Guillaume St-Onge

Ph.D. candidate in Physics studying Complex Systems

Département de physique, génie physique, et d'optique
Université Laval, Québec (QC), Canada, G1V 0A6

- ✉ guillaume.st-onge.4@ulaval.ca
- ☎ (418) 573-2745
- 🌐 gstonge.github.io

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 (NM), USA   2018
- Complex Networks Winter Workshop, Québec (QC), 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. *Social Confinement and Mesoscopic Localization of Epidemics on Networks*
G. St-Onge, V. Thibeault, A. Allard, L. J. Dubé, L. Hébert-Dufresne
Phys. Rev. Lett. **126**, 098301
2021

13. *Master equation analysis of mesoscopic localization in contagion dynamics on higher-order networks*
G. St-Onge, V. Thibeault, A. Allard, L. J. Dubé, L. Hébert-Dufresne
Phys. Rev. E **103**, 032301
2021

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

11. *Localization, epidemic transitions, and unpredictability of multistrain epidemics with an underlying genotype network*
B. J. M. Blake, **G. St-Onge**, L. Hébert-Dufresne
PLOS Comput. Biol. **17**, e1008606
2021

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

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

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

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

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

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

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

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

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

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

Preprints

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

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

Patents

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

Other research experiences

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 — 2016, 2018
  Tasks: guidance for student projects, marking

- PHY-3000: *Statistical Physics*, teaching assistant — 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
  14th International School and Conference on Network Science, Rome, Italy

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

- **G. St-Onge**, V. Thibeault, L. Hébert-Dufresne, L. J. Dubé — 2019
  Mesoscopic localization of spreading processes on networks
  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
  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
  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
  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
  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
- Mentor for Physique mathématique III (undergraduate course)   2014
- Mentor for Physique mathématique I, 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, CSS, HTML, LaTeX, Linux 🐧, Git, Jupyter Notebook, Pybind11

Selected packages (open-source):

- **SamplableSet**: implementation of sets which can be randomly sampled efficiently (C++/Python)
- **spreading_CR**: stochastic simulation algorithm for contagion processes (C++/Python)
- **fasttr**: uniform sampler for the temporal reconstruction of growing trees (C++/Python)

Languages

- French–native speaker
- English–fluent (spoken and written); 117/120 on the TOEFL test
- German–elementary