Hanlin Sun

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Education

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

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

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

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

- Thesis: "Low rank approximation of tensor networks"

Experience

Aston University — Birmingham, United Kingdom
Advisor: Prof. David Saad — Summer 2019

- Competition, collaboration, and optimization in multiple interacting spreading processes
- Using Dynamic Message-passing algorithm to predict and optimize the competing and collaborative spreading processes.

KTH Royal Institute of Technology — Stockholm, Sweden
Advisor: Prof. Michael Hanke — Spring 2018

- Project of Parallel Computation: Simulation of N-body problems
- Using Barnes-Hut Algorithm to simulate N-body problem and the example which we are implementing is to calculate the energy spectrum of electron beam.

KTH Royal Institute of Technology — Stockholm, Sweden
Advisor: Prof. Josephine Sullivan — Spring 2018

- Project of Deep Learning: End-to-End Text Detection and Recognition of Web Images
- Recognizing English and Chinese characters on web images.

Institute of Theoretical Physics, CAS — Beijing, China
Advisor: Prof. Pan Zhang — Summer 2017

- The application of Mean Field Approximation in neural network
- The purpose of this study is trying to construct (supervised and unsupervised) neural network learning algorithms using approximation method in statistical physics.

University of Chinese Academy of Sciences — Beijing, China
Advisor: Prof. Xiaosong Chen — Spring 2017

- Project of Statistics Physics:Computer Simulation of Kosterlitz-Thousless Phase Transition
- Using Monte Carlo method to simulate the Kosterlitz-Thouless Phase Transition on 2 dimensional XY model.

Teaching

- **Teaching Associate** at Queen Mary University of London 2019-Current
  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 - Mar 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-Mar 2020*
- **Demonstrator** at Queen Mary University of London 2019-Current
  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-Current
  Linear Algebra and Geometry II, *Level 5 module, Jan 2022-Mar 2022*
  Calculus I, *Level 4 module, Sep 2021-Dec 2021*

Skills

- **Programming skills:**
  - MATLAB, Python, Mathematica, Julia, LaTeX
  - Basic knowledge on TensorFlow and Pytorch
  - Basic knowledge on C and C++
- **Languages:**
  - English: very fluent
  - Chinese: native speaker

Review service

- Physica A: Statistical Mechanics and its Applications
- Communication Physics
- Scientific Reports
- New Journal of Physics
- IEEE Transactions on Network Science and Engineering
- Bioinformatics

Scholarships and Grants

- 2022 Research Support Funding, QMUL, £1000
- 2021 Travel Grant Complex Systems & Networks Group, QMUL, £700
- 2020 Travel Grant Complex Systems & Networks Group, QMUL, £300

Activities, Seminars and Conferences

Organization of events

- Co-organiser of DERI PhD forum 2020-Current
  A seminar at the Digital Enviroment Research Institute, Queen Mary University of London
- Co-organiser of NetPLACE Seminar 2021-Current
  A seminar of Network, Phd Life And ComplExity, Queen Mary University of London

Conference talk

- 4th IMA Conference on The Mathematical Challenges of Big Data (Oxford, United Kingdom) Sep 2022
  Contributed talk. "A message-passing approach to epidemic tracing and mitigation with apps"
- Satellite @ NetSci2022: Signed Networks and their Applications (Online) July 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) July 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"
- TopoNet2021: Networks beyond pairwise interactions, Satellite @ Networks 2021 (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 talk and events

- Lipari School Computational Complex and Social Systems, Lipari, Italy July 2022
  DATA SCIENCE: Models, Algorithms, AI and Beyond
- Complex Systems Seminar, Queen Mary University of London Apr 2022
  Title: "Mathematics in epidemic spreading: from containment measures to critical behaviours"
- Internal seminar at Aston University Mar 2022
  Title: "Mathematics in epidemic spreading: from containment measures to critical behaviours"
- Queen Mary Internal Postgraduate Seminar (QuIPS) Nov 2020
  Title: "A message-passing approach to epidemic tracing and mitigation with apps"

Publications

[1] **H. Sun**, I. Kryven, and G. Bianconi, "Critical time-dependent branching process modelling epidemic spreading with containment measures", *Journal of Physics A: Mathematical and Theoretical*, 2022.

[2] **H. Sun**, F. Radicchi, J. Kurths, and G. Bianconi, *Triadic interactions induce blinking and chaos in the connectivity of higher-order networks*, 2022.

[3] G. Bianconi, **H. Sun**, G. Rapisardi, and A. Arenas, "Message-passing approach to epidemic tracing and mitigation with apps", *Phys. Rev. Research*, vol. 3, p. L012014, 1 Feb. 2021.

[4] G. St-Onge, **H. Sun**, A. Allard, L. Hébert-Dufresne, and G. Bianconi, "Universal nonlinear infection kernel from heterogeneous exposure on higher-order networks", *Phys. Rev. Lett.*, vol. 127, p. 158 301, 15 Oct. 2021.

[5] **H. Sun** and G. Bianconi, "Higher-order percolation processes on multiplex hypergraphs", *Phys. Rev. E*, vol. 104, p. 034 306, 3 Sep. 2021.

[6] **H. Sun**, D. Saad, and A. Y. Lokhov, "Competition, collaboration, and optimization in multiple interacting spreading processes", *Phys. Rev. X*, vol. 11, p. 011 048, 1 Mar. 2021.

[7] **H. Sun**, R. M. Ziff, and G. Bianconi, "Renormalization group theory of percolation on pseudofractal simplicial and cell complexes", *Phys. Rev. E*, vol. 102, p. 012 308, 1 Jul. 2020.