

# Luise Ge (Haijing)

g.luise@wustl.edu

1 Brookings Dr, St. Louis, MO 63130, USA

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## EDUCATION

**Washington University in St Louis**, MO, USA, 2023–

*P.h.D.* Computer Science

Interested in computational learning theory Advisor: Prof. Yevgeny Vorobeychik

**Imperial College London**, UK, 2022–23

*MSc.*, Pure Mathematics, Distinction

Thesis title: Introduction to toric varieties Advisor: Prof. Paolo Cascini

**University of Edinburgh**, UK, 2018–2022

*BSc. (Hons)*, Artificial Intelligence and Mathematics, First Class

Thesis title: Fair allocation: implementing and evaluating an algorithm for competitive allocation of chores, Advisor: Prof. Kousha Etessami

## Research Interests

Multi-agent system, Computational Social Choice, Mechanism Design, Game theory, Learning Theory, Reasoning and Decision making

## Publications

Ge. L. , Juba. B. , Vorobeychik. Y.(2024). Learning Linear Utility Functions From Pairwise Preference Queries (Under Review)

## AWARDS

**Cox Fellowship**, McKelvey School of Engineering, Washington University in St Louis  
**Best Final-Year Performance by Woman Student**, School of Informatics, University of Edinburgh

**Outstanding Honours Project**, School of Informatics, University of Edinburgh

**Exchange to California Institute of Technology**(cancelled due to Covid-19), University of Edinburgh

## PAST CS RESEARCH PROJECTS

**Implementing and evaluating an algorithm for fair allocation of chores**

Laboratory for Foundations of Computer Science, Edinburgh University

Computing competitive allocation for chores is difficult as the solutions can be wildly multi-valued and discontinuous, corresponding to all critical points of Nash Social Welfare on the Pareto frontier. I implemented the complicated algorithm which has three stages, involving different classes for graphs and agents, and about eight sub-algorithms; Explored the implementation's feasibility, surrounding four different themes, namely integrity and privacy, time complexity, incentive compatibility, and the situation of having no solution or multiple solutions; Improved the algorithm hugely by adopting different tricks, found the algorithm is still very hard to compute after both the numbers of agents and chores reach five even after the improvement; Showed that integrity and privacy can be maintained during the process, and incentives for lying can be partially restrained.

**Investigating the structure of small compact category with applications to the category-based cryptography**

Laboratory for Foundations of Computer Science, Edinburgh University

Understood the basics of quantum computing and category theory; Suggested original public key encryption protocol based on category's universal properties; Wrote programs using the computational discrete algebra software GAP to test different category properties, and computed all the categories with up to seven morphisms based on semigroups.

**Probabilistic modelling patients' activities of daily lives (ADL) and interactions with the carers with the aim to promote care setting's efficiency.**

Laboratory for Foundations of Computer Science and Advanced Care Research Centre, Edinburgh University

Grasped stochastic calculi PEPA, Bio-PEPA as well as the graph modelling language Petri Net Using real sensor data and care plans provided by our collaborators, categorised patients and carers to different types and modelled their 24-hour routines Conducted Markov analysis and simulations on different models, proved our model's effectiveness.

**Analysing the dynamics of deep neural networks using chaos theory**

Mathematics Department, Oxford University

Self-taught chaos theory and bifurcation theory; Familiarised with TensorFlow's automatic differentiation function; Built experiments to compare different DNNs' Lyapunov spectra

**TEACHING EXPERIENCE**

**Tutor, Demonstrator, Marker**  
2019-2022

University of Edinburgh  
School of Informatics

Cognitive Science, Demonstrator, Jan-May 21,22  
Introduction to Algorithms and Data Structure, Tutor, Sep 20-May 21  
Introduction to Computation and Logic, Tutor, Sep-Dec 2020  
Functional Programming, Marker, Dec 2019

**LEADERSHIP AND OUTREACH**

**Student Representative** Imperial College London  
**Edinburgh Award - Volunteering** (Worked as a befriender with the isolated elderly for 1.5 years)  
**Member of Beneficiary AI society, Sustainable Development Association**  
**Edinburgh Award - Change Agents** (Engaged in collaborative research for circular economy)

**PROFESSIONAL EXPERIENCES**

**Technology Spring Insight**  
April 2019

Morgan Stanley  
Glasgow,Scotland