Guillaume St-Onge

Ph.D. candidate in Physics studying Complex Systems

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

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

14. **G. St-Onge**, V. Thibeault, A. Allard, L. J. Dubé, L. Hébert-Dufresne 2021
Social confinement and mesoscopic localization of epidemics on networks,
Accepted in Phys. Rev. Lett.

13. **G. St-Onge**, V. Thibeault, A. Allard, L. J. Dubé, L. Hébert-Dufresne 2021
Master equation analysis of mesoscopic localization in contagion dynamics on higher-order networks,
Accepted in Phys. Rev. E

12. G. T. Cantwell, **G. St-Onge**, J.-G. Young 2021
Inference, Model Selection, and the Combinatorics of Growing Trees,
Phys. Rev. Lett. **126**, 038301

11. B. J. M. Blake, **G. St-Onge**, L. Hébert-Dufresne 2020
Localization, epidemic transitions, and unpredictability of multistrain epidemics with an underlying genotype network,
Accepted in PLOS Comput. Biol.

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. Research **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

- **G. St-Onge**, H. Sun, A. Allard, L. Hébert-Dufresne, G. Bianconi
Bursty exposure on higher-order networks leads to nonlinear infection kernels,
arXiv:2006.05232

- 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 student 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
- PLOS Computational Biology
- 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.
- **fasttr**: C++/Python efficient uniform sampler for the temporal reconstruction of growing trees.

Languages

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