Lun Ai (lu-en I)

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Research Interests

- Artificial Intelligence (AI), Logic-based AI, Inductive Logic Programming
- Human-AI Partnership, Explainable AI, Ultra-Strong Machine Learning
- AI for Science, Discovery Biology, Active Learning

Education

PhD, Computing Science, **Imperial College London**, UK 28/09/2019 - 01/05/2024

Thesis: Effects of Machine-Learned Logic Theories on Human Comprehension in Machine-Human Teaching

Areas: Explainable AI, Inductive Logic Programming

MEng, Computer Science (Artificial Intelligence), **Imperial College London**, UK 03/10/2015 - 01/08/2019

A-level, New Talent Academy, Beijing, China 09/2012 - 06/2015

Subjects: Physics(A*)/Chemistry(A*)/Further Mathematics(A*)/Pure Mathematics(A+)

Employment

Research Associate, UKRI BBSRC AI Modelling to drive EB, Imperial College London, UK 01/08/2024 -

Integrating AI and biological experimentation with 30k phenotype measurements throughput

Areas: Active Learning, Inductive Logic Programming

Research Assistant, UKRI BBSRC AI-4-EB, Imperial College London, UK 23/10/2022 - 31/07/2024

Developed an AI system to learn 100% accurate gene functions with 90% fewer data

Areas: Active learning, Genome-Scale Metabolic Networks, Inductive Logic Programming

Research Assistant, EU Horizon TAILOR, Imperial College London, UK 19/11/2020 - 22/10/2022

1st demonstration of an AI system that improves human problem-solving and discovery

Areas: Explainable AI, Ultra-Strong Machine Learning, Inductive Logic Programming

Research Support Officer, UKRI EPSRC Network+ HLC, Imperial College London, UK 11/05 - 18/11/2020

Co-organised the 2nd International Joint Conference on Learning and Reasoning (200+ attendees)

Conference site: https://ijclr22.doc.ic.ac.uk/

Software Engineer Intern, Schlumberger Technology Center, Norway 09/04 - 21/09/2018

Developed and deployed a Google Cloud service for geographic analysis parameterisation

Skills: Tensorflow, Pytorch, Google GAE & GCP, Git, Docker, Python, C#, Kubernetes

Software Engineer Part-time, LV8Sports (startup), UK 05/11/2017 - 03/04/2018

Created a prototype of a mobile physical training assistant on the Android platform

Skills: OpenCV, Android, Git, Java, C++

Software Engineer Intern, Yiwei Tech (startup), China 09/07 - 11/09/2016

Built a browser web application for mobile video streaming

Skills: HTML, Javascript, Java

Awards

Travel Award, UKRI EPSRC Network+ HLC, UK 2024

The Best Poster, Department of Computing Poster Competition, Imperial College London, UK 2021

Overall Best Project, Microsoft 3Hack Hackathon, Imperial College London, UK 2017

Entry Scholarship, Imperial College London, UK 2015

Organisation

Postdoctoral Representative, Department of Computing, Imperial College London, UK 2024

Organising Committee, the 2nd International Joint Conference on Learning and Reasoning, IJCLR 2022

Publications

L. Ai, S. H. Muggleton, S.-S. Liang, and G. S. Baldwin, "Active learning of digenic functions with boolean matrix logic programming," the 4th International Joint Conference on Learning & Reasoning (**IJCLR**), Sep. 2024. doi:10.48550/arXiv.2408.14487.

L. Ai, S. H. Muggleton,"Boolean matrix logic programming," **arXiv**, Aug. 2024. doi:10.48550/arXiv.2408.10369 (under review at the **AAAI** Conference on Artificial Intelligence 2025).

L. Ai, S. H. Muggleton, S.-S. Liang, and G. S. Baldwin, "Boolean matrix logic programming for active learning of gene functions in genome-scale metabolic network models," **arXiv**, May. 2024. doi:10.48550/arXiv.2405.06724 (under review at the **Machine Learning** journal).

