Antoine Allard
Curriculum Vitæ

Senior Research Fellow
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Education

Ph.D. in Physics, *Université Laval*, 2009–2014
- Thesis Title: *Percolation sur graphes aléatoires: Modélisation et description analytique*[1]
  - ⋆ Thesis added to the Board of Honour for receiving the highest overall mark

M.Sc. in Physics, *Université Laval*, 2006–2008
- Thesis Title: *Modélisation Mathématique en Epidémiologie par Réseaux de Contacts: Introduction de l'Hétérogénéité dans la Transmissibilité*[2]
  - ⋆ Thesis added to the Board of Honour for receiving the highest overall mark

B.Sc. in Physics (Theoretical Physics option), *Université Laval*, 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)

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

Research, Teaching and Mentoring

Research
- Senior Research Fellow, *Centre de Recerca Matemàtica*, Barcelona, 2017–present
- FRQNT Postdoctoral Fellow, *Universitat de Barcelona*, 2014–2016
- CIHR Ph.D. Candidate, *Université Laval*, 2009–2014
- Master Student, *Université Laval*, 2006–2008
- Research Assistant, Division of Mathematical Modeling, *University of British Columbia Centre for Disease Control*, Vancouver, Canada, 2006–2007
- NSERC Undergraduate Research Assistant, Nonlinear Dynamics Group, *Université Laval*, 2006
- NSERC Undergraduate Research Assistant, Radio Oncology Department, *Centre de Recherche de l'Hôtel-Dieu de Québec*, 2005
- Undergraduate Research Assistant, Astrophysics Group, *Université Laval*, 2004

Teaching
- Teaching Assistant, PHY-3000 Statistical Physics, *Université Laval*, 2009, 2010 and 2013
  - ⋆ Nominated 2013 AESGUL Prize for "Staff member of the year" (elected by the undergraduate students)
- Teaching Assistant, PHY-2502 Nonlinear Dynamics, Chaos and Complexity, *Université Laval*, 2007 and 2012
- Foreign Language Assistant, *St. Anthony's RC Girls School/Hetton School*, Sunderland, United Kingdom, 2008–2009
- Teaching Assistant, PHY-1002 Mathematical Physics II, *Université Laval*, 2006 and 2007
  - ⋆ Awarded 2006 AESGUL Prize for "Staff member of the year" (elected by the undergraduate students)

Mentoring
- Charles Murphy (co-advisor, Master's thesis) *Université Laval*, 2016–2017

[1] Percolation on random graphs: Modelling and analytical description
[2] Mathematical modelling in contact networks for epidemiology: Introduction of heterogenity in transmissibility.

Awards

Fellowships

- Juan de la Cierva – Incorporación (postdoctoral fellowship), *Ministerio de Economía, Industria y Competitividad de España*, 2017
- Postdoctoral Fellowship *Fonds de recherche du Québec – Nature et Technologies* (FRQNT), 2014
- Frederick Banting and Charles Best Canada Graduate Scholarships - Doctoral Awards, *Canadian Institutes of Health Research* (CIHR), 2008
- Doctoral Research Scholarship, *Fonds de recherche du Québec – Nature et Technologies* (FRQ-NT), 2008 (declined)
- Doctoral Research Scholarship, *Fondation de l'Université Laval*, 2008 (declined)
- Undergraduate Student Research Award, *Natural Sciences and Engineering Research Council of Canada* (NSERC), 2006
- Undergraduate Student Research Award, *Natural Sciences and Engineering Research Council of Canada* (NSERC), 2005

Other Recognitions

- 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

Organizing, Reviewing and Administrative Activities

Organizing committee

- Contagion & Networks satellite symposium (ContNet2017) of the International School and Conference on Network Science (NetSci 2017)

Program committee member

- 6th International Conference on Complex Networks and their Applications (Complex Networks 2017)
- Mapping Complexity: Foundations and Applications of Network Geometry workshop (MACFANG-17)
- 5th International Workshop on Complex Networks and their Applications (Complex Networks 2016)

Thesis jury member

- Jaume Palmer Real (Master's thesis, *Universitat Autònoma de Barcelona*, 2017)
- Edward Laurence (PhD exam, *Université Laval*, 2017)

Reviewer for the following journals

- Applied Network Science
- Discrete Dynamics in Nature and Society
- Europhysics Letters
- IEEE's Transactions on Network Science and Engineering
- Nature Communications
- Physical Review E
- Physical Review Letters

- PLOS ONE
- Scientific Reports

Other committees

- Board member of the Student Investment Fund, *Université Laval*, 2012–2013
- Treasurer, Undergraduate/Graduate Physics Student Union, *Université Laval*, 2009–2011/2011–2012
- Student representative at the Physics Professoral Assembly, *Université Laval*, 2010–2012
- Member of the Physics Graduate Program Committee, *Université Laval*, 2009–2011

Publications and Presentations

Research publications[3] (refereed)

- *The risk of sustained sexual transmission of Zika is underestimated*, **A. Allard**[4], B. M. Althouse[4], L. Hébert-Dufresne[4], and S. V. Scarpino[4] PLoS Pathog. 13, e1006633 (2017) [1]

- *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) [1]

- *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) [1]

- *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) [7]
  - ⋆ 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, Nature Phys. 12, 1042–1046 (2016) [13]
  - ⋆ Featured in Nature Physics' News & Views.
  - ⋆ In the top 5% of all research outputs scored by `Altmetric` (media coverage).

