

Antoine Allard

Curriculum Vitæ

Juan de la Cierva Postdoctoral Fellow
Departament de Física de la Matèria Condensada and
Institute of Complex Systems (UBICS)
Universitat de Barcelona
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E-08028 Barcelona, Spain

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EDUCATION

Université Laval

Ph.D. in Physics

Québec, Canada

2009–2014

- Thesis Title: *Percolation sur graphes aléatoires: Modélisation et description analytique*¹
- Advisor: Louis J. Dubé
- ★ 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

Complex Systems Summer School

Santa Fe, NM, USA

2011

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*²
- Advisor: Louis J. Dubé
- ★ 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)

ACADEMIC POSITIONS

Université Laval

Assistant Professor

Québec, Canada

August 2018

- ★ Awarded the Sentinelle Nord Research Chair on the theoretical modeling of complex networks

Universitat de Barcelona

Postdoctoral Fellow

Barcelona, Spain

2018–present

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

Centre de Recerca Matemàtica

Senior Research Fellow

Bellaterra, Spain

2017

Universitat de Barcelona

Postdoctoral Fellow

Barcelona, Spain

2014–2016

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

¹Percolation on random graphs: Modelling and analytical description

²Mathematical modelling in contact networks for epidemiology: Introduction of heterogeneity in transmissibility.

University of British Columbia Centre for Disease Control
Research Assistant

Vancouver, Canada
2006–2007

Université Laval

Undergraduate Research Assistant

Québec, Canada
2006

- Supervisor: Louis J. Dubé, Nonlinear Dynamics Group

★ Natural Sciences and Engineering Research Council of Canada Undergraduate Student Research Award

Centre de Recherche de l'Hôtel-Dieu de Québec

Undergraduate Research Assistant

Québec, Canada
2005

- Supervisor: Luc Beaulieu, Radio Oncology Department

★ Natural Sciences and Engineering Research Council of Canada Undergraduate Student Research Award

Université Laval

Undergraduate Research Assistant

Québec, Canada
2004

- Supervisor: Gilles Joncas, Astrophysics Group

FUNDING AND AWARDS

Funding

- Sentinelle Nord Research Chair on the theoretical modeling of complex networks, 2018–2023

Fellowships

- 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* (FRQNT), 2014–2016
- Frederick Banting and Charles Best Canada Graduate Scholarships - Doctoral Awards, *Canadian Institutes of Health Research* (CIHR), 2009–2012
- 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

TEACHING

Université Laval

Québec, Canada

Professor

- PHY-3000 Statistical Physics
- PHY-2502 Nonlinear Dynamics, Chaos and Complexity

Fall 2018

Spring 2019

Université Laval

Québec, Canada

Teaching Assistant

- PHY-3000 Statistical Physics
- ★ Nominated 2013 AESGUL Prize for “Staff member of the year” (elected by the undergraduate students)
- PHY-2502 Nonlinear Dynamics, Chaos and Complexity
- PHY-3000 Statistical Physics
- PHY-3000 Statistical Physics
- PHY-1002 Mathematical Physics II
- PHY-2502 Nonlinear Dynamics, Chaos and Complexity
- PHY-1002 Mathematical Physics II
- ★ Awarded 2006 AESGUL Prize for “Staff member of the year” (elected by the undergraduate students)

Fall 2013

Fall 2012

Fall 2010

Fall 2009

Fall 2007

Spring 2007

Fall 2006

St. Anthony's RC Girls School/Hetton School

Sunderland, United Kingdom

Foreign Language Assistant

2008–2009

MENTORING

Ph.D. students

- Charles Murphy (co-advisor) *Université Laval*, 2018–present

M.Sc. students

- Charles Murphy (co-advisor) *Université Laval*, 2016–2017

Bachelor's thesis

- Marta Cavero Lázaro (co-advisor) *Universitat Autònoma de Barcelona*, 2018

ORGANIZING ACTIVITIES

Complex Networks Winter Workshop (CNWW)

Québec, Canada

Co-director

December 2018

- In collaboration with J. Lovato and L. Hébert-Dufresne

Contagion & Networks (ContNet2018)

Paris, France

Co-organizer

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)

Indianapolis IN, USA

Co-organizer

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

Program committee member

- 7th International Conference on Complex Networks and their Applications (Complex Networks 2018)
- International School and Conference on Network Science (NetSci 2018)
- 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
- Bioinformatics
- Discrete Dynamics in Nature and Society
- Europhysics Letters
- IEEE's Transactions on Network Science and Engineering
- Nature Communications
- Physica A
- Physical Review E
- Physical Review Letters
- PLOS ONE
- Scientific Reports

ADMINISTRATIVE ACTIVITIES

Student Investment Fund Board member	Université Laval 2012–2013
Physics Graduate Student Union Treasurer	Université Laval 2011–2012
Physics Graduate Program Committee Member	Université Laval 2011–2012
Physics Professoral Assembly Student representative	Université Laval 2010–2012
Physics Undergraduate Student Union Treasurer	Université Laval 2004–2006

Submitted manuscripts

- *Navigable maps of structural brain networks across species*, **A. Allard** and M. Á. Serrano [arXiv:1801.06079](#) (2018)

Research publications³ (refereed)

- *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) [0]
- *The risk of sustained sexual transmission of Zika is underestimated*, **A. Allard**⁴, B. M. Althouse⁴, L. Hébert-Dufresne⁴, and S. V. Scarpino⁴ [PLoS Pathog. 13, e1006633](#) (2017) [3]
- *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) [4]
- *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) [2]
- *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) [16]
 - ★ 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) [16]
 - ★ 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) [13]
 - ★ 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**, and 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) [6]
- *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) [8]
 - ★ 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) [7]
- *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) [11]
- *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) [8]
- *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) [9]

³Known number of citations in brackets (according to [Google Scholar](#)).

⁴Equal contribution.

- *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) [26]
- *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-Dufresne⁴, **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-Dufresne⁴, **A. Allard**⁴, J.-G. Young⁴, and L. J. Dubé, *Sci. Rep.* **3**, 2171 (2013) [60]
- *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) [24]
- *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) [7]
- *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) [23]
- *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) [10]
- *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) [92]
- *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) [166]
 ★ 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) [87]
 ★ 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

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

- *Double epidemic threshold and the potential of the Zika virus as a sustained STI* (oral), BIFI International Conference, Zaragoza, Spain, 2018
- *The effective navigable geometry of the brain* (oral), Mapping Complexity: Foundations and Applications of Network Geometry workshop (MACFANG-17), Barcelona, Spain, 2017
- *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.