Jean-Gabriel Young

Assistant Professor

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Research interests: Statistical Inference, Epidemiology, Complex Networks, Complex Systems

Academic positions

- *University of Vermont*, Assistant Professor, Department of Mathematics and Statistics* — 2021–
- *Université Laval*, Affiliate Professor, Département de Physique — 2020–
- *University of Vermont*, Research Assistant Professor, Department of Computer Science — 2020–2021
- *University of Michigan*, Postdoctoral Fellow, Center for the Study of Complex Systems — 2018–2020
- *Université Laval*, Research Assistant, Group of Prof. Louis. J. Dubé — 2012–2018

Education

Degrees

Ph.D. in Physics, Université Laval — 2014–2018

- *Thesis title*: Inférence et réseaux complexes †
- *Advisors*: Louis J. Dubé and Patrick Desrosiers
- ⋆ Thesis added to the *Board of Honour*.

M.Sc. in Physics, Université Laval — 2012–2014

- *Thesis title*: De la détection de la structure communautaire des réseaux complexes ‡
- *Advisors*: Louis J. Dubé

B.Sc. in Physics, Theoretical Physics major, Université Laval — 2009–2012

Summer schools

- *Complex networks : Theory, methods and applications II*, Lake Como School of Advanced Studies — 2016
- *Complex Systems Summer School*, Santa Fe Institute — 2015

Scholarships, grants and awards

Fellowships and Scholarships

- *Postdoctoral Fellowship in Studying Complex Systems*, James S. MacDonnell Foundation ($200 000) — 2017
- *Doctoral Research Scholarship*, Fonds de recherche du Québec – Nature et Technologies ($60 000) — 2014

Awards

- *FOSS Award*, 2021 Mining Software Repositories Conference — 2021
- *Zachary Karate Club award* — 2021
- *Best oral presentation award*, NERCCS 2020 — 2020
- *Board of Honour* (Highest overall mark award by all committee members), Ph.D thesis, Université Laval — 2018
- *YRNCS Bridge Grant*, Young Researcher Network On Complex Systems, joint award with Alice Patania — 2016
- *Concours d'expression scientifique Pierre Amiot*, Physics Department, Université Laval — 2016

*__Secondary appointement with__: Vermont Complex Systems Center, Larner College of Medicine, Department of Computer Science
†Inference and complex networks
‡Of community structure detection on complex networks

PUBLICATIONS

Peer-reviewed journals (24)

24. Reconstruction of plant–pollinator networks from observational data 2021
J.-G. Young, F. S. Valdovinos and M. E. J. Newman
Nat. Commun. 12, 3911

23. Hypergraph reconstruction from network data[§] 2021
J.-G. Young, G. Petri and T. P. Peixoto
Commun. Phys. 4, 135

22. A clarified typology of core-periphery structure in networks 2021
R. J. Gallagher, **J.-G. Young** and B. Foucault Welles
Sci. Adv. 7, eabc9800

21. Bayesian inference of network structure from unreliable data 2021
J.-G. Young, G. T. Cantwell and M. E. J. Newman
J. Complex. Netw. 8, cnaa046

20. Inference, model selection, and the combinatorics for growing trees 2021
G. T. Cantwell, G. St-Onge and **J.-G. Young**
Phys. Rev. Lett. 126, 038301

19. Networks beyond pairwise interactions: structure and dynamics (*review*) 2020
F. Battiston, G. Cencetti, I. Iacopini, V. Latora, M. Lucas, A. Patania, **J.-G. Young** and G. Petri
Phys. Rep. 874

18. Improved mutual information measure for classification and community detection 2020
M. E. J. Newman, G. T. Cantwell and **J.-G. Young**
Phys. Rev. E 101, 042304

17. Macroscopic patterns of interacting contagions are indistinguishable from social reinforcement 2020
L. Hébert-Dufresne, S. V. Scarpino and **J.-G. Young**
Nat. Phys. 16, 426

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

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

14. Universality of the stochastic block model 2018
J.-G. Young, G. St-Onges, P. Desrosiers and L.J.Dubé
Phys. Rev. E 98, 032309

