. Leblanc, Y. Boulanger, C. Hébert, P. Desrosiers, **A. Allard** and D. Fortin, [bioRxiv](#)

- *The network epidemiology of an Ebola epidemic*, L. Hébert-Dufresne, J.-G. Young, J. Bedson, L. A. Skrip, D. Pedi, M. F. Jalloh, B. Raulier, O. Lapointe-Gagné, A. Jambai, **A. Allard** and B. M. Althouse, [arXiv:2111.08686](#)
- *The unintended consequences of inconsistent pandemic control policies*, B. M. Althouse, B. Case, S. V. Scarpino, **A. Allard**, A. M. Berdahl, E. R. White and L. Hébert-Dufresne, [medRxiv](#)
- *On the accuracy of message-passing approaches to percolation in complex networks*, **A. Allard** and L. Hébert-Dufresne, [arXiv:1906.10377](#)

## Refereed research publications

- *The role of directionality, heterogeneity and correlations in epidemic risk and spread*, **A. Allard**, C. Moore, S. V. Scarpino, B. M. Althouse and L. Hébert-Dufresne, [SIAM Rev.](#) (in press)
- *Limits of Individual Consent and Models of Distributed Consent in Online Social Networks*, J. Lovato, **A. Allard**, R. Harp, J. Onalapo and L. Hébert-Dufresne, [FAccT'22 2251–2262](#) (2022)
- *Predicting the diversity of early epidemic spread on networks*, A. J. Allen, M. C. Boudreau, N. J. Roberts, **A. Allard** and L. Hébert-Dufresne, [Phys. Rev. Research](#) 4, 013123 (2022)
- *Influential groups for seeding and sustaining nonlinear contagion in heterogeneous hypergraphs*, G. St-Onge, I. Iacopini, V. Latora, A. Barrat, G. Petri, **A. Allard** and L. Hébert-Dufresne, [Commun. Phys.](#) 5, 25 (2022)
- *Universal nonlinear infection kernel from heterogeneous exposure on higher-order networks*, G. St-Onge, H. Sun, **A. Allard**, L. Hébert-Dufresne and G. Bianconi, [Phys. Rev. Lett.](#) 127, 158301 (2021)
- *Deep learning of contagion dynamics on complex networks*, C. Murphy, E. Laurence and **A. Allard**, [Nat. Commun.](#) 12, 4720 (2021)  
★ Featured in [Nature communications' Editors' Highlights](#).
- *Social confinement and mesoscopic localization of epidemics on networks*, G. St-Onge, V. Thibeault, **A. Allard**, L. J. Dubé and L. Hébert-Dufresne, [Phys. Rev. Lett.](#) 126, 098301 (2021)
- *Master equation analysis of mesoscopic localization in contagion dynamics on higher-order networks*, G. St-Onge, V. Thibeault, **A. Allard**, L. J. Dubé and L. Hébert-Dufresne, [Phys. Rev. E](#) 103, 032301 (2021)
- *Beyond  $R_0$ : Heterogeneity in secondary infections and probabilistic epidemic forecasting*, L. Hébert-Dufresne, B. M. Althouse, S. V. Scarpino and **A. Allard**, [J. R. Soc. Interface](#) 17, 20200393 (2020)
- *Superspreading events in the transmission dynamics of SARS-CoV-2: opportunities for interventions and control*, B. M. Althouse, E. A. Wenger, J. C. Miller, S. V. Scarpino, **A. Allard**, L. Hébert-Dufresne and H. Hu, [PLOS Biol.](#) 18, e3000897 (2020)
- *Geometric renormalization unravels self-similarity of the multiscale human connectome*, M. Zheng, **A. Allard**, P. Hagmann, Y. Alemán-Gómez and M. Á. Serrano, [Proc. Natl. Acad. Sci. USA](#) 117, 20244 (2020)
- *Navigable maps of structural brain networks across species*, **A. Allard** and M. Á. Serrano, [PLOS Comput. Biol.](#) 16, e1007584 (2020)
- *Genome-scale modeling of metabolism in the polar diatom *Fragilariopsis cylindrus* underscores the strong robustness of growth rate in response to cellular perturbations*, M. Lavoie, B. Saint-Béat, J. Strauss, S. Guérin, **A. Allard**, S. V. Hardy, A. Falcioro and J. Lavaud, [Biology](#) 9, 30 (2020)
- *Mercator: uncovering faithful hyperbolic embeddings of complex networks*, G. García-Pérez\*, **A. Allard**\*, M. Á. Serrano and M. Boguñá, [New J. Phys.](#) 21, 123033 (2019)
- *Smeared phase transitions in percolation on real complex networks*, L. Hébert-Dufresne and **A. Allard**, [Phys. Rev. Research](#) 1, 013009 (2019)
- *Percolation and the effective structure of complex networks*, **A. Allard** and L. Hébert-Dufresne, [Phys. Rev. X](#) 9, 011023 (2019)
- *Geometric evolution of complex networks with degree correlations*, C. Murphy, **A. Allard**, E. Laurence, G. St-Onge and L. J. Dubé, [Phys. Rev. E](#) 97, 032309 (2018)
- *The risk of sustained sexual transmission of Zika is underestimated*, **A. Allard**\*, B. M. Althouse\*, L. Hébert-Dufresne\* and S. V. Scarpino\*, [PLOS Pathog.](#) 13, e1006633 (2017)
- *Asymmetric percolation drives a double transition in sexual contact networks*, **A. Allard**, B. M. Althouse, S. V. Scarpino and L. Hébert-Dufresne, [Proc. Natl. Acad. Sci. USA](#) 114, 8969–8973 (2017)



