

Tong Xia

Affiliation: Computer Science and Technology Department, University of Cambridge
Research Interests: Mobile health, Deep learning, Ubiquitous computing, Computing health
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Working Experience

- Sept. 2023 – Sept. 2024 **Research Assistant, University of Cambridge, Cambridge**
- Department of Computer Science and Technology
 - Mobile Systems group, supervised by [Prof. Cecilia Mascolo](#)
 - Funded by European Research Council (ERC) Grant – Horizon 2020
- May. 2019 – Feb. 2020 **Research Intern, Tencent Inc., Beijing, China**
- Map Service, Map Big Data Lab, Tencent Inc.
 - Rhino-Bird Elite Training Program, rewarded as the Best Intern
 - Owning two innovative patents in trajectory modelling and transportation planning

Education

- Oct. 2020 – **Ph.D. Computer Science, University of Cambridge, Cambridge**
- Department of Computer Science and Technology & Queens' College
 - Mobile Systems group, supervised by [Prof. Cecilia Mascolo](#)
 - Member of Women@CS Cambridge
 - Thesis submitted: *Reliable and decentralised deep learning for physiological data.*
- Sept. 2017 – July 2020 **M.Eng. Electronics and Communication Engineering, Tsinghua University**
- Department of Electronic Engineering & Tsinghua Shenzhen International Graduate School, Tsinghua University, supervised by [Prof. Yong Li](#) & [Prof. Qingmin Liao](#)
 - GPA: 3.83/4.0, [graduate with honour](#)
 - Thesis titled by *Mobile users online and offline behaviour modelling.*
 - [Distinguished Master Thesis Award](#)
- Sept. 2013 – Jun. 2017 **B.Eng. Electronic Information Engineering, Wuhan University**
- School of Electronic Information, Wuhan, China
 - GPA: 3.93/4.0, [ranked 1st out of ~400 students](#)
 - [Outstanding undergraduate](#)

Research Directions

Audio-driven and machine learning-empowered health screening

- This project analyzes audio – a digital biomarker that can be easily collected by ubiquitous mobile devices – for respiratory and cardiovascular disease prediction.
- For the first time, developing a sound-based COVID-19 detection model to achieve scalable and affordable COVID-19 screening.
- Papers published in NPJ Digital Medicine, JMIR, KDD, NeurIPS, ICASSP, INTERSPEECH, CinC, etc.

Human-centric deep learning

- Human-centric AI for healthcare requires the algorithms not only to be accurate but also to be responsible. Contributing several novel data-efficient, uncertainty-aware, privacy-preserving approaches to develop high-performing machine learning models for real-world health diagnostics.
- Novel deep learning methods to model complex human behaviours including mobility and app usage.
- Data generation methods such as Transformer, GAN, Diffusion model to enlarge human-centric data.
- Papers published in TKDE, JBHI, AAAI, UbiComp, ICASSP, etc.

Big data and AI in public health

- Utilizing big data techniques to comprehend the impact of urban environmental factors on public health.
- Analyzing the effectiveness of mobility intervention strategies for pandemic control and devising state-of-the-art intelligent interventions.
- Papers published in Scientific data, KDD, IEEE Big Data, UbiComp, Sigspatial, etc.

Through these projects, I have fostered close collaborations and connections beyond my academic affiliation with institutions such as the University of Birmingham, University of Southampton, University of Sydney, and others, as well as in the industry with companies like Tencent, Huawei, Nokia Bell Labs, and Samsung AI Cambridge.