13. Exact analytical solution of irreversible binary dynamics on networks 2018
E. Laurence, **J.-G. Young**, S. Melnik and L.J.Dubé
Phys. Rev. E 97, 032302

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

11. Construction of and efficient sampling from the simplicial configuration model 2017
J.-G. Young, G. Petri, F. Vaccarino and A. Patania
Phys. Rev. E 96, 032312

10. Strategic tradeoffs in competitor dynamics on adaptive networks 2017
L. Hébert-Dufresne, A. Allard, P.-A. Noël, **J.-G. Young**, and E. Libby
Sci. Rep. 7, 7576

9. Finite size analysis of the detectability limit of the stochastic block model 2017
J.-G. Young, P. Desrosiers, L. Hébert-Dufresne, E. Laurence and L. J. Dubé
Phys. Rev. E 95, 062304

[§]Appears in the Focus Collection on Higher-order Interaction Networks

8. Growing networks of overlapping communities with internal structure 2016
J.-G. Young, L. Hébert-Dufresne, A. Allard and L. J. Dubé
Phys. Rev. E 94, 022317

7. Constrained growth of complex scale-independent systems ¶ 2016
L. Hébert-Dufresne, A. Allard, **J.-G. Young** and L. J. Dubé
Phys. Rev. E 93, 032304

6. Complex networks as an emerging property of hierarchical preferential attachment 2015
L. Hébert-Dufresne, E. Laurence, A. Allard, **J.-G. Young** and L. J. Dubé
Phys. Rev. E 92, 062809

5. General and exact approach to percolation on random graphs 2015
A. Allard, L. Hébert-Dufresne, **J.-G. Young** and L. J. Dubé
Phys. Rev. E 92, 062807

4. A shadowing problem in the detection of overlapping communities 2015
J.-G. Young, A. Allard, L. Hébert-Dufresne and L. J. Dubé
PLoS ONE 10, e0140133

3. Coexistence of phases and the observability of random graphs ¶ 2014
A. Allard, L. Hébert-Dufresne, **J.-G. Young** and L. J. Dubé
Phys. Rev. E 89, 022801

2. Percolation on random networks with arbitrary k-core structure 2013
L. Hébert-Dufresne, A. Allard, **J.-G. Young** and L. J. Dubé
Phys. Rev. E 88, 062820

1. Global efficiency of local immunization on complex networks 2013
L. Hébert-Dufresne, A. Allard, **J.-G. Young** and L. J. Dubé
Sci. Rep. 3, 2171

Peer-reviewed conference proceeding (3)

3. Which contributions count? Analysis of attribution in open source 2021
J.-G. Young, A. Casari, K. McLaughlin, M. Z. Trujillo, L. Hébert-Dufresne and J. P. Bagrow
MSR 2021, Proceedings of the 18th International Conference on Mining Software Repositories

2. Countering hate on social media: Large scale classification of hate and counter speech 2020
J. Garland, K. Ghazi-Zahedi, **J.-G. Young**, L. Hébert-Dufresne and M. Galesic
ACL 2020, Proceedings of the Fourth Workshop on Online Abuse and Harms, pp. 102–112.

1. Connected graphs with a given degree sequence: 2020
Efficient sampling, correlations, community detection and robustness
J. Ring IV, **J.-G. Young** and L. Hébert-Dufresne.
NetSci-X 2020, Proceedings of NetSci-X 2020: Sixth International Winter School and Conference on Network Science, pp. 33–47.