- *Strategic tradeoffs in competitor dynamics on adaptive networks*, L. Hébert-Dufresne, **A. Allard**, P.-A. Noël, J.-G. Young and E. Libby, [Sci. Rep. 7, 7576 \(2017\)](#)
- *The geometric nature of weights in real complex networks*, **A. Allard**, M. Á. Serrano, G. García-Pérez and M. Boguñá, [Nat. Commun. 8, 14103 \(2017\)](#)
  - ★ Featured in [Nature Physics' Research highlights](#).
  - ★ Featured in [Nature Communications' Web collection on complex systems](#).
- *The effect of a prudent adaptive behaviour on disease transmission*, S. V. Scarpino, **A. Allard** and L. Hébert-Dufresne, [Nat. Phys. 12, 1042–1046 \(2016\)](#)
  - ★ Featured in [Nature Physics' News & Views](#).
- *The hidden hyperbolic geometry of international trade: World Trade Atlas 1870–2013*, G. García-Pérez, M. Boguñá, **A. Allard** and M. Á. Serrano, [Sci. Rep. 6, 33441 \(2016\)](#)
- *Growing networks of overlapping communities with internal structure*, J.-G. Young, L. Hébert-Dufresne, **A. Allard** and L. J. Dubé, [Phys. Rev. E 94, 022317 \(2016\)](#)
- *Multi-scale structure and topological anomaly detection via a new network statistic: The onion decomposition*, L. Hébert-Dufresne, J. Grochow and **A. Allard**, [Sci. Rep. 6, 31708 \(2016\)](#)
- *Constrained growth of complex scale-independent systems*, L. Hébert-Dufresne, **A. Allard**, J.-G. Young and L. J. Dubé, [Phys. Rev. E 93, 032304 \(2016\)](#)
  - ★ Featured in the *Editors' Suggestions* section of *Phys. Rev. E*.
- *Complex networks as an emerging property of hierarchical preferential attachment*, L. Hébert-Dufresne, E. Laurence, **A. Allard**, J.-G. Young and L. J. Dubé, [Phys. Rev. E 92, 062809 \(2015\)](#)
- *General and exact approach to percolation on random graphs*, **A. Allard**, L. Hébert-Dufresne, J.-G. Young and L. J. Dubé, [Phys. Rev. E 92, 062807 \(2015\)](#)
- *A shadowing problem in the detection of overlapping communities: Lifting the resolution limit through a cascading procedure*, J.-G. Young, **A. Allard**, L. Hébert-Dufresne and L. J. Dubé, [PLOS ONE 10, e0140133 \(2015\)](#)
- *Spreading dynamics on complex networks: a general stochastic approach*, P.-A. Noël, **A. Allard**, L. Hébert-Dufresne, V. Marceau and L. J. Dubé, [J. Math. Biol. 69, 1627–1660 \(2014\)](#)
- *A system-level model for the microbial regulatory genome*, A. N. Brooks, D. J. Reiss, **A. Allard**, W.-J. Wu, D. M. Salvanha, C. L. Plaisier, S. Chandrasekaran, M. Pan, A. Kaur and N. S. Baliga, [Mol. Syst. Biol. 10, 740 \(2014\)](#)
- *Coexistence of phases and the observability of random graphs*, **A. Allard**, L. Hébert-Dufresne, J.-G. Young and L. J. Dubé, [Phys. Rev. E 89, 022801 \(2014\)](#)
  - ★ Featured in the *Editors' Suggestions* section of *Phys. Rev. E*.
- *Percolation on random networks with arbitrary  $k$ -core structure*, L. Hébert-Dufresne\*, **A. Allard\***, J.-G. Young and L. J. Dubé, [Phys. Rev. E 88, 062820 \(2013\)](#)
- *Global efficiency of local immunization of complex networks*, L. Hébert-Dufresne\*, **A. Allard\***, J.-G. Young\* and L. J. Dubé, [Sci. Rep. 3, 2171 \(2013\)](#)
- *Bond percolation on a class of correlated and clustered random graphs*, **A. Allard**, L. Hébert-Dufresne, P.-A. Noël, V. Marceau and L. J. Dubé, [J. Phys. A 45, 405005 \(2012\)](#)
- *Exact solution of bond percolation on small arbitrary graphs*, **A. Allard**, L. Hébert-Dufresne, P.-A. Noël, V. Marceau and L. J. Dubé, [EPL 98, 16001 \(2012\)](#)
- *Propagation on networks: An exact alternative perspective*, P.-A. Noël, **A. Allard**, L. Hébert-Dufresne, V. Marceau and L. J. Dubé, [Phys. Rev. E 85, 031118 \(2012\)](#)
- *Structural preferential attachment: Stochastic process for the growth of scale-free, modular and self-similar systems*, L. Hébert-Dufresne, **A. Allard**, V. Marceau, P.-A. Noël and L. J. Dubé, [Phys. Rev. E 85, 026108 \(2012\)](#)
- *Structural preferential attachment: Network organization beyond the link*, L. Hébert-Dufresne, **A. Allard**, V. Marceau, P.-A. Noël and L. J. Dubé, [Phys. Rev. Lett. 107, 158702 \(2011\)](#)
- *Modeling the dynamical interaction between epidemics on overlay networks*, V. Marceau, P.-A. Noël, L. Hébert-Dufresne, **A. Allard** and L. J. Dubé, [Phys. Rev. E 84, 026105 \(2011\)](#)
- *Propagation dynamics on networks featuring complex topologies*, L. Hébert-Dufresne, P.-A. Noël, V. Marceau, **A. Allard** and

