Antoine Allard
Curriculum Vitæ

Senior research fellow
Centre de Recerca Matemàtica
Campus de Bellaterra, Edifici C
08193 Bellaterra (Barcelona), Spain

Office : 22
Email : aallard@crm.cat
W3   : antoineallard.info

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 AND TEACHING EXPERIENCE

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)

Supervision

Co-advisor of Charles Murphy's master's thesis (Advisor: L. J Dubé), *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

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

Other Activities and Skills

Involvement and Volunteerism

Reviewer for Physical Review Letters, Nature Communications, Physical Review E, Scientific Reports, PLOS ONE, Europhysics Letters, Applied Network Science, IEEE's Transactions on Network Science and Engineering, Discrete Dynamics in Nature and Society, 2013–present

Organizing Committee member of Contagion & Networks satellite symposium (ContNet2017) of International School and Conference on Network Science (NetSci 2017)

Thesis Committee member of Edward Laurence (Université Laval, PhD, 2016–2019)

Program Committee member of the 5th/6th International Conference on Complex Networks and their Applications (Complex Networks 2016, 2017)

Program Committee member of the workshop Mapping Complexity: Foundations and Applications of Network Geometry (MACFANG 2017)

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

Skills

Languages : French (native language), English (full professional proficiency), Spanish (intermediate level) and Catalan (beginner level)

Submitted manuscripts

○ *Asymmetric percolation drives a double transition in sexual contact networks*, **A. Allard**, B. M. Althouse, and L. Hébert-Dufresne, arxiv:1702.06224

○ *The risk of sustained sexual transmission of Zika is underestimated*, **A. Allard**[3], B. M. Althouse[3], L. Hébert-Dufresne[3], and S. V. Scarpino[3], bioRxiv:090324

○ *Strategic tradeoffs in competitor dynamics on adaptive networks*, L. Hébert-Dufresne, **A. Allard**, P.-A. Noël, J.-G. Young, and E. Libby arxiv:1607.04632

Research publications[4] (refereed)

○ *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) [3]
  ⋆ 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 Physics 12, 1042–1046 (2016) [8]
  ⋆ 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, Scientific Reports 6 33441 (2016) [3]
  ⋆ 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**, Scientific Reports 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]

○ *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) [8]

○ *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) [20]

---

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

- *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[3], **A. Allard**[3], 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[3], **A. Allard**[3], J.-G. Young[3], and L. J. Dubé, Sci. Rep. 3, 2171 (2013) [51]

- *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) [20]

- *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) [28]

- *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) [84]

- *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) [155]
  ⋆ 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) [83]
  ⋆ 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), 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

---

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

- *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