Honours and Awards

- 2023, Chinese Government Award for **Outstanding Self-financed Students Abroad** (a prize of 6K US dollars), UK
- 2022, the 3rd Place of intelligent medical track, in 2022 World Privacy-Preserving Computing Competition
- 2022, the 2nd poster award at the Precision Health Initiative Launch Symposium
- 2022, Best Postgraduate Poster in Oxbridge Women in Computer Science Conference
- 2022, COVID-19 Sounds project awarded as **Better Future Award** in Hall of Fame Awards, Cambridge
- 2021, ISCA INTERSPEECH Student Travel Grant
- 2020, Huawei Studentship, **Overseas PhD Full Scholarship** for 2020-2023
- 2020, **Distinguished Master Thesis** Award by the Chinese Institute of Electronics
- 2020, **Outstanding Master's Graduates** of Tsinghua University
- 2020, Outstanding Research Intern, Tencent, Beijing
- 2019, National Graduate Student Scholarship of China
- 2017, **Outstanding Undergraduate Prize** of Wuhan University
- 2016, Intel Cup Embedded System Invitational Contest, National Third Prize
- 2014, National Undergraduate Student Scholarship of China

Selected Publications

Conference papers:

- **Cross-device Federated Learning for Mobile Health Diagnostics: A First Study on COVID-19 Detection**
T. Xia, J. Han, A. Ghosh, and C. Mascolo
IEEE International Conference on Acoustics, Speech and Signal Processing, ICASSP 2023
- **COVID-19 Sounds: A Large-Scale Audio Dataset for Digital Respiratory Screening**
T. Xia*, D. Spathis*, C. Brown, J. Chauhan, A. Grammenos, J. Han, C. Mascolo, et al.
Conference on Neural Information Processing Systems, NeurIPS Datasets and Benchmarks Track 2021.
- **Uncertainty-aware COVID-19 Detection from Imbalanced Sound Data**
T. Xia, J. Han, L. Qendro, T. Dang, and C. Mascolo
Conference of the International Speech Communication Association, INTERSPEECH 2021

- **Conditional Neural ODE Processes for Individual Disease Progression Forecasting: A Case Study on COVID-19**
T. Dang, J. Han*, **T. Xia***, D. Spathis, C. Mascolo, et al.
ACM SIGKDD Conference of Knowledge Discovery and Data Mining, KDD 2023
- **Exploring Automatic Diagnosis of COVID-19 from Crowdsourced Respiratory Sound Data**
C. Brown*, J. Chauhan*, A. Grammenos*, J. Han*, A. Hasthanasombat*, D. Spathis*, **T. Xia***, P. Cicuta, and C. Mascolo
ACM SIGKDD Conference of Knowledge Discovery and Data Mining, KDD 2020, [Better Future Reward](#)
- **Towards Uncertainty-Aware Murmur Detection in Heart Sounds via Tandem Learning**
E. Bondareva, **T. Xia**, J. Han, C. Mascolo
Computing in Cardiology, CinC 2022
- **Attnmove: History Enhanced Trajectory Recovery via Attentional Network**
T. Xia, Y. Qi, J. Feng, F. Xu, F. Sun, D. Guo, and Y. Li
Annual AAAI Conference on Artificial Intelligence, AAAI 2021
- **Mobility-based Individual POI Recommendation to Control the COVID-19 Spread**
A. Ghosh* and **T. Xia***
IEEE International Conference on Big Data, Big Data 2021
- **Precise Mobility Intervention for Epidemic Control Using Unobservable Information via Deep Reinforcement Learning**
Feng, **T. Xia**, H. Wang, X. Fan, and Y. Li
ACM SIGKDD Conference of Knowledge Discovery and Data Mining, KDD 2022
- **Quantifying the Causal Effect of Individual Mobility on Health Status in Urban Space**
Y. Zhang, F. Xu, **T. Xia**, and Y. Li
ACM international joint conference on pervasive and ubiquitous computing, UbiComp 2021
- **Revealing Urban Dynamics by Learning Online and Offline Behaviours Together**
T. Xia, Y. Li, J. Feng, D. Jin, Q. Zhang, H. Luo, and Q. Liao
ACM international joint conference on pervasive and ubiquitous computing, UbiComp 2019
- **Semantic-aware spatio-temporal app usage representation via graph convolutional network**
Y. Yu*, **T. Xia***, H. Wang, J. Feng, Y. Li
ACM international joint conference on pervasive and ubiquitous computing, UbiComp 2020
- **A Sequential Convolution Network for Population Flow Prediction with Explicitly Correlation Modelling**
J. Feng, Z. Lin, **T. Xia**, F. Sun, D. Guo, Y. Li
International Joint Conferences on Artificial Intelligence, IJCAI 2020
- **Detecting popular temporal modes in population-scale unlabelled trajectory data**
F. Xu, **T. Xia**, Y. Li, F. Sun, F. Meng
ACM international joint conference on pervasive and ubiquitous computing, UbiComp 2018

