Xue Gong

✉ X.Gong-8@sms.ed.ac.uk | 🎓 Scholar

Education

The University of Edinburgh *Edinburgh, UK*
PhD in Applied Mathematics *Sep 2019 - Nov 2023*
- MAC-MIGS CDT scholarship, Doctoral Training Programme with Integrated Study in Mathematical Modelling, Analysis and Computation
- **Supervisors**: Des Higham, Kostas Zygalakis
- **Research Interests:** Graph-based algorithms, Graph models, Node embedding, Spectral clustering, Graph mining, Learning on graphs

National University of Singapore *Singapore*
M.Sc in Statistics (Honours with Distinction) *2017 - 2019*

Nanyang Technological University *Singapore*
BSc (Hons) in Physics (First Class Honours) *2011 - 2015*
- Dean's List (top 5% of cohort)
- Singapore Government Merit Undergraduate Scholarship

Awards

Turing Enrichment Award *London, UK*
Alan Turing Institute *Oct 2022*
Offer PhD students the opportunity to enrich and enhance their current research by accessing the facilities and opportunities available at The Alan Turing Institute and its partners as well as a grant to undertake research activity.

Associate Fellowship *UK*
Advanced Higher Education *Sep 2022*
In recognition of attainment against the UK Professional Standards Framework for teaching and learning support in higher education

Outstanding Talk Award *Online*
SIAM Workshop on Network Science (NS22) *Sep 2022*

Teaching Award *UK*
The University of Edinburgh *Sep 2022*

Laura Wisewell Travel Scholarship *UK*
The University of Edinburgh *Jun 2022*

MATH+ Thematic Einstein Semester Summer School Travel Award *Germany*
Zuse Institute Berlin *Jun 2022*

MAC-MIGS Travel Fund *UK*
EPSRC *2019 - 2023*

MAC-MIGS CDT Scholarship (Fully Funded) *UK*
EPSRC *2019*

Dean's List (top 5% of cohort) *Singapore*
Nanyang Technological University *2014*

Singapore Government Merit Undergraduate Scholarship (Fully Funded) *Singapore*
Ministry of Education of Singapore *2011*

Publications

- **Gong, X.**, Higham, D.J. and Zygalakis, K. Generative hypergraph models and spectral embedding. *Scientific Report* 13, 540 (2023). https://doi.org/10.1038/s41598-023-27565-9

- **Gong, X.**, Higham, D.J. and Zygalakis, K., 2021. Directed network Laplacians and random graph models. *Royal Society open science*, 8(10), p.211144.

- Lu, X., Utama, M.I.B., Lin, J., **Gong, X.**, Zhang, J., Zhao, Y., Pantelides, S.T., Wang, J., Dong, Z., Liu, Z. and Zhou, W., 2014. Large-area synthesis of monolayer and few-layer MoSe2 films on SiO2 substrates. *Nano letters*, 14(5), pp.2419-2425.

Talks & Presentations

Conference on Complex Systems 2022 (CCS 2022) — *Palma de Mallorca, Spain*
Poster Presentation, *"Spectral Embedding and Associated Generative Models for Hypergraphs"* — *Oct 2022*

SIAM Workshop on Network Science — *Online*
Outstanding Talk Award, Lightning Talk, *"Generative Hypergraph Models and Spectral Embedding"* — *Sep 2022*

4th IMA Conference on The Mathematical Challenges of Big Data — *Oxford, UK*
Contributed Talk, *"Hypergraph Generative Models and Associated Spectral Embedding Algorithms"* — *Sep 2022*

Conference on Network Science (NetSci) — *Online*
Contributed Talk, "Hypergraph Generative Models and Associated Laplacians" — *Jul 2022*

AAAI 2022 Workshop on Graphs and More Complex Structures for Learning and Reasoning — *UK*
Short Paper, "Visualizing and Quantifying Linear and Periodic Structures in Directed Networks" — *Feb 2022*

Oxford Network Seminar — *Online*
Seminar Talk, "Random Graph Interpretation of Directed Graph Laplacians" — *Dec 2021*

10th International Conference on Complex Networks & Their Applications — *Online*
Contributed Talk, "Random Graph Interpretation of Directed Graph Laplacians" — *Nov 2021*

Conference on Complex Systems — *Online*
Contributed Talk, "Directed Random Graph Models and Their Associated Laplacians" — *Oct 2021*

Oxford-Warwick-Edinburgh Network Science Workshop — *Online*
Contributed Talk, "Mapping Directed Networks Using the Magnetic Laplacian" — *Mar 2021*

Cambridge Joint CDT Student Conference — *Online*
Contributed Talk, "Mapping Directed Networks Using the Magnetic Laplacian" — *Dec 2020*

Events Participation

Jun 2022	**Mathematics of Complex Social Systems Summer School**, Participant	*Berlin, Germany*
Jul 2021	**Networks 2021 (Joint Sunbelt and NetSci Conference)**, Participant	*Online*
Jun 2021	**SIAM-IMA Edinburgh - Study Group with Industry**, Participant in the project "Generating Irregular Sequences for Seismic Imaging Problems"	*Online*
Dec 2020	**Conference on Complex Systems 2020 (CCS 2020) online**, Participant	*Online*
Sep 2020	**Agrifood Data Study Group: Evaluating the UK's resilience to supply chain shocks**, Participant	*Online*
May 2020	**ICMS and MAC-MIGS Modelling Camp 2020**, Participant	*Edinburgh, UK*

