Hanlin Sun

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Professional Experience

NORDITA, Stockholm University and KTH Royal Institute of Technology — Stockholm, Sweden
WINQ Research Fellow — Sep 2023 –Current

Queen Mary University of London — London, United Kingdom
Teaching Associate and Demonstrator — Jan 2020 –Aug 2023

King's College London — London, United Kingdom
Graduate Teaching Associate — Sep 2021 –Dec 2022

Education

Queen Mary, University of London — London, United Kingdom
Ph.D. in Applied Mathematics, Advisor: Prof. Ginestra Bianconi — Sep 2019 –Sep 2023

- Thesis: "Dynamic processes on networks and higher-order structures"

Aston University — Birmingham, United Kingdom
Visiting student, Advisor: Prof. David Saad — Jul 2018 –Aug 2018

KTH Royal Institute of Technology — Stockholm, Sweden
Visiting student — Jan 2018 –Jun 2018

University of Chinese Academy of Sciences — Beijing, China
B.Sc. in Physics, Advisor: Prof. Pan Zhang — Sep 2015 –Jul 2019

- Thesis: "Low rank approximation of tensor networks"

Talks and poster presentations

Conference presentations

- CCS/Italy 2023 (Naples, Italy) — Oct 2023
  Contributed talk. Title: "The dynamic nature of percolation on networks with triadic interactions"
- NetSci 2023 (Vienna, Austria) — Jul 2023
  Contributed talk. Title: "The dynamic nature of percolation on networks with triadic interactions"
- Conference on Complex Systems 2022 (Palma de Mallorca, Spain) — Oct 2022
  Contributed talk. Title: "Triadic interactions induce blinking and chaos in connectivity of higher-order networks"
- 4th IMA Conference on The Mathematical Challenges of Big Data (Oxford, United Kingdom) — Sep 2022
  Contributed talk. Title: "A message-passing approach to epidemic tracing and mitigation with apps"
- Satellite @ NetSci2022: Signed Networks and their Applications (Online) — Jul 2022
  Invited talk. *Title: "Triadic interactions induce blinking and chaos in connectivity of higher-order networks"*
- Satellite @ NetSci2022: Higher-Order Topology & Dynamics in Complex Networks (Online) — Jul 2022
  Contributed talk. Title: "Higher-order percolation processes on multiplex hypergraphs"
- Conference on Complex Systems 2021 (Lyon, France) — Oct 2021

Contributed talk. Title: "Higher-order percolation processes on multiplex hypergraphs"

- Satellite @ Networks 2021: TopoNet2021: Networks beyond pairwise interactions (Online) Jun 2021
  Contributed talk. Title: "Higher-order percolation processes on multiplex hypergraphs"
- The 46th Conference of the Middle European Cooperation in Statistical Physics (Online) May 2021
  Contributed talk. Title: "A message-passing approach to epidemic tracing and mitigation with apps"
- Conference on Complex Systems 2020 (Online) Dec 2020
  Contributed talk. Title: "A message-passing approach to epidemic tracing and mitigation with apps"

Other presentations

- Internal seminar, Institute of Theoretical Physics, Chinese Academy of Sciences Aug 2023
  Invited talk. *Title: "The dynamic nature of percolation on networks with triadic interactions"*
- Internal seminar, Aston University Aug 2023
  Invited talk. *Title: "The dynamic nature of percolation on networks with triadic interactions"*
- NetPLACE seminar Feb 2023
  Invited talk. *Title: "Message-passing approach to epidemic tracing and mitigation with apps"*
- Networks and Time Workshop, Queen Mary University of London Jan 2023
  Contributed talk. Title: "Triadic interactions induce blinking and chaos in connectivity of higher-order networks"
- Complex Systems Seminar, Queen Mary University of London Apr 2022
  Invited talk. *Title: "Mathematics in epidemic spreading: from containment measures to critical behaviours"*
- Postgraduate Research Day 2022, Queen Mary University of London May 2022
  Talk. Title: "Triadic interactions induce blinking and chaos in connectivity of higher-order networks"
- Internal seminar, Aston University Mar 2022
  Invited talk. *Title: "Mathematics in epidemic spreading: from containment measures to critical behaviours"*
- Postgraduate Research Day 2021, Queen Mary University of London May 2021
  Poster presentation. Title: "A message-passing approach to epidemic tracing and mitigation with apps"
- Queen Mary Internal Postgraduate Seminar (QuIPS) Nov 2020
  Invited talk. *Title: "A message-passing approach to epidemic tracing and mitigation with apps"*

Other academic activities

Organization of events

- Organiser of panel NetPLACE@NetSci at NetSci 2023, Vienna Jul 2023
  A 2-day panel discussion on academic writing and mental well-being in academia
- Organiser of DERI PhD forum 2020-2023
  A seminar at the Digital Environment Research Institute, Queen Mary University of London
- Organiser of NetPLACE Seminar 2021-Current
  An international online seminar for early-career researchers about Network, Phd Life And ComplExity

Attendance of other events

- Lipari School Computational Complex and Social Systems, Lipari, Italy Jul 2022
  DATA SCIENCE: Models, Algorithms, AI and Beyond

Referee and editorial service

- Reviewer for: Physica A, Communication Physics, Scientific Reports, New Journal of Physics, Bioinformatics, Chaos Solitons and Fractals, IEEE Transactions on Network Science and Engineering, Journal of Physics A, Chaos: An Interdisciplinary Journal of Nonlinear Science
- Guest Editor Assistant of the Special Issue "Models, Topology and Inference of Multilayer and Higher-Order Networks" in *Entropy.*

