Guillaume St-Onge

Ph.D. candidate in Physics studying Complex Systems

Département de physique, génie physique, et d'optique

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Research interests: Complex Networks, Dynamical Systems, Bayesian Inference, Contagions

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Education

Degrees

Ph.D. in Physics, Université Laval   2018–2021 (expected)

- Advisors: Antoine Allard and Laurent Hébert-Dufresne (co-advisor)
- Thesis title: *Contagion dynamics on complex networks: beyond pairwise interactions*

M.Sc. in Physics, Université Laval   2015–2017

- Advisor: Louis J. Dubé
- Thesis title: *Propagation dynamics on random networks: characterization of the phase transition*
- **Honor board mention: Highest grade attributed unanimously by the jury**

B.Sc. in Physics, Theoretical physics concentration, Université Laval   2012–2015

- **Governor General's Academic Medal: Highest academic standing, B.Sc. degree**   2016

Summer and winter schools

- Complex Systems Summer School, Santa Fe (New Mexico), USA   2018
- Complex Networks Winter Workshop, Québec (Québec), Canada   2018

Scholarships and honors

Graduate research scholarships

- NSERC : Doctoral Scholarship – Alexander Graham Bell Canada ($105 000)   Jan. 2018–Dec. 2020
- FRQNT : Doctoral Scholarship* ($60 000)   Jan. 2018–Dec. 2020
- NSERC : Master Scholarship – Alexander Graham Bell Canada ($17 500)   Sept. 2015–Aug. 2016
- FRQNT : Master Scholarship ($30 000)   Sept. 2015–Aug. 2017
- Desjardins Foundation : Master Scholarship* ($3 000)   Oct. 2015

Internship research grants

- FRQNT – International Internship Program ($7 500)   2020
- NSERC – Michael Smith Foreign Study Supplements ($6 000)   2019
- NSERC – Undergraduate Student Research Award ($4 500, Awarded 3 times)   2013, 2014, 2015

Other awards

- *Concours d'expression scientifique Pierre Amiot*[†] (3rd place), Université Laval   2017
- Student merit award–Direction mention, Université Laval   2015
- Pedagogue of the year, Physics Students Association, Université Laval   2014

*Awarded but declined
[†]Scientific communication prize

Publications and patents

Articles published or accepted in a peer-reviewed journal

10. V. Thibeault, **G. St-Onge**, L. J. Dubé, P. Desrosiers   2020
    Threefold way to the dimension reduction of dynamics on networks: an application to synchronization,
    Phys. Rev. R **2**, 043215

9. H. Hartle, B. Klein, S. McCabe, A. Daniels, **G. St-Onge**, C. Murphy, L. Hébert-Dufresne   2020
    Network comparison and the within-ensemble graph distance,
    Proc. Math. Phys. Eng. Sci. **476**, 20190744

8. G. T. Cantwell, Y. Liu, B. F. Maier, A. C. Schwarze, C. A. Serván, J. Snyder, **G. St-Onge**   2020
    Thresholding normally distributed data creates complex networks,
    Phys. Rev. E **101**, 062302

7. J.-G. Young, **G. St-Onge**, E. Laurence, C. Murphy, L. Hébert-Dufresne, P. Desrosiers   2019
    Phase transition in the recoverability of network history,
    Phys. Rev. X **9**, 041056

6. **G. St-Onge**, J.-G. Young, L. Hébert-Dufresne, L. J. Dubé   2019
    Efficient sampling of spreading processes on complex networks using a composition and rejection algorithm,
    Comput. Phys. Commun. **240**, 30

5. J.-G. Young, **G. St-Onge**, P. Desrosiers, L. J. Dubé   2018
    Universality of the stochastic block model,
    Phys. Rev. E **98**, 032309

4. **G. St-Onge**, J.-G. Young, E. Laurence, C. Murphy, L. J. Dubé   2018
    Phase transition of the susceptible-infected-susceptible dynamics on time-varying configuration model networks,
    Phys. Rev. E **97**, 022305

3. C. Murphy, A. Allard, E. Laurence, **G. St-Onge**, L. J. Dubé   2018
    Geometric evolution of complex networks with degree correlations,
    Phys. Rev. E **97**, 032309

2. D. Panneton, **G. St-Onge**, M. Piché, S. Thibault   2016
    Exact vectorial model for nonparaxial focusing by arbitrary axisymmetric surfaces,
    J. Opt. Soc. Am. **33**, 801

1. D. Panneton, **G. St-Onge**, M. Piché, S. Thibault   2015
    Needles of light produced with a spherical mirror,
    Opt. Lett. **4**, 419

Preprints under review

- **G. St-Onge**, V. Thibeault, A. Allard, L. J. Dubé, L. Hébert-Dufresne
  Social confinement and mesoscopic localization of epidemics on networks,
  arXiv:2003.05924

- **G. St-Onge**, V. Thibeault, A. Allard, L. J. Dubé, L. Hébert-Dufresne
  Master equation analysis of mesoscopic localization in contagion dynamics on higher-order networks,
  arXiv:2004.10203