Teaching Experience

MATH08058 Calculus and its Applications — *The University of Edinburgh*
Tutor and Marker — *Spring 2022*
- An undergraduate course offered to College of Science and Engineering students to develop calculus skills
- Facilitated weekly problem-solving tutorials, marked assignments and final exams

MATH11197 Research Skills for Computational and Applied Mathematics — *The University of Edinburgh*
Tutor and Marker — *Fall 2020*
- A Master's level course to develop research skills through a set of programming exercises, workshops and group projects
- Facilitated programming workshops, soft-skill workshops; marked programming assignments and final reports

School of Physical and Mathematical Sciences Learning Centre — *Nanyang Technological University*
Peer Tutor — *2014*
- One-to-one tutoring with undergraduate students on Fluid Mechanics, Classical Mechanics, Quantum Mechanics, and experiment modules

Research Projects

Directed Laplacian on Simplicial Complexes — *Edinburgh, UK*
Turing Enrichment Scheme — *Aug 2022 - Now*
- **Collaborators**: Ginestra Bianconi, Desmond Higham ,Konstantinos Zygalakis
- Developed theories for directed simplicial complexes
- Extended directed graph Laplacian such as the Magnetic Laplacian to higher-order graphs

Spectral Embedding and Generative Hypergraph Models
Edinburgh, UK
The University of Edinburgh
Aug 2021 - Aug 2022
- **Supervisors**: Desmond Higham ,Konstantinos Zygalakis
- Studied spectral algorithms for hypergraphs that captures higher-order interactions
- Established the connection between novel random graph models and spectral algorithms
- Performed numerical experiments on synthetic and real hypergraph from social sciences for node embedding, clustering, and link prediction

Visualizing and Quantifying Structures in Directed Networks
Edinburgh, UK
The University of Edinburgh
May 2020 - Aug 2021
- **Supervisors**: Desmond Higham ,Konstantinos Zygalakis
- Analyzed spectral algorithms for clustering and mapping directed graphs
- Derive associated random graph models and proposed workflow for comparing structures based on the models
- Ran experiments on synthetic and real networks from ecology, biology and social sciences for graph visualization and structure recovery

Efficient Approximation of Pricing Functions
Edinburgh, UK
The University of Edinburgh
Jan - Mar 2020
- **Supervisors**: Aretha Teckentrup, Abdul-Lateef Haji-Ali
- Enhanced the efficiency of option price estimation by by generating training data using multi-level Monte Carlo, and estimating price function using Gaussian process regression

Opinion Dynamics
Edinburgh, UK
The University of Edinburgh
Oct - Dec 2019
- **Supervisor**: Ben Goddard
- Simulated and studied the behaviors of opinion dynamics models including the voter model, the Deffuant model and the HK model

Modified Dealer's Model for the Electricity Market
Singapore
Nanyang Technological University
Aug 2014- May 2015
- **Supervisor**: Cheong Siew Ann
- Modelled the spiking behaviour of the electricity market using modified dealer's model; studied the spike statistics and the impact of model parameters

The Minority Game Model
Singapore
Nanyang Technological University
Jun 2012 - Aug 2012
- **Supervisor**: Chew Lock Yue
- Simulated the dynamics of a system using the Minority Game Model and studied the influence of agent memory and strategy pool on the volatility of the system

EVENTS CO-ORGANIZED

MAC-MIGS Research Afternoon on Learning Complex Structures on Graphs
Edinburgh, UK
MAC-MIGS CDT
Jul 2022
Invited speakers to present recent advances in the research on learning graph structures, such as clustering and structure recovery on graphs and hypergraphs

Networks Book Club
Online
2021- 2022
Held regular online meetings to discuss books and topics on network science, such as graph representation learning, dynamics and modularity on graphs, and natural language processing

Networks Reading Group
Edinburgh, UK
The University of Edinburgh
2022 - Now
Ran regular face-to-face meetings in Edinburgh to discuss papers on graphs and networks covering topics such as graph neural networks, community detection, and spectral clustering

Reviewer

Neurocomputing

PROFESSIONAL SOCIETIES

Society for Industrial and Applied Mathematics

The Institute of Mathematics and its Applications

Other Experience

Quantitative Analyst
Singapore
Rio Tinto
Apr 2017 - Jul 2019
Built statistical models such as time series forecasting; designed optimization model for planning and scheduling

Geophysicist   *Singapore*

CGG   *Jul 2015 - Apr 2017*

Performed seismic image processing using techniques such as inversion algorithm, wave equation, and signal processing

Skills

Programming	Python, Matlab R, C/C++, HTML/CSS, SQL
Miscellaneous	Linux, Shell, LaTeX, Tableau, Power BI, Git
Languages	English, Chinese

Languages

English	Professional proficiency
Chinese	Native proficiency