Journal papers:

- **Sounds of COVID-19: Exploring Realistic Performance of Audio-based Digital Testing**
J. Han*, **T. Xia***, D. Spathis, C. Mascolo, et al.
NPJ Digital Medicine (IF=15.357), 2022
- **Exploring Longitudinal Cough, Breath, and Voice Data for COVID-19 Disease Progression Prediction via Sequential Deep Learning: Model Development and Validation**
T. Dang, J. Han*, **T. Xia***, D. Spathis, and C. Mascolo, et al.
Journal of Medical Internet Research (JMIR, IF=7.076), 2022
- **Class-balanced Evidential Deep Learning for Health Diagnostics**
T. Xia, T. Dang, J. Han, L. Qendro, and C. Mascolo
IEEE Journal of Biomedical and Health Informatics, JBHI (IF=7.7), 2024

- **Exploring Machine Learning for Audio-based Respiratory Condition Screening: A Concise Review of Databases, Methods, and Open Issues**
T. Xia, J. Han, L. Qendro, and C. Mascolo
Journal of Experimental Biology and Medicine (IF=4.088), 2022
- **Healthy Cities, A Comprehensive Dataset for Environmental Determinants of Health in England Cities**
Z. Han, T. Xia, Y. Xi, and Y. Li
Scientific Data (IF=9.8), 2023
- **Uncertainty-aware and History-enhanced Trajectory Recovery via Attentional Network**
T. Xia, Y. Qi, J. Feng, F. Xu, F. Sun, D. Guo, and Y. Li
ACM Transactions on Knowledge Discovery from Data, TKDD (IF=4.157), 2023
- **Understanding Urban Dynamics via State-sharing Hidden Markov Model**
T. Xia, Y. Yue, Y. Li, et al.
Extended version in IEEE Transactions on Knowledge and Data Engineering, TKDE (IF=9.235), 2021
- **3DGCN: 3-dimensional Dynamic Graph Convolutional Network for Citywide Crowd Flow Prediction**
T. Xia, J. Lin, Y. Li, J. Feng, P. Hui, F. Sun, D. Guo, and D. Jin
ACM Transactions on Knowledge Discovery from Data, TKDD (IF=4.157), 2021
- **DeepApp: Predicting Personalized Smartphone App Usage via Context-aware Multi-task Learning**
T. Xia, Y. Li, J. Feng, D. Jin, Q. Zhang, H. Luo, and Q. Liao
ACM Transactions on Intelligent Systems and Technology, TIST (IF=5.0), 2020
- **Smartphone App Usage Analysis: Datasets, Methods, and Applications**
Li, T. Xia, H. Wang, Z. Tu, S. Tarkoma, Z. Han, and P. Hui
IEEE Communications Surveys & Tutorials (IF=35.6), 2022
- **Finding spatiotemporal patterns of mobile application usage**
T. Li, Y. Li, T. Xia, P. Hui
IEEE Transactions on Network Science and Engineering, TNSE (IF=6.6), 2021
- **Reinforcement Learning for Solving Multiple Vehicle Routing Problem with Time Window**
Z. Zong, T. Xia, M. Zheng, Y. Li
ACM Transactions on Intelligent Systems and Technology, TIST (IF=5.0), 2024

*Equal contribution, alphabetical order.