L. J. Dubé, [Phys. Rev. E 82, 036115 \(2010\)](#)

- *Adaptive networks: Coevolution of disease and topology*, V. Marceau, P.-A. Noël, L. Hébert-Dufresne, **A. Allard** and L. J. Dubé, [Phys. Rev. E 82, 036116 \(2010\)](#)
- *Heterogeneous bond percolation on multitype networks with an application to epidemic dynamics*, **A. Allard**, P.-A. Noël, L. J. Dubé and B. Pourbohloul, [Phys. Rev. E 79, 036113 \(2009\)](#)

### Book chapters

- *A new approach to international trade from Network Geometry: The World Trade Atlas 1870-2013*, G. García-Pérez, M. Boguñá, **A. Allard** and M. Á. Serrano, in [Networks of International Trade and Investment: Understanding globalization through the lens of network analysis](#), S. Gorgoni, A. Amighini and M. Smith (Eds.), Vernon Press, pp. 71–112 (2018) ISBN:978-1-62273-065-0
- *The Social Zombie: Modelling undead outbreaks on social networks*, L. Hébert-Dufresne, P.-A. Noël, V. Marceau, **A. Allard** and L. J. Dubé, in [Mathematical Modelling of Zombies](#), R. Smith? (Ed.), University of Ottawa Press, pp. 149–170 (2014) ISBN:978-0-77662-210-1

### Perspectives, opinions and outreach publications

- *La modélisation mathématique pour cartographier le complexe et l'inconnu*<sup>6</sup>, **A. Allard**, L. J. Dubé and L. Hébert-Dufresne, [ACFAS Magazine \(September 2020\)](#)
- *COVID-19: Cancel your next large event, and tell your friends to cancel theirs*, G. St-Onge, V. Thibeault, **A. Allard**, L. J. Dubé and L. Hébert-Dufresne, [medium.com \(March 2020\)](#)
- *Des ponts d'Euler à la grippe aviaire: De l'abstraction mathématique à la réalité sociale des épidémies*<sup>7</sup>, **A. Allard**, P.-A. Noël and L. J. Dubé, [Accromath 4 \(winter-spring 2009\)](#)

