

# 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

Email: guillaume.st-onge.4@ulaval.ca

Tel: (418) 573-2745

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

---

## Education

### Degrees

Ph.D. in Physics, Université Laval	2018–2021 (expected)
<ul style="list-style-type: none"><li>Advisors: Antoine Allard and Laurent Hébert-Dufresne (co-advisor)</li><li>Thesis title: <i>Contagion dynamics on complex networks: beyond pairwise interactions</i></li></ul>	
M.Sc. in Physics, Université Laval	2015–2017
<ul style="list-style-type: none"><li>Advisor: Louis J. Dubé</li><li>Thesis title: <i>Propagation dynamics on random networks: characterization of the phase transition</i></li><li>Honor board mention: Highest grade attributed unanimously by the jury</li></ul>	
B.Sc. in Physics, Theoretical physics concentration, Université Laval	2012–2015
<ul style="list-style-type: none"><li><b>Governor General's Academic Medal:</b> Highest academic standing, B.Sc. degree</li></ul>	2016

### Summer and winter schools

<ul style="list-style-type: none"><li>Complex Systems Summer School, Santa Fe (New Mexico), USA</li></ul>	2018
<ul style="list-style-type: none"><li>Complex Networks Winter Workshop, Québec (Québec), Canada</li></ul>	2018

---

## Scholarships and honors

### Graduate research scholarships

<ul style="list-style-type: none"><li>NSERC : Doctoral Scholarship – Alexander Graham Bell Canada (\$105 000)</li></ul>	Jan. 2018–Dec. 2020
<ul style="list-style-type: none"><li>FRQNT : Doctoral Scholarship* (\$60 000)</li></ul>	Jan. 2018–Dec. 2020
<ul style="list-style-type: none"><li>NSERC : Master Scholarship – Alexander Graham Bell Canada (\$17 500)</li></ul>	Sept. 2015–Aug. 2016
<ul style="list-style-type: none"><li>FRQNT : Master Scholarship (\$30 000)</li></ul>	Sept. 2015–Aug. 2017
<ul style="list-style-type: none"><li>Desjardins Foundation : Master Scholarship* (\$3 000)</li></ul>	Oct. 2015

### Internship research grants

<ul style="list-style-type: none"><li>FRQNT – International Internship Program (\$7 500)</li></ul>	2020
<ul style="list-style-type: none"><li>NSERC – Michael Smith Foreign Study Supplements (\$6 000)</li></ul>	2019
<ul style="list-style-type: none"><li>NSERC – Undergraduate Student Research Award (\$4 500, Awarded 3 times)</li></ul>	2013, 2014, 2015

### Other awards

<ul style="list-style-type: none"><li>Concours d'expression scientifique Pierre Amiot<sup>†</sup> (3rd place), Université Laval</li></ul>	2017
<ul style="list-style-type: none"><li>Student merit award–Direction mention, Université Laval</li></ul>	2015
<ul style="list-style-type: none"><li>Pedagogue of the year, Physics Students Association, Université Laval</li></ul>	2014

---

\*Awarded but declined

<sup>†</sup>Scientific communication prize

## Publications and patents

### Articles published or accepted in a peer-reviewed journal

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**, 801–810
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  
*Master equation analysis of mesoscopic localization in contagion dynamics on higher-order networks*,  
arXiv:2004.10203
- **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
- V. Thibeault, **G. St-Onge**, L. J. Dubé, P. Desrosiers  
*Threefold way to the dimension reduction of dynamics on networks: an application to synchronization*,  
arXiv:2005.10922
- G. T. Cantwell, **G. St-Onge**, J.-G. Young  
*Recovering the past states of 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
- H. Hartle, B. Klein, S. McCabe, A. Daniels, **G. St-Onge**, C. Murphy, L. Hébert-Dufresne  
*Network comparison and the within-ensemble graph distance*,  
arXiv:2008.02415

### 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  
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
- Chaos: An Interdisciplinary Journal of Nonlinear Science
- IMA Journal of Applied Mathematics
- Journal of Complex Networks

### Mentoring

- 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,  $\text{\LaTeX}$ , 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