

Siyuan Guo

PHD STUDENT · CAMBRIDGE-TÜBINGEN FELLOWSHIP IN MACHINE LEARNING

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Research Summary

My research focuses on data-centric machine learning and understanding causality in exchangeable data (causal exchangeability) and transferring knowledge in multiple environments. I am also interested in reasoning in language models.

Education

University of Cambridge & Max Planck Institute for Intelligent Systems

UK, Germany

PHD IN COMPUTER SCIENCE

2021 - present

- Advisor: Dr. Ferenc Huszár and Prof. Bernhard Schölkopf

University College London

UK

MSC IN MACHINE LEARNING

2020 - 2021

- Advisor: Prof. Ricardo Silva
- Grade: Distinction

University of Cambridge

UK

BSC AND MMATH IN MATHEMATICS

2015 - 2019

- Undergrad research advisor: Prof. Richard Samworth
- Grade: Distinction

Publications

Siyuan Guo*, Viktor Tóth*, Bernhard Schölkopf, Ferenc Huszár. Causal de Finetti: On the Identification of Invariant Causal Structure in Exchangeable Data. *Advances in Neural Information Processing Systems (NeurIPS)*, 2023.

Siyuan Guo, Jonas Wildberger, Bernhard Schölkopf. Out-of-Variable Generalization for Discriminative Models. *Under review in International Conference on Learning Representations (ICLR)*, 2024.

Ishan Kumar, Zhijing Jin, Ehsan Mokhtarian, **Siyuan Guo**, Yuen Chen, Negar Kiyavash, Mrinmaya Sachan, Bernhard Schölkopf. Causal Impact Index: A Causal Formulation of Citations. *Under review in International Conference on Learning Representations (ICLR)*, 2024.

Jonas Wildberger, **Siyuan Guo**, Arnab Bhattacharyya, Bernhard Schölkopf. On the Interventional Kullback-Leibler Divergence. *Causal Learning and Reasoning (CLear)*, 2023.

Andrei Paleyes*, **Siyuan Guo***, Bernhard Schölkopf, Neil Lawrence. Dataflow graphs as complete causal graphs. *IEEE/ACM 2nd International Conference on AI Engineering-Software Engineering for AI (CAIN)*, 2023.

Limor Gultchin, **Siyuan Guo**, Alan Malek, Silvia Chiappa, Ricardo Silva. 2022. Pragmatic Fairness: Optimizing Policies with Outcome Disparity Control. *NeurIPS Algorithmic Fairness through the Lens of Causality and Privacy Workshop*, 2022.

Siyuan Guo, Soo Ling Lim, Peter Bentley. Teams frightened of failure fail more: modelling reward sensitivity in teamwork. *IEEE Symposium Series on Computational Intelligence (SSCI)*, 2020.

Research Projects

Collaboration

LLM REASONING

July 2023 - Present

- Project on language model reasoning ability. It involves text generation inference and fine-tuning LLMs.

Invited Talks

Siyuan Guo. Moving beyond I.I.D.: Causal de Finetti and OOV Generalization. 2023.
Workshop on Causal Representation Learning, Max Planck Institute for Intelligent Systems.

Siyuan Guo. Causal de Finetti: On the Identification of Invariant Causal Structure in Exchangeable Data. 2022.
Departmental seminar: Computational Statistics & Machine Learning Group (OxCSML), Oxford;
Departmental seminar: Deepmind/ELLIS CSML Seminar Series, UCL;
Causal reading group: Statistical Laboratory, Cambridge;
Invited talk: Causal Science Reading group @ Swarma with over 1000 participants;
Invited talk: Causal Methods in Environmental Sciences (CMES) Workshop;
ELLIS Theory Program Workshop, Italy (Poster);
ELLIS Machine Learning Summer School, Cambridge (Poster)

Mentoring

2023 **Davin Xianjun Choo**, Visiting intern at Max Planck Institute for Intelligent Systems

Outreach & Professional Development

SERVICE

2023 **Workshop on Causal Representation Learning @ MPI** *Germany*
<https://crl-tuebingen-2023.github.io/>, Organizer

2023 **Causal Digital Twins Workshop @ ELLIS unconference**, Organizer *Spain*

Professional Experience

2019-2020 **Quantitative Strategist**, Goldman Sachs Internatioal

Awards, Fellowships, & Grants

2021 **Premium Research Bursary**, University of Cambridge *£15,609*
Cambridge-Tübingen Fellowship, Max Planck Institute *£168,249*
Dean's List, University College London

2015-2018 **Openshaw Prize, Exhibition & Foundation Scholarship**, Queen's College, Cambridge