- *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) [6]
  - ⋆ Featured in the section *Economía* of the newspaper *El Periódico*.

- *Growing networks of overlapping communities with internal structure*, J.-G. Young, L. Hébert-Dufresne, **A. Allard**, L. J. Dubé, Phys. Rev. E 94, 022317 (2016) [1]

- *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) [1]

- *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) [5]
  - ⋆ 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) [6]

- *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) [9]

- *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) [7]

[3] Known number of citations in brackets (according to `Google Scholar`).
[4] Equal contribution.

- *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. (2014) [9]
- *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) [24]
- *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) [3]
  ⋆ Featured in the *Editors' Suggestions* section of Phys. Rev. E.
- *Percolation on random networks with arbitrary k-core structure*, L. Hébert-Dufresne[4], **A. Allard**[4], J.-G. Young, and L. J. Dubé, Phys. Rev. E 88, 062820 (2013) [16]
- *Global efficiency of local immunization of complex networks*, L. Hébert-Dufresne[4], **A. Allard**[4], J.-G. Young[4], and L. J. Dubé, Sci. Rep. 3, 2171 (2013) [55]
- *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) [21]
- *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) [5]
- *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) [21]
- *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) [9]
- *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) [29]
- *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) [88]
- *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) [34]
  ⋆ Also in the *Virtual Journal of Biological Physics Research*, issue 7, vol. 20 (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) [158]
  ⋆ Also in the *Virtual Journal of Biological Physics Research*, issue 7, vol. 20 (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) [85]
  ⋆ Also in the *Virtual Journal of Biological Physics Research*, issue 7, vol. 17 (2009).

Other publications (refereed)

- *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 press.
- *The Social Zombie: Modelling undead outbreaks on social networks*, L. Hébert-Dufresne, P.-A. Noël, V. Marceau, **A. Allard**, and L. J. Dubé, R. Smith? (Ed.), University of Ottawa Press (2014)
- *Des ponts d'Euler à la grippe aviaire: De l'abstraction mathématique à la réalité sociale des épidémies*[5], **A. Allard**, P.-A. Noël, and L. J. Dubé, Accromath 4 (winter-spring 2009)

Selected presentations

- *The effective navigable geometry of the brain* (oral), Mapping Complexity: Foundations and Applications of Network Geometry workshop (MACFANG-17), Barcelona, Spain, 2017

[5] From Euler bridges to avian flu: From mathematical abstraction to the social reality of epidemics.

- *The effective navigable geometry of the brain* (oral), International School and Conference on Network Science, Indianapolis, Indiana, 2017
- *Towards an effective structure of complex networks and its contributions to epidemiology and neuroscience* (oral), Network Science Institute, Boston, Massachusetts, 2017
- *The geometric nature of weights in real complex networks* (oral), Conference on Complex Systems (CCS 2016), Amsterdam, The Netherlands, 2016
- *The hidden geometry of complex weighted networks* (oral), 8th International Conference on Discrete Models of Complex Systems (Summer Solstice 2016), Aveiro, Portugal, 2016
- *Unveiling the hidden geometry of weighted networks* (oral), International School and Conference on Network Science (TOPONETS15), Zaragoza, Spain, 2015
- *Exploring the hidden metric space of complex networks* (oral), Santa Fe Institute, Santa Fe, New Mexico, 2015
- *Percolation on clustered and correlated random graphs: General formalism and applications* (poster), International School and Conference on Network Science, Copenhagen, Denmark, 2013
- *Bond and site percolation on clustered and correlated random graphs* (oral), Joint CRM-Imperial College School and Workshop in Complex Systems, Barcelona, Spain, 2013
- *Unveiling hidden communities through cascading detection on network structures* (oral), 2nd International Conference on Complex Sciences, Santa Fe, New Mexico, 2012
- *Exact solution of bond percolation on small arbitrary graphs* (oral), International School and Conference on Network Science, Evanston, Illinois, 2012
- *Using network organization to hinder propagation in structured populations* (poster), International School and Conference on Network Science, Evanston, Illinois, 2012
- *Multitype modular networks as a model of clustered social networks* (poster), International School and Conference on Network Science, Boston & Cambridge, Massachusetts, 2010
- *Heterogeneous Bond Percolation on Complex Networks: Application to Epidemiology* (poster), Canadian Association of Physicists Congress, Québec City, 2008
  ⋆ Third place at the student competition.

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