- G. T. Cantwell, **G. St-Onge**, J.-G. Young
  Inference for growing trees,
  arXiv:1910.04788

- B. J. M. Blake, **G. St-Onge**, L. Hébert-Dufresne
  Emergence of multistrain epidemics with an underlying genotype network,
  arXiv:2007.07429

- E. Laurence, C. Murphy, **G. St-Onge**, X. Roy-Pomerleau, V. Thibeault
  Detecting structural perturbations from time series with deep learning,
  arXiv:2006.05232

Patents

- C. Allen, S. Thibault, A. Talbot-Lanciault, P. Blais, **G. St-Onge**, P. Desaulniers   2017
  Hybrid nanocomposite materials, laser scanning system and use thereof in volumetric image projection,
  CA Patent No. 2983656

Research and teaching experience

Internships

Vermont Complex System Center, Burlington (VT), USA

- **Visiting graduate student**, group of Prof. Laurent Hébert-Dufresne 2019-2020
  Project: *Temporal reconstruction of networks with message-passing*

Université Laval, Québec (QC), Canada

- **Undergraduate research assistant**, group of Prof. Louis J. Dubé 2015
  Project: *Statistical physics of complex networks*

- **Undergraduate research assistant**, group of Prof. Michel Piché 2014
  Project: *Highly focused laser beam modeling*

- **Undergraduate research assistant**, group of Prof. Claudine Allen 2013
  Project: *Development of an optical system for biodetection*

Workshops

- *Detecting structural perturbations from time series*, Université Laval, Québec (QC), Canada 2019

- *Network Reconstruction & Graph Distances*, Northeastern University, Boston (MA), USA 2019

- *Network Archaeology*, Université Laval, Québec (QC), Canada 2016

Teaching

- PHY-3500: *Computational Physics*, teaching assistant for P. Després 2016, 2018
  Tasks : guidance for students projects, marking

- PHY-3000: *Statistical Physics*, teaching assistant for L. J. Dubé, Y. Sheng, and A. Allard 2016–2018, 2020
  Tasks : lectures, marking

Selected conference contributions and invited lectures

- **G. St-Onge**, I. Iacopini, G. Petri, A. Barrat, V. Latora and L. Hebert-Dufresne 2020
  Influence maximization in simplicial contagion (Talk)
  14th International School and Conference on Network Science, Rome, Italy (virtual)

- **G. St-Onge**, A. Allard, L. Hébert-Dufresne 2020
  Localization, bistability and optimal seeding of contagions on higher-order networks (Talk with proceeding)
  Artificial Life Conference, Montreal, QC, Canada (virtual)

- **G. St-Onge**, V. Thibeault, L. Hébert-Dufresne, L. J. Dubé 2019
  Mesoscopic localization of spreading processes on networks (Talk)
  14th International School and Conference on Network Science, Burlington, VT, USA

- **G. St-Onge**, J.-G. Young, E. Laurence, C. Murphy, L. J. Dubé 2017
  SIS dynamics on time-varying random networks (Talk)
  Institute for Disease Modeling, Seattle, WA, USA

- **G. St-Onge**, J.-G. Young, E. Laurence, C. Murphy, L. J. Dubé 2017
  Susceptible-infected-susceptible dynamics on the rewired configuration model (Talk)
  12th International School and Conference on Network Science, Indianapolis, IN, USA

- **G. St-Onge**, E. Laurence, C. Murphy, J.-G. Young and L. J. Dubé 2016
  Co-evolution of Growth and Dynamics on Network (Poster)
  11th International School and Conference on Network Science, Seoul, Republic of Korea

- **G. St-Onge**, D. Panneton, M. Piché, S. Thibault 2014
  Modeling ultra-sharp needles of light using vector diffraction theory (Talk)
  50th Canadian Undergraduate Physics Conference, Kingston, ON, Canada

Service and leadership

Projects liaison: Complex Networks Winter Workshop   2019

Journal referee

- Nature Communications
- Scientific Reports
- Journal of Complex Networks
- Chaos: An Interdisciplinary Journal of Nonlinear Science
- IMA Journal of Applied Mathematics

Mentoring

- Internship mentor for an undergraduate student research   2018
- Physique mathématique III (undergraduate course)   2014
- Physique mathématique I et II (undergraduate courses)   2013

Volunteering

- La Coupe de Science (youth science contest)   2016
- Festival de Sciences et Génies (science festival)   2015
- Les Jeux photoniques (youth science contest)   2012–2014

Miscellaneous

Computer skills

Programming languages and tools: C++, Python, Bash, Linux, Git, LaTeX, Jupyter Notebook, Pybind11 (binding tool)

Selected packages

- **SamplableSet**: C++/Python implementation of sets which can be randomly sampled efficiently.
- **spreading_CR**: C++/Python stochastic simulation algorithm for contagion processes.

Languages

- French–native speaker
- English–fluent (spoken and written)
- German–elementary