Other edited works (1)

1. Open Source Ecosystems Need Equitable Credit Across Contributions 2021
A. Casari, K. McLaughlin, M. Z. Trujillo, **J.-G. Young**, J. P. Bagrow and L. Hébert-Dufresne
Nat. Comput. Sci. 1, 2

Preprints in submission (3)

- Changes in group size during resource shifts reveal drivers of sociality across the tree of life
A. B. Kao, A. K. Hund, F. P. Santos, **J.-G. Young**, D. Bhat, J. Garland, R. A. Oomen and H. F. McCreery
bioRxiv:2020/994343
Under review, *Proceedings of the Royal Society B*.
- Impact and dynamics of hate and counter speech online
J. Garland, K. Ghazi-Zahedi, **J.-G. Young**, L. Hébert-Dufresne and M. Galesic
arXiv:2009.08392
Under review, *EPJ Data Science.*
- Clustering of heterogeneous populations of networks
J.-G. Young, A. Kirkley and M. E. J. Newman
arXiv:2107.07489
Submitted, *Physical Review E*

¶Editors' suggestion

TEACHING AND MENTORING

Instructor

- STAT-330: *Bayesian Statistics* Fall 2021

Schools and guest lectures

- CSYS/CS 302: Modeling Complex Systems, University of Vermont, Burlington VT 2020
- CNWW2020: Complex Networks Winter Workshop, Québec, Canada 2020
- CRM Summer School: Spectral Theory and Applications, Québec, Canada 2016

Supervision

- Master Students:
  - ◇ Simon Lizotte, Université Laval (co-direction with Antoine Allard) 2020–
- PhD Students:
  - ◇ Brendan Case, University of Vermont (co-direction with Laurent Hébert-Dufresne) 2021–
  - ◇ Nicholas Robert, University of Vermont (co-direction with Laurent Hébert-Dufresne) 2021–

INVITED TALKS AND SELECTED CONFERENCE CONTRIBUTIONS

- *"Inference with growing networks"* 2021
  CNWW2020, online (invited talk)
- *"Bayesian approaches to network epidemiology"* 2020
  TGIR Seminar, online (invited talk)
- *"Hypergraph reconstruction from network data"* 2020
  HONS 2020, online (invited talk)
- *"Paper Unwind: Network archaeology"* 2020
  School of the NERCCS 2020 conference, Buffalo, NY, USA (invited talk)
- *"Efficient and fully bayesian inference of complex networks from noisy data"* 2019–2020
  - ▷ Indiana University — CNETS, Bloomington, IN, USA (invited seminar)
  - ▷ Université Laval — CIMMUL, Québec, QC, Canada (invited seminar)
  - ▷ Netsci-X 2020, Tokyo, Japan (talk)
  - ▷ NERCCS 2020, Buffalo, NY, USA (talk, best presentation award)
  - ▷ University of Michigan — Jacobs Lab (UMSI), Ann Arbor MI, USA (invited seminar)
  - ▷ Indiana University — Betzel Lab, Bloomington, IN, USA (invited seminar)
  - ▷ Netsci 2020, online (talk)
- *"Compression of treelike complex networks using layered configuration models"* 2019
  Netsci 2019, Burlington, VT, USA (talk)
- *"Bayesian inference of effective contagion models from population level data"* 2019
  SINM 2019, Burlington, VT, USA (talk)
- *"Universality of the stochastic block model"* 2019
  SYNS Warm-up Event 2019, Burlington, VT, USA (invited talk)
- *"The statistical physics of inference for Complex Networks"* 2018
  Department of Physics Colloquium Oakland University, Rochester, MI, USA (invited seminar)
- *"Network archaeology: phase transition in the recoverability of network history"* 2018
  - ▷ Univeristy of Colorado Boulder — StatOptML seminar, Boulder, CO, USA (invited seminar)
  - ▷ Univeristy of Vermont — Vermont Complex Systems Center, Burlington, VT, USA (invited seminar)
  - ▷ Netsci 2018, Paris, France (talk)
  - ▷ Sentinel North 2018 Annual Meeting, Québec, Canada (plenary)
  - ▷ Univeristy of Bath — Centre for Networks and Collective Behaviour, Bath, UK (invited seminar)
  - ▷ Connected Past 2018, Oxford, UK (talk)
- *"Construction of and efficient sampling from the simplicial configuration model"* 2017
  - ▷ HONS 2017, Indianapolis, IN, USA (invited talk)
  - ▷ Indiana University — School of Informatics, Bloomington, IN, USA (invited seminar)
  - ▷ University of Michigan — Center for the Study of Complex Systems, Ann Arbor, MI, USA (invited talk)