Teaching

- **Teaching Associate** at Queen Mary University of London 2019-2023
  Calculus II, *Level 4 module, Jan 2023-Apr 2023*
  Vectors and Matrices, *Level 4 module, Jan 2023-Apr 2023*
  Calculus I, *Level 4 module, Sep 2022-Dec 2022*
  Calculus I, *Level 4 module, Sep 2021-Dec 2021*
  Machine Learning with Python, *Level 7 module, Jun 2021-Aug 2021*
  Calculus II, *Level 4 module, Jan 2021-Apr 2021*
  Calculus I, *Level 4 module, Sep 2020-Dec 2020*
  Linear Algebra I, *Level 5 module, Sep 2020-Dec 2020*
  Vectors and Matrices, *Level 4 module, Jan 2020-Apr 2020*
- **Demonstrator** at Queen Mary University of London 2019-2021
  Introduction to Machine Learning, *Level 6 module, Jan 2021-Mar 2021*
  Complex Networks, *Level 6 module, Jan 2020 - Mar 2020*
  Electricity and Atomic Physics, *Introductory module, Jan 2020-Mar 2020*
- **Graduate Teaching Associate** at King's College London 2021-2022
  Theory of Complex Networks, *Level 7 module, Sep 2022-Dec 2022*
  Linear Algebra and Geometry II, *Level 5 module, Jan 2022-Apr 2022*
  Calculus I, *Level 4 module, Sep 2021-Dec 2021*

Skills

- **Programming skills:**
  - MATLAB, Python, Mathematica, Julia, LaTeX
  - Basic TensorFlow and Pytorch
  - Basic C and C++
- **Languages:**
  - English: professional proficiency
  - Chinese: native speaker

Scholarships and Grants

- 2023 INI Network Support funding, Isaac Newton Institute for Mathematical Sciences, £5000 (with Silvia Rognone, Gabriele Di Bona, Annalisa Caligiuri)
- 2022 Small Grant, The Institute of Mathematics and its applications, £600
- 2022 Student Grants, Conference on Complex Systems 2022, Fee waiver (equivalently €340)
- 2022 Research Support Funding, QMUL, £1000
- 2021 Travel Grant Complex Systems & Networks Group, QMUL, £700
- 2020 Travel Grant Complex Systems & Networks Group, QMUL, £300

Awards and Achievements

- 2022 Outstanding Teaching Assistant (Nomination), King's College London
- 2021 Press coverage: "*Competition and collaboration: Understanding interacting epidemics can unlock better disease forecasts*", Los Alamos National Laboratory
- 2021 Press coverage: "*Competition and Collaboration: Understanding Interacting Epidemics Can Unlock Better Disease Forecasts*", *Discover Magazine*

Publications

[Pan+23] Rajat K Panda, Roberto Verdel, Alex Rodriguez, **Hanlin Sun**, Ginestra Bianconi, and Marcello Dalmonte. "Non-parametric learning critical behavior in Ising partition functions: PCA entropy and intrinsic dimension". In: *arXiv preprint arXiv:2308.13636* (2023).

[Sun+23a] **Hanlin Sun**, Rajat Kumar Panda, Roberto Verdel, Alex Rodriguez, Marcello Dalmonte, and Ginestra Bianconi. "Network science Ising states of matter". In: *arXiv preprint arXiv:2308.13604* (2023).

[Sun+23b] **Hanlin Sun**, Filippo Radicchi, Jürgen Kurths, and Ginestra Bianconi. "The dynamic nature of percolation on networks with triadic interactions". In: *Nature Communications* 14.1 (Mar. 2023), p. 1308. ISSN: 2041-1723.

[SKB22] **Hanlin Sun**, Ivan Kryven, and Ginestra Bianconi. "Critical time-dependent branching process modelling epidemic spreading with containment measures". In: *Journal of Physics A: Mathematical and Theoretical* 55.22 (May 2022), p. 224006.

[Bia+21] Ginestra Bianconi, **Hanlin Sun**, Giacomo Rapisardi, and Alex Arenas. "Message-passing approach to epidemic tracing and mitigation with apps". In: *Phys. Rev. Research* 3 (1 Feb. 2021), p. L012014.

[St-+21] Guillaume St-Onge, **Hanlin Sun**, Antoine Allard, Laurent Hébert-Dufresne, and Ginestra Bianconi. "Universal Nonlinear Infection Kernel from Heterogeneous Exposure on Higher-Order Networks". In: *Phys. Rev. Lett.* 127 (15 Oct. 2021), p. 158301.

[SB21] **Hanlin Sun** and Ginestra Bianconi. "Higher-order percolation processes on multiplex hypergraphs". In: *Phys. Rev. E* 104 (3 Sept. 2021), p. 034306.

[SSL21] **Hanlin Sun**, David Saad, and Andrey Y. Lokhov. "Competition, Collaboration, and Optimization in Multiple Interacting Spreading Processes". In: *Phys. Rev. X* 11 (1 Mar. 2021), p. 011048.

[SZB20] **Hanlin Sun**, Robert M. Ziff, and Ginestra Bianconi. "Renormalization group theory of percolation on pseudofractal simplicial and cell complexes". In: *Phys. Rev. E* 102 (1 July 2020), p. 012308.