My papers have gained over 1300+ citations. A full list of publications can be found on my [Google Scholar](#).

Invited Talks and Presentations

- July 2023 Invited talk Sounds of COVID-19 at Launch of Compendium of Open Technology, Cambridge, UK
- April 2023 Invited talk Sounds of COVID-19: Exploring Realistic Performance of Audio-based Digital Testing, Tsinghua University, Beijing
- July 2022 Evidential Deep Learning for Uncertainty-Aware Mobile Health, [MobiUK](#), London
- Sep. 2021 Uncertainty-Aware COVID-19 Detection from Imbalanced Sound Data, INTERSPEECH conference presentation
- Nov. 2021 Uncertainty-aware Machine Learning for Biosignal-based Healthcare Applications, Women@CL [Talks](#), University of Cambridge
- Dec. 2020 Exploring Automatic Diagnosis of COVID-19 from Crowdsourced Respiratory Sound Data, Cambridge University Students' Clinical Research Society - [Research During COVID](#)

Teaching Experience

Guest Lecturer, University of Cambridge:

- [Mobile Health](#) course for MPhil students, 2024

Undergraduate Lab Demonstrating, University of Cambridge:

- Machine Learning & Real-World Data, Part IA (1st year undergraduate), 2023

Face-to-face Undergraduate Group Supervision, University of Cambridge:

- Artificial Intelligence, Part IB (2nd year undergraduate), 2022, 2023
- Machine Learning & Real-World Data, Part IA (1st year undergraduate), 2021, 2022
- Foundation of Data Science, Part IA (1st year undergraduate), 2021

Online AI Research Skill Training, CCISTC Distance Internship Programs:

- Teaching general computer science research skills including Python, Matlab, TensorFlow programming
- Supervising individual AI research proposal writing, 60 students in total, 2020-2021

Lecture Teaching Assistant, Tsinghua University:

- Big Data and Machine Learning, undergraduate course, 50 students, 2019

Research Mentoring

MPhil Project, University of Cambridge:

- Co-supervising MPhil dissertation: Exploring uncertainty quantification in federated learning for healthcare, 2022
- Paper presented to KDD workshop
- The student was awarded a commended dissertation award by the department - one of the 4 prizes awarded for dissertations in computer science

Undergraduate (Part II) Project, University of Cambridge:

- Co-supervising part II dissertation: A holistic evaluation of the quality of uncertainty from Bayesian model ensemble in federated learning, 2022

Master Dissertation, Tsinghua University:

- Co-supervising Master research: Exploring deep reinforcement learning for mobility-based precise epidemic controlling, 2019-2022, with paper accepted by KDD 2022

Undergraduate Student Research Training, Tsinghua University:

- Project: Smartphone app usage representation via graph convolutional network, 2018-2019. A paper published in ACM UbiComp 2020
- Project: Dynamic graph convolutional network for citywide crowd flow prediction, 2019-2020. A paper published in TKDD 2021

Academic Service

Peer Reviewer for:

- IEEE Transactions on Neural Networks and Learning Systems (IF= 14.255)
- IEEE Transactions on Network and Service Management (IF=4.758)

- IEEE Transactions on Affective Computing (IF=11.2)
- EPJ Data Science (IF=3.63)
- Nature Scientific Data (IF=8.051)
- Nature Scientific Reports (IF=4.996)

Programme Chair for Conferences:

- AAAI 2021/2022/2023
- IJCAI 2021/2022/2023/2024
- KDD 2021/2022
- UbiComp 2020/2021
- ICASSP 2022/2023/2024

Programme Committee:

- Poster&Demo Chair of the ACM [UbiComp](#) 2022
- Organizer of UbiComp [FairComp](#) workshop, 2023

Organizing seminar:

- Mobile and Wearable Health Seminar Series, 2022, [2023, 2024](#)