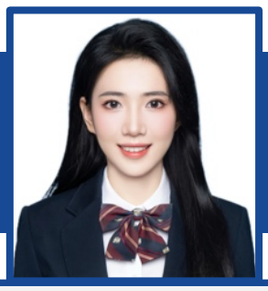

Jialing (Lynn) Dai

Richardson, TX
Email: daijialing20@mails.ucas.ac.cn
Webpage: https://gagarindjl.github.io

Research Interests

Influence Maximization; Social Network Analysis; Optimization Algorithms; Data-driven Decision Making; Reinforcement Learning

Research Summary

Research on group-aware diffusion and influence maximization beyond classical submodularity: **modeling** group mechanisms and their impact on objectives, **proving** hardness and approximation results, and developing scalable **algorithms** that combine approximation and learning-based approaches, supported by reproducible large-scale **experiments**.

Education

Ph.D. in Computer Science, University of Chinese Academy of Sciences (UCAS) **Beijing, China**
Advisor: Prof. Jianming Zhu *Sep. 2020 - Expected Jun. 2026*
Honors: GPA: 3.83/4.00
Dissertation: Modeling Group Opinion Dynamics and Designing Influence Optimization Algorithms in Social Networks

Visiting Researcher, University of Texas at Dallas (UTD) **Richardson, TX**
Advisor: Prof. Weili Wu, Prof. Ding-Zhu Du *Jan. 2025 – Expected Jan. 2026*

Bachelor of Management, Information Systems, Beijing University of Chemical Technology (BUCT) **Beijing, China**
Honors: GPA 4.0/4.33 (92.68/100), **Ranked 1st** in major *Sep.2016 – Jun. 2020*

Research Experience

- **Opinion Influence Maximization under Group Polarization** *Information Sciences,* 2022 First author
  - Built a real-world OSN dataset with a **Python crawler + MongoDB** storage (50 threads, 127,178 replies; ~2,595 replies/thread), enabling the **first empirical detection and operational modeling** of group-level polarization on OSN data.
  - Proposed an enhanced independent-cascade model with **preference updates** to capture **shock/aversion** when persuasive exposure meets large preference gaps. Designed GEIM algorithm (structure-aware candidate selection with seed adjustment) and derived a **closed-form, per-iteration Signed-LAIM update rule** from the preference dynamics.
  - Showed that **initial preference** and **group size** crucially shape polarization; for **extreme groups**, wider propagation can **backfire** and reduce the objective.
- **Competitive Net Influence under Intergroup Debate** *Information Sciences*, 2024 First author
  - Modeled **inter-group debate** with the **IDIC** model using a **hypergraph coupling** between group-consensus and member nodes; formalized a competitive net-influence objective.
  - Proved NP-hard, non-submodularity, even bound objectives are #P-hard to evaluate. Introduced HCIC model with t**ype-dependent** activation probabilities used to construct **submodular upper and lower bounds** for the objective.
  - Designed **heterogeneous competitive influence sampling** to estimate bounds. Built a **greedy solver** with **sampling refinements, tailored data structures, lazy gains, and pruning**; integrated an efficient reverse-sampling evaluation stack.
  - Used a **Sandwich** framework to obtain and analyze approximate solutions with **data-dependent guarantees**, showed efficiency on simulated and real datasets.
  - Revealed that **stronger group cohesion** yields **larger information explosions** during intergroup debate, consistent with **social identity theory**.
- **Net Positive Activity in Signed Networks** *Chinese Journal of Management Science*, 2025 First author
  - Formulated a **Signed** Independent Cascade model with a net-positive activity objective where **activity** measures **edge-level** information amount rather than node counts.
  - Converted a non-submodular objective into a **path-based submodular surrogate**, enabling maximum-coverage greedy with **CELF acceleration**; produced signed-aware diagnostics and ablation studies.
  - Demonstrated that “reaching more users” is not always beneficial; **wider coverage can induce negative word-of-mouth.**
- **Unified Group-aware Influence Propagation (UGIP) and UG-DCGNN** *IEEE/ACM TON*, under review First author
  - Prior studies—often introduce **problem-specific** diffusion variants with bespoke solvers. Addressed fragmentation by a **unified parameterization** (**UGIP**) that subsumes echo-chamber, homophily, topic-aware, and other group mechanisms; identified violations of submodularity/supermodularity and proved constant-factor inapproximability in certain settings.
  - Introduced **UG-DCGNN**, an **end-to-end DDQN with coupled GNNs** that injects group evidence via **IP+IGF** before message passing, **predicts marginal gains directly**, and **avoids Monte-Carlo at inference**; encoder complexity **near-linear** in |E| with an **O(K|V|)** decision head. Ablations verify the group channel and multi-step aggregation.

Across these first-author papers, **I led end-to-end work — from conceptualization and modeling to algorithm design/proofs, implementation, experiments/ablations, visualization, and writing.**

Analysis & toolkit: reductions for NP/#P hardness, approximation-ratio analyses, and submodular/supermodular reasoning; Python/PyTorch/NetworkX, web crawling, MongoDB, deterministic seeds & multi-process evaluation, reverse-/Monte-Carlo sampling, and CELF-accelerated greedy.