- *"Statistical mechanics of mesoscopic structure extraction"* 2017
  Netsci 2017, Indianapolis, IN, USA (talk)
- *"Finite size analysis of the detectability limit of the stochastic block model"* 2016
  - ▷ Netsci 2016, Seoul, Korea (lightning talk)
  - ▷ SINM 2016, Seoul, Korea (talk)
  - ▷ ISI Foundation, Torino, Italy (invited seminar)
- *"Structural preferential attachment: scale-free benchmark for overlapping community detection algorithms"* 2015
  Netsci 2015, Zaragoza, Spain (poster)
- *"Structural preferential attachment of community structure and its relation to Dunbar's number"* 2014
  Netsci 2014, Berkeley, CA, USA (talk)
- *"Complex networks are an emerging property of hierarchical preferential attachment"*[||] 2014
  NetSci 2014 Science, Berkeley, CA, USA (poster)
- *"Local and global solutions to community detection: when resolution matters"* 2013
  NetSci 2013 , Copenhagen, Denmark (poster)

LEADERSHIP AND SERVICE

Organizer

- *Organizer*, SINM 2021 (Statistical Inference for Network Models), online 2021
- *Organizer*, SIAM DS 21 Mini-Symposium on Dynamics in Higher-Order Networks, online 2021
- *Co-director*, CNWW2021, Complex Networks Winter Workshop, Québec, Canada 2021
- *Program co-chair*, First OpenNetSci Hackathon, Burlington VT, USA 2019
- *Adjacent Activities Committee*, NetSci 2019, Burlington VT, USA 2019

Service

- *AUR Maintainer*, Several python packages *ongoing*
- *Contributor*, Several open-source projects *ongoing*
- *Elected Student Representative*, Physics Faculty Meetings, Université Laval 2015–2016
- *Board member*, Student Investment Fund, Université Laval 2013–2016
- *Technical Director*, Coupe de Science (Science Cup), Université Laval 2011–2014
- *Technical Director*, Festival de Sciences et Génies (Science and Engineering Festival) 2010–2012

Reviewer

- *Grants*: Panelist, NSF, IIS Division (2019).
- *Journals* (22): Science Advances, SIAM Review, Physical Review Letters, Physical Review X, PLOS Computational Biology, Physical Review E, Physical Review Research, EPJ Data Science, EPL, Journal of Open Source Software, Journal of Physics: Complexity, Journal of Physics A, Scientific Reports, Palgrave Communications, PLOS ONE, Journal of Complex Networks, Physics Letter A, Chaos Solitons & Fractals, Entropy, Animal Behaviour, Applied Network Science, Chaos.

Program committee

- Northeast Regional Conference on Complex Systems (NERCCS) 2020, 2021, 2022
- International School and Conference on Network Science (NetSci) 2019, 2020
- SIAM Workshop on Network Science (SIAM NS) 2018, 2020

[||] Outstanding poster award

SELECTED SOFTWARE PACKAGES

(Complete list available online)

- Bayesian inference of networks from noisy data (stan)
- Bayesian inference of effective contagion models from population level data (stan)
- Reconstruction of plant–pollinator networks from observational data (stan + python)
- Sequential MC sampler for Network Archaeology (python + C++)
- MCMC sampler for the Simplicial Configuration Model (C++)
- MCMC sampler for the Stochastic Block Model (C++)
- Structural Preferential Attachment community detection benchmark (C++)

VARIA

Selected media coverage

- "*A selection of 2020's highlighted research*." Nature 2021
- "*To find the right network model, compare all possible histories*." Phys.org 2021
- "*Fighting Hate Speech with AI & Social Science*," Complexity Podcast 2020
- "*How you talk about coronavirus actually impacts its spread*," cnet 2020
- "*Neue Studie zeigt Wirksamkeit von Gegenrede im Netz*," netzpolitik.org 2020
- "*When coronavirus is not alone*," Phys.org 2020
- "*The shape of randomness*." Physics Central 2017
- "*What algae can tell us about political strategy*." Phys.org 2017
- "*L'univers complexe de Jean-Gabriel Young*." Le Soleil (French) 2017