

# 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)
<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: <b>Highest grade attributed unanimously by the jury</b></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

• <a href="#">Complex Systems Summer School</a> , Santa Fe (NM), USA	2018
• <a href="#">Complex Networks Winter Workshop</a> , Québec (QC), Canada	2018

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## Scholarships and honors

### Graduate research scholarships

• <a href="#">NSERC: Doctoral Scholarship – Alexander Graham Bell Canada</a> (\$105 000)	Jan. 2018–Dec. 2020
• <a href="#">FRQNT: Doctoral Scholarship*</a> (\$60 000)	Jan. 2018–Dec. 2020
• <a href="#">NSERC: Master Scholarship – Alexander Graham Bell Canada</a> (\$17 500)	Sept. 2015–Aug. 2016
• <a href="#">FRQNT: Master Scholarship</a> (\$30 000)	Sept. 2015–Aug. 2017
• <a href="#">Desjardins Foundation: Master Scholarship*</a> (\$3 000)	Oct. 2015

### Internship research grants

• <a href="#">FRQNT: International Internship Program</a> (\$7 500)	2020
• <a href="#">NSERC: Michael Smith Foreign Study Supplements</a> (\$6 000)	2019
• <a href="#">NSERC: Undergraduate Student Research Award</a> (\$4 500, Awarded 3 times)	2013, 2014, 2015

### Other awards

• <a href="#">Concours d'expression scientifique Pierre Amiot<sup>†</sup></a> (3rd place), Université Laval	2017
• Student merit award–Direction mention, Université Laval	2015
• Pedagogue of the year, Physics Students Association, Université Laval	2014

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\*Awarded but declined

<sup>†</sup>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*,  
Phys. Rev. Lett. **126**, 098301
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*,  
Phys. Rev. E **103**, 032301
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 2021  
*Localization, epidemic transitions, and unpredictability of multistrain epidemics with an underlying genotype network*,  
PLOS Comput. Biol. **17**, e1008606
10. V. Thibeault, **G. St-Onge**, L. J. Dubé, P. Desrosiers 2020  
*Threifold 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-Lanciale, 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

## 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. Hébert-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  
*Mesosopic 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,  $\text{\LaTeX}$ , 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