Kairan ZHAO

MB 4.17 – University of Warwick – Coventry, UK
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Education

University of Warwick **Jan. 2023 - present**
Coventry, UK
- Ph.D. in Computer Science
- Advisors: Prof. Peter Triantafillou
- Research focus: Machine Unlearning, Machine Learning Privacy

Xi'an Jiaotong University **Sep. 2019 - Jun. 2022**
Xi'an, China
- M.Sc. in Control Engineering
- Advisors: Prof. Chao Shen, Prof. Meng Zhang, Prof. Xiaohong Guan
- Member of MOE Key Lab for Intelligent Networks and Network Security
- GPA: 3.72/4.0 (Top 1%)

École Centrale de Lille **Jul. 2017 - Jun. 2019**
Lille, France
- M.Eng. in General Engineering (Diplôme d'Ingénieur Généraliste)
- Double Master's Degree Program

Xi'an Jiaotong University **Sep. 2015 - Jun. 2019**
Xi'an, China
- B.Eng. in Computer Science and Technology

Projects

Understanding Difficulty of Unlearning **Sep. 2023 - May 2024**
- Led the project to comprehend the difficulty of machine unlearning, in collaboration with Google DeepMind
- Identified two key factors affecting unlearning difficulty and the performance of unlearning algorithms, revealed previously-unknown behaviours of state-of-the-art algorithms
- Developed a framework coined Refined-Unlearning Meta-algorithm (RUM) that substantially improves top-performing unlearning algorithms

NeurIPS 2023 Machine Unlearning Competition (Project Page, Kaggle) **May. 2023 - present**
- Served as an organiser of NeurIPS 2023 Machine Unlearning Competition
- Developed unlearning baselines and attack models, with a unified API
- Reviewed participant code submissions for rule compliance and technical precision

Towards Secure and Privacy-Preserving Driver Identification **Oct. 2022 - Nov.2023**
- Proposed a new digital twin attack and analysed its effectiveness against various identification models
- Developed a defence strategy employing key generation, ensuring a low-complexity solution without the need for powerful hardware on the vehicle side

Secure P2P Electricity Trading System for Electric Vehicles **Oct. 2020 - Jun. 2021**
- Proposed a P2P energy trading mechanism based on blockchain to improve demand-response management and intensify the information security
- Employed ensemble learning for energy trading volume prediction, leveraged multi-objective optimization and game theory for effective trading coordination, and integrated transactions into blockchain for secure operations
- Achieved better overall social welfare with better algorithm performance

Blockchain-Based Smart Grid Data Protection System **Jul. 2021 - Nov.2021**
- Proposed a blockchain-based data protection system to ensure data security in the smart grid, including attack simulation, attack detection, and defence modules.
- Developed an ensemble learning model for attack detection, surpassing traditional methods by over 20% in accuracy. Implemented a blockchain mechanism reducing specific attack success rates by 95% and overall attack rates by 17.6%.
- Led the project and successfully applied the system to the national smart grid experimental platform.

Experience

Department of Computer Science, University of Warwick
Senior Teaching Assistant *Oct. 2023 - present*
- CS331 Neural Computing
- CS342 Machine Learning
- CS130 Mathematics for Computer Scientists

SPRITZ Group (Security and Privacy Research Group)
Research Assistant *Jun. 2022 - Nov.2023*
- Advisors: Prof. Mauro Conti, Dr. Alessandro Brighente
- Conducted research on security and privacy in Cyber-Physical Systems

Community Service
- **Programme Committee**: WPCCS (Warwick Postgraduate Colloquium in Computer Science)
- **Reviewer**: NeurIPS 2024, WPCCS, IEEE Robotics & Automation Magazine

Publications & Patents

- **What makes unlearning hard and what to do about it.** Kairan Zhao, Meghdad Kurmanji, George-Octavian Bărbulescu, Eleni Triantafillou, Peter Triantafillou. *arXiv* (link)
- **A Secure Intra-Regional-Inter-Regional Peer-to-Peer Electricity Trading System for Electric Vehicles.** Kairan Zhao, Meng Zhang, Rongxing Lu, Chao Shen. *IEEE Transactions on Vehicular Technology* (*2022*) (link)
- **Blockchain-Enabled EV P2P Electricity Trading Method, System and Equipment.** Meng Zhang, Kairan Zhao, Chao Shen, Xiaohong Guan. *2023122701442020* (link)

Honors & Awards

Computer Science Centre for Doctoral Training and Research Scholarships **2023 – 2027**
- Value: Tuition fees, stipend, travel expenses

Postgraduate Academic Awards **2019 – 2022**
- Excellent Student Leader of the Year (Top 3%)
- First-class Scholarship (Top 5%)

National College Student Innovation & Entrepreneur Competition **2021**
- Bronze medallist (Business Proposal for Intelligent Hotel Management Platform)

"Huawei Cup" 17th China Postgraduate Mathematical Contest in Modeling **2021**
- National Third Prize (EEG Signal Analysis and Discriminant Model)

China Scholarship Council (CSC) Scholarship **2017 – 2019**
- Selected through a rigid academic evaluation process organized by CSC

Undergraduate Academic Awards **2015 – 2017**
- Excellent Student of the Year (Top 5%)
- Outstanding Social/Student Affairs Worker

Extracurricular Activities

Student Staff Liaison Committee (SSLC), University of Warwick **May. 2023 – present**
- Served as a representative of Computer Science PGR (Postgraduate Researcher) SSLC

ITCILO Winter Global Youth Forum 2021 & Internship Training Program **Jan. 2021 – Feb. 2021**
- Participated in training activities with other global youth leaders within International Labour Organization
- Led a team to complete the training project and was selected as "Excellent Group Leader"

Global Governance Course **Nov. 2020 – Jan. 2021**

Advisor: Prof. Slav W. Hermanowicz, UC Berkeley

- Completed the course "Sustainable Development and Entrepreneurship: Ethics, Physics and Technology" with a score of 87/100 and was selected as "Excellent Student"

Sino-French Communication Student Association **Sep. 2019 – Oct. 2020**

- Minister of Literature and Art Department

Volunteer for "Heart to Heart" Organization **Sep. 2015 – Jun. 2017**

- Completed more than 30 hours of volunteer work

Skills

- **Programming Languages & Developer Tools:** Python, CUDA, Matlab, Linux, Git, Java, C, LaTeX, Microsoft Office suite, etc.
- **Libraries:** PyTorch, Keras, Scikit-learn, Pandas, NumPy, Matplotlib, etc.
- **English Skills:** Advanced, 7.5(6.5) on IELTS, 323(V153+Q170) on GRE, 855/990 on TOEIC
- **Other Languages: Mandarin:** Native; **French:** Advanced, C1 on DALF