



## RESEARCH INTERESTS

Broadly interested in **Algorithmic Game Theory** and **Optimization**, with a focus on their integration and application in:

- **Computational Economics (EconCS)**: Mechanism design in e-commerce systems (e.g., ad auctions, attribution), Online Matching, and market design for Generative AI (pricing, billing).
- **Large Language Models (LLMs)**: System optimization (e.g., routing, scheduling, token allocation), strategic multi-agent systems, and applying LLMs to facilitate problem formalization and the computation of equilibria in complex systems.

## EDUCATION

**Renmin University of China (RUC)**, Gaoling School of Artificial Intelligence, Beijing, China

- Bachelor of Engineering in Artificial Intelligence (Honors Program) *Sept. 2022-Jun. 2026 (Expected)*
- **GPA**: 3.93 / 4.00 (**Rank**: 1/61 in Sophomore & Junior years)
- **Selected Courses**: Optimization Theory and Methodology (HONORS COURSE) (99), Game Theory (98), Math Foundation of Artificial Intelligence (HONORS COURSE) (97), Introduction to Deep Learning (HONORS) (95), Introduction to NLP (93), *Networks, Crowds, and Markets* (98), Computational Economics(97)

## PUBLICATIONS

- [1] **Nan An**<sup>\*</sup>, Weian Li<sup>\*</sup>, Qi Qi<sup>†</sup>, Liang Zhang. [Merging Mechanisms for Ads and Organic Items in E-commerce Platforms](#). In Proc. of the 39th AAAI Conference on Artificial Intelligence (AAAI 2025), **Oral presentation (4.6%)**
- [2] **Nan An**, Weian Li, Qi Qi<sup>†</sup>, Changyuan Yu, Liang Zhang. [Beyond Last-Click: An Optimal Mechanism for Ad Attribution](#). In Proc. of the 39th Annual Conference on Neural Information Processing Systems (NeurIPS 2025), **Poster**

## RESEARCH EXPERIENCE

*Research Assistant @ RUC-EconCS Lab, (Advisor: Prof. Qi Qi)*

**Merging Mechanisms for Ads and Organic Items (AAAI 2025 Oral)** *May 2024- Dec. 2024*

- **Core Insight**: Designed the first IC & IR mechanisms (G-FIX & G-CHANGE) to **unify** ad auctions and organic recommendations in **multi-slot settings**, balancing revenue and user experience under a **no-repetition** constraint.
- Proved novel **necessary conditions for optimality** and discovered the critical **partial order relation** that organic items must satisfy in the base setting (3 items, 2 slots).
- Designed and analyzed G-FIX (a  $(4/5)^3$ -**approximation** in base settings and a near-optimal mechanism under assumptions) and G-CHANGE (the provably **optimal** mechanism in base settings and a **1/2-approximation** generally).
- Drafted core sections on mechanism characterization, G-FIX, and G-CHANGE.

**Beyond Last-Click: An Optimal Mechanism for Ad Attribution (NeurIPS 2025)** *Nov. 2024- Sep. 2025*

- **Core Insight**: Addressed the incentive misalignment in the standard Last-Click Mechanism (LCM) by modeling ad attribution as a **Game-Theoretic** problem. Proposed the **Peer-Validated Mechanism (PVM)**, leveraging **Information Elicitation** principles to enforce truthful reporting and maximize attribution accuracy, **while ensuring fairness**.
- Constructed rigorous **worst-case counterexamples** for LCM. Proved its accuracy **drops to 0** in heterogeneous settings and **decays exponentially** in homogeneous settings (specifically **0.3431** for  $n = 2$ , which is **tight**).
- Designed PVM and **proved it guarantees fairness** and is the **optimal DSIC** mechanism in homogeneous settings (accuracy decays at  $O(1/n)$ ). Established a robust accuracy lower bound of  $(19/27)^{\lceil \log_2 n \rceil}$  in heterogeneous settings (achieving **tight** worst-case accuracy of  $19/27 \approx 0.7037$  for  $n = 2$ , compared to LCM's 0).
- Designed and executed the **full experimental pipeline** using real-world click data to empirically validate PVM's advantages.

INDUSTRY EXPERIENCE

Dynamic Multi-Channel Budget Allocation Strategy

Industry-Academia Collaborative Project @ A Leading Tech Company in China Aug. 2025 – Present

- **Industry Problem:** The inefficiency of static budget allocation for **multiple campaigns** in **dynamic markets**, characterized by **premature stopping** (for high-quality sub-campaigns) and **low utilization** (for low-quality sub-campaigns).
- **Our Goal:** Designing an **Online Algorithm** for **real-time budget redistribution** across heterogeneous sub-campaigns with distinct ROI targets, aiming to maximize **total delivery rate** while strictly satisfying performance boundaries..

SELECTED PROJECTS

LLM-based Multi-Agent Simulation: Simulation and Analysis of Socio-Economic Behaviors

Course Project: Networks, Crowds, and Markets (Grade 98/100, GPA: 4.0/4.0) Fall 2024

- Built an **LLM-based multi-agent system** to simulate Triadic Closure, Information Cascades, and Auction Mechanisms
- Validated whether agents exhibit behaviors consistent with theoretical expectations

Intelligent Q&A System with RAG and LoRA Fine-tuning

Course Project: Introduction to Natural Language Processing (Grade: 93/100, GPA 4.0/4.0) Spring 2025

- Developed a vertical-domain Q&A system based on **Qwen2.5-7B-Instruct**
- Implemented a **RAG pipeline** with People's Daily corpus for factual grounding
- Applied **LoRA** for efficient fine-tuning on open-ended generation

Multimodal Video Clickbait Detection and Rectification System

National Undergraduate Innovation and Entrepreneurship Training Program (Grant: CNY 20,000) May 2024- Apr. 2025

- Developed a **multimodal** framework to detect clickbait
- Utilized **LLM agents** to provide **interpretability** and automatically **generate** rectified **titles/covers**.

HONORS & AWARDS

- 2025
- **National Scholarship** for Undergraduate Students (*Highest Honor for Undergraduates in China*)
  - “Leading” Scholarship from the Gaoling School of Artificial Intelligence (Academic Excellence)
  - RUC “Qiushi Academic” International Outreach Fund
- 2024
- **National First Prize**, China Undergraduate Mathematical Contest in Modeling (*Top 0.5% Nationwide*)
  - Outstanding Scholarship for Academic Excellence (JD Scholarship) (*Top 2%*)
- 2023
- First-Class Scholarship for Academic Excellence (*Top 5%*)
  - “Outstanding Student” Honor Award

ACADEMIC SERVICE

- **Reviewer:** The 25th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2026)
- **Speaker:** Mathematical Modeling Contest Strategy Seminar, Renmin University of China (2025)
- **Speaker:** Research Experience Sharing Session, 2025 Gaoling AI "Leading" Program kickoff ceremony.

SKILLS

Programming Languages: C/C++, Python  
Languages: English (TOEFL 106, GRE 324), Chinese (Native)