### Selected presentations<sup>8</sup>

- *Dynamics on networks through the lens of spectral and information theories*, Universitat de Barcelona Institute of Complex Systems, Barcelona, Spain, 2022
- *Graphe poissonien, un oxymore?*, Centre Interdisciplinaire en Modélisation Mathématique de l'Université Laval (CIM-MUL), Québec, Canada, 2022
- *Contact Network Epidemiology: Heterogeneity and Stochasticity of Disease Spread*, Quantitative Life Sciences, McGill University, Montréal, Canada, 2022
- *Realistic clustering patterns in directed geometric networks*, Networks 2021: A Joint Sunbelt and NetSci Conference, Washington DC, USA, 2021
- *Deep learning of dynamical epidemic processes on complex networks*, Vermont Complex Systems Center, University of Vermont, Burlington, USA, 2019
- *Deep learning of dynamical epidemic processes on complex networks*, Universitat de Barcelona Institute of Complex Systems, Barcelona, Spain, 2019
- *Chaire de recherche Sentinelle Nord en modélisation mathématique des systèmes et des réseaux complexes*, Official inauguration of the latest Sentinelle Nord research chairs, Lévis, Canada, 2019
- *An introduction to the methodologies for studying complex networks*, Scientific retreat of the thematic project 1 (TP1) – Sentinelle Nord, Forêt Montmorency, Canada, 2019
- *Three tales about percolation on real complex networks*, International Conference on Complex Networks (CompleNet 2019), Tarragona, Spain, 2019

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<sup>6</sup>Mapping the complex and the unknown with mathematical modeling

<sup>7</sup>From Euler bridges to avian flu: From mathematical abstraction to the social reality of epidemics.

<sup>8</sup>Invited presentations are denoted with a filled circle.



- *Modeling with Random Networks*, Complex Networks Winter Workshop (CNWW18), Québec, Canada, 2018
- *Les réseaux complexes: un paradigme unificateur et transformateur pour comprendre la relation dynamique/structure des systèmes complexes*, Centre de recherche CERVO, Québec, Canada, 2018
- *Les réseaux complexes: un paradigme unificateur et transformateur pour comprendre la relation dynamique/structure des systèmes complexes*, Institut de biologie intégrative et des systèmes, Université Laval, Québec, Canada, 2018
- *The hyperbolic brain: A geometric approach to network neuroscience*, Sentinelle Nord Annual Meeting, Québec, Canada, 2018
- *Effective structure of complex networks and a second look at message passing approaches* (poster), International School and Conference on Network Science (NetSci 2018), Paris, France, 2018
- *Double epidemic threshold and the potential of the Zika virus as a sustained STI*, BIFI International Conference, Zaragoza, Spain, 2018
- *The effective navigable geometry of the brain*, Mapping Complexity: Foundations and Applications of Network Geometry workshop (MACFANG-17), Barcelona, Spain, 2017
- *The effective navigable geometry of the brain*, International School and Conference on Network Science (NetSci 2017), Indianapolis, Indiana, USA, 2017
- *Towards an effective structure of complex networks and its contributions to epidemiology and neuroscience*, Network Science Institute, Boston, Massachusetts, USA, 2017
- *The geometric nature of weights in real complex networks*, Conference on Complex Systems (CCS 2016), Amsterdam, The Netherlands, 2016
- *The hidden geometry of complex weighted networks*, 8th International Conference on Discrete Models of Complex Systems (Summer Solstice 2016), Aveiro, Portugal, 2016
- *Unveiling the hidden geometry of weighted networks*, International School and Conference on Network Science (TOPONETS15), Zaragoza, Spain, 2015
- *Exploring the hidden metric space of complex networks*, Santa Fe Institute, Santa Fe, New Mexico, USA, 2015
- *Percolation on clustered and correlated random graphs: General formalism and applications* (poster), International School and Conference on Network Science (NetSci 2013), Copenhagen, Denmark, 2013
- *Bond and site percolation on clustered and correlated random graphs*, Joint CRM-Imperial College School and Workshop in Complex Systems, Barcelona, Spain, 2013
- *Unveiling hidden communities through cascading detection on network structures*, 2nd International Conference on Complex Sciences, Santa Fe, New Mexico, USA, 2012
- *Exact solution of bond percolation on small arbitrary graphs*, International School and Conference on Network Science (NetSci 2012), Evanston, Illinois, USA, 2012
- *Using network organization to hinder propagation in structured populations* (poster), International School and Conference on Network Science (NetSci 2012), Evanston, Illinois, USA, 2012
- *Multitype modular networks as a model of clustered social networks* (poster), International School and Conference on Network Science (NetSci 2010), Boston & Cambridge, Massachusetts, USA, 2010
- *Heterogeneous Bond Percolation on Complex Networks: Application to Epidemiology* (poster), Canadian Association of Physicists Congress, Québec, Canada, 2008

★ Third place at the student competition.