L. Ai, S. H. Muggleton, S.-S. Liang, and G. S. Baldwin, "Simulating Petri nets with Boolean Matrix Logic Programming," **arXiv**, May. 2024. doi:10.48550/arXiv.2405.11412 (submitted to International Joint Conferences on Artificial Intelligence (**IJCAI**) 2024).

L. Ai, S.-S. Liang, W.-Z. Dai, L. Hallett, S. H. Muggleton, and G. S. Baldwin, "Human comprehensible active learning of genome-scale metabolic networks," **arXiv**, Aug. 2023. doi:10.48550/arXiv.2308.12740 (accepted by **AAAI** Spring Symposium on Computational Approaches to Scientific Discovery, 2023).

L. Ai, J. Langer, S. H. Muggleton and U. Schmid, "Explanatory machine learning for sequential human teaching," **Machine Learning**, 112:3591–3632, Jun. 2023. doi:10.1007/s10994-023-06351-8.

L. Ai, S. H. Muggleton, C. Hocquette, M. Gromowski and U. Schmid, "Beneficial and harmful explanatory machine learning," **Machine Learning**, 110:695-721, Mar. 2021. doi:10.1007/s10994-020-05941-0.

Oral Presentations

Conferences

L. Ai, S.-S. Liang, S. H. Muggleton, and G. S. Baldwin, "A Comprehensible Framework to Active Learning Genome-Scale Metabolic Networks," **AAAI** Fall Symposium on AI for Synthetic Biology, Nov. 2023.

L. Ai, J. Langer, S. H. Muggleton and U. Schmid, "Explanatory machine learning for sequential human teaching," the 3rd International Joint Conference on Learning & Reasoning (**IJCLR**), Nov. 2023.

L. Ai, S.-S. Liang, W.-Z. Dai, L. Hallett, S. H. Muggleton, and G. S. Baldwin, "Human comprehensible active learning of genome-scale metabolic networks," **AAAI** Spring Symposium on Computational Approaches to Scientific Discovery, Mar. 2023.

L. Ai, S. H. Muggleton, C. Hocquette, M. Gromowski and U. Schmid, "Beneficial and harmful explanatory machine learning," the 1st International Joint Conference on Learning and Reasoning (**IJCLR**), Oct. 2021.

L. Ai, S. H. Muggleton, C. Hocquette, M. Gromowski and U. Schmid, "Beneficial and harmful explanatory machine learning," the Conference on Trustworthy AI Through The Integration Of Learning, Optimisation and Reasoning (**TAILOR**), Sep. 2021.

Other

L. Ai, "Effects of explaining machine-learned logic programs for human comprehension and discovery," the Dagstuhl Seminar on Approaches and Applications of Inductive Programming, Dagstuhl, Germany, Nov. 2023.

L. Ai, "Explanatory machine learning for sequential human teaching," Imperial College London explAIn Technical Workshop on Explainable AI, Interactivity, and Natural Language, London, UK, Sep. 2023.

L. Ai, S.-S. Liang, W.-Z. Dai, L. Hallett, S. H. Muggleton, and G. S. Baldwin, "Active Learning of Genome-Scale Metabolic Networks via Abduction," Nanjing University AI Summer School, Jul. 2023.

L. Ai, S.-S. Liang, S. H. Muggleton, and G. S. Baldwin,"AI-4-EB Network Engineering," AI-4-EB AI and Engineering Biology Consortium, London, UK, Apr. 2023.

L. Ai, S. H. Muggleton, "Effects of machine-learned logic theories on human comprehension," Imperial College London Explainable AI Seminar Series, London, UK, Jul. 2022.

L. Ai, S. H. Muggleton, C. Hocquette, M. Gromowski and U. Schmid, "Beneficial and harmful explanatory machine learning," the Dagstuhl Seminar on Approaches and Applications of Inductive Programming, May. 2021.