Journal Publications

[1] **Jialing Dai**, Yisheng Zhou, Yefeng Sun, Jianming Zhu, Weili Wu.
"Unified Group-Aware Influence Maximization with Generalized Deep Reinforcement Learning."
IEEE/ACM Transactions on Networking (TON), (**JCR Q1, JIF=3.6**), **under review**.

[2] **Jialing Dai**, Jianming Zhu, Guoqing Wang.
"Competitive net influence maximization on intergroup debate effect."
Information Sciences, 2024 (**JCR Q1, JIF=6.8**), vol. 680, p. 121139, https://doi.org/10.1016/j.ins.2024.121139.

[3] **Jialing Dai**, Jianming Zhu, Guoqing Wang.
"Opinion influence maximization problem in online social networks based on group polarization effect."
Information Sciences, 2022 (**JCR Q1, JIF=8.1**), vol. 609, pp. 195-214, https://doi.org/10.1016/j.ins.2022.07.086.

[4] **Jialing Dai**, Jianming Zhu, Guoqing Wang, Jun Huang.
"Net positive information diffusion activity maximizing in signed online social networks."
Chinese Journal of Management Science, 2025 (in Chinese with English Abstract, Chinese Social Sciences Citation Index: **CSSCI**), vol. 33, no. 03, pp. 139-150 ,https://doi.org/10.16381/j.cnki.issn1003-207x.2022.0173.

[5] Yefeng Sun, **Jialing Dai**, Liang Gong, Gao Bishu, Jinghan Cai, Gengjie Lin, Jiayu Chen, Yanming Li, Chengliang Liu.
"A Robust Semantic-Enhanced Framework for Multi-Robot SLAM Merging in Orchard."
IEEE Transactions on Robotics (T-RO), (**JCR Q1, JIF=10.5**), **under review**.

Conference Proceedings

[6] Yefeng Sun, Liang Gong, **Jialing Dai**, Bishu Gao, Jinghan Cai, Gengjie Lin, Fabien Moutarde, Junguo Lu, Chengliang Liu.
"S^2BEV: Lightweight, Robust, and Precise SLAM-Oriented Segmentation Bird Eye's View Mapping Approach."
IEEE International Conference on Robotics and Automation (ICRA 2025), Atlanta, GA, USA, 2025, pp. 13160-13165, https://doi.org/10.1109/ICRA55743.2025.11127686.

[7] "Manuscript on multi-robot coordination and cloud-based control", **under double-blind review**.

Teaching Experience

Teaching Assistant, UCAS— School of Engineering Sciences *Sep. 2020 - Expected Jun. 2026*

Mathematical Methods and Its Applications in Management	2 TAs / 127 students
Accounting and Cost Management	1 TA / 74 students
Human Factors Engineering	1 TA / 14 students

Assisted in tutorials, case discussions, and project mentoring; prepared assignments and rubrics; graded homework and exams; held office hours and provided logistical and technical support.

Graduate Program Secretary, UCAS *2022-2023*

Coordinated proposal defenses for Master of Engineering Management; managed schedules, documentation, and minutes. Served as secretary for master's thesis defenses and graduate admissions interviews at the school level

Library Assistant, UCAS Yuquan Road Library *2021–2023*

Provided information assistance; supported instructional services and academic resource curation.

Peer Instructor / Lecturer, BUCT Peer Academic Development Center *2018–2020*

Conducted peer-instruction sessions and academic seminars for undergraduates.

Courses Prepared to Teach

- **Data Science & Analytics** — Data Mining, Machine Learning, Python for Data Science, Database Systems, Data Visualization
- **Optimization & OR** — Optimization Models, Decision Analytics, Network and Graph Algorithms, Combinatorial Optimization
- **Networks & Computational Social Systems** — Social Network Analysis, Influence and Diffusion Modeling, Network Science
- **Foundations** — Algorithms and Data Structures, Probability and Statistics, Research Methods for Engineering Management

Projects

- **Faculty-Supervised Contributions** Graduate, uncredited

- **Safety Violation Analytics for Power-Grid Construction** Student Project Coordinator
  UCAS × State Grid Henan Electric Power Research Institute *Oct. 2022.10 – Dec. 2022*
  Led a **6-member** student team; built a **hierarchical taxonomy** and a **labeled dataset** (1,498 cases).
  Ran **association** and **clustering** analyses; drafted targeted management recommendations.

- **Accident-Tree Modeling: Methods and Applications** Student Co-Lead
  Department of Emergency Management *May. 2022 – Apr.2023*
  Developed a **hazard root-tracing ("source tree")** approach based on fault-tree analysis.
  Completed **multi-case studies** and authored substantial sections of the final report.

- **Book & Translation Contributions** Under advisor supervision (uncredited)

- **Quantitative Analysis: Models and Methods**, in editorial review (forthcoming) *Dec. 2024 – Oct. 2025*
  Drafted and expanded Chapters 1–2 from the advisor's 44-page draft to 55 pages, refining structure and examples; coordinated compilation and formatting, integrating inputs from seven students and unifying references and symbols.

- **Model, Algorithm, Applications of Information Dissemination in Online Social Networks**, published *May.2024 – Jul.2024*
  Wrote Chapter 7, section 2 - 3, text and figures; delivered a camera-ready chapter per house style.

Projects Continued

- **Chinese translation of Introduction to Operations Research (11th ed.)** *Nov. 2023 – Dec. 2023*
  Contributing translator for Chapter 9 (Integer Programming) and Chapter 10 (Heuristics Algorithm) using LaTeX.

- **Selected Applied Projects** Undergraduate

- **Undergraduate Thesis: Multi-Objective Flexible Job-Shop Scheduling (FJSP) — BUCT** *Jun. 2020*
  Built and analyzed an improved **NSGA-II** for multi-objective FJSP with niche retention and elitism, adaptive operators, and greedy initialization; implemented in **MATLAB** with **Gantt-based diagnostics** and **Pareto-front** (C-metric) evaluation.
- **Periodic RGV Scheduling with Improved GA — Course paper** *Jun. 2019*
  Encoded tool allocation, vehicle sequencing, and batch size; introduced **niche, population migration, and punctuated-equilibrium strategies**; showed clear improvement over a vanilla GA baseline.
- **Hadoop "Data Wall" — China College Service Outsourcing Contest** Dec. 2018 – Apr. 2019
  Project lead; set up pseudo-distributed Hadoop, built ETL to MySQL, and delivered an interactive dashboard demo.
- **Mathematical Modeling Contests — BUCT** *2017 – 2019*
  Auxiliary co-modeler and **coder** in three-person teams; implemented **cellular automata** for SIS-style opioid spread modeling and an **SVM-based** traffic-congestion predictor using **MATLAB**; received campus awards.
- **National University of Singapore — Research visit** *Feb. 2019*
  Azure Face API / classification pipeline: completed model setup and evaluation; issued certificate of completion.
  iSpace entrepreneurship project: co-developed an AI concept demo; won first prize in a team entrepreneurship competition.
- **Advisor-Selection Web System — Course project, B/S architecture** *Jun. 2018 – Jul. 2018*
  End-to-end Java (JSP/Servlet) + MySQL web system for student–advisor matching: front-end forms & validation, database schema & persistence, role-based access, preference submission & matching workflow, basic CRUD operations.
- **Financial Distress Warning (SOM-BP) — Course paper** *May. 2019*
  Combined Information Gain/ReliefF with SOM pre-selection and BP classification; reported accuracy/precision/recall improvements over BP/SVM/Logistic/DT.
- **"Budding Cup" Innovation and Academic Essay — BUCT** 2017 – 2018
  Team lead for market analysis and contributor on differentiated marketing; received two **Excellent Work awards**.

Service & Leadership

Peer Reviewer
IEEE Transactions on Computational Social Systems (T-CSS); World Wide Web Journal (WWW)

President of the Graduate Student Union *Sep. 2021 - Jul. 2022*
School of Engineering Sciences, UCAS

Class President
Class 9003, School of Engineering Sciences, UCAS *Sep. 2021 - Jul. 2022*
Class Information Systems 1602, College of Economic and Management, BUCT *Sep. 2018 - Jul. 2020*

Minister of Organization Department *Sep. 2017 - Jul. 2018*
Student Union, College of Economic and Management, BUCT

Head of Volunteer Association *Sep. 2017 - Jul. 2018*
College of Economic and Management, BUCT

Awards & Honors

National Young Talent Support Project China Association for Science and Technology (CAST)
Doctoral Fellowship, National-Level Program, First Cohort *Dec. 2024*

National Scholarship Ministry of Education (China)
Graduate, National Top Scholar Honor *Dec. 2022*
Undergraduate, National Top Scholar Honor *Dec. 2019*
Undergraduate, National Top Scholar Honor Nov. *2018*

Outstanding Graduate of Beijing Beijing Municipal Education Commission
Regional -level Honor *Jul. 2020*

Outstanding Young Scholar Paper (Second Prize) International Symposium on Emergency Management (ISEM)
First-author paper presented at International Conference *Dec. 2021*

Merit Student (×3); Excellent Student Leader (×2)
University of Chinese Academy of Sciences (UCAS) *Jul. 2022 - Jul. 2023*
Beijing University of Chemical Technology (BUCT) *Dec. 2017 - Nov. 2018*

Skills

- **Data & Systems Analytics**: Reproducible pipelines (Git · Linux · Conda · Jupyter); Monte-Carlo evaluation & experiment tracking; data management & reporting (SQL Server · SPSS); deployment on Azure.
- **Programming & Tools: Python** (PyTorch, NetworkX, NumPy/Pandas), MATLAB, C, Java, LaTeX, Git, Linux, Matplotlib.
- **Language**: Fluent in both English and Mandarin, enabling seamless communication in diverse settings .