Anjie Le

Cambridge mathematician
with a focus on applying her mathematical knowledge to the biomedical world

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Education

•University of Cambridge, BA Mathematics *2019-2022*

Relevant Courses: GPA: 3.7/4 (excluding last year)

- **Data Science**: Statistical Modelling, Mathematics of Machine Learning, Linear Algebra
- **Stochastic Process**: Applied Probability, Mathematical Biology
- **Measure Theory**: Probability and Measure
- **Mathematical Modelling and Analysis**: Numerical Analysis, Optimisation, Methods
- **Information and Computer Science**: Graph Theory, Quantum Information and Computation, Logic and Set Theory, Groups Rings and Modules, Numbers and Sets

Experience

•Research Assistant: Federated Learning *The Chinese University of Hong Kong*

Supervisor: Prof Qi Dou March 2023 - present

- Proposed a differentially private federated learning(FL) approach for optimizing the **trade-off between privacy and performance**, proved its privacy guarantees and asymptotic property; paper submitted to MICCAI (in review)
- Proposed a method for Personalized FL using feature analysis to balance client unique knowledge and common knowledge for optimal performance, conduct **convergence analysis**; paper in progress

•Assistant: Ultrasound Imaging Development *eSonic Imaging*

Supervisor: Academician Jacques Souquet October 2022 - February 2023; August 2021 - October 2021

- Investigated the entire process of medical ultrasound product development, facilitating **communication** between different teams to address progress and technological challenges.
- **Initiated and organized** a project for an AI-based breast cancer diagnosis platform using ultrasound images. Developed a prototype to demonstrate its efficacy.
- **Designed and patented** an end-to-end AI research tool on the ultrasound platform, enabling doctors to locally train personalized deep learning models, which can also serve as a hub for federated learning.

•Research Internship: AI Body-Part Detection Tool on Canine CT Scans *VetCT & University of Cambridge*

Supervisor: Dr Julien Labruyère, Advisor: Dr Michael Roberts July 2022 - October 2022

- Utilized YOLOv5 to train a machine learning model for detecting 8 different body parts in dogs. Produced a comprehensive paper outlining the project's purpose, procedure, and significance.
- Conducted data pre-processing on raw CT scans, involving working with DICOM files and applying classical computer vision techniques for **data cleaning**.
- **Presented** the research findings at the Cambridge Mathematics Placements annual open day.

•Research Project: Development of a Cancer Diagnosis Tool *Remote*

Supervisor: Prof Mark Vogelsberger June 2021 - August 2021

- Conducted research on four popular models of neural networks and implemented each model. Implemented the models, achieved high accuracy. Presented findings in seminars.
- Published a paper based on the developed platform to diagnose breast cancer by examining whole slide images of lymph nodes. Tested several SOTA neural networks, and eventually achieved 95% accuracy on the test dataset with ResNet.
- Developed a chatbot using LSTM for the cancer diagnosis application.

Skills

Programming: MATLAB, Python, RStudio
Software Development: Git (version control), AWS, Jira and Confluence
Professional Skills: Operating medical ultrasound devices; public speaking and marketing
Languages: English-Chinese translation and simultaneous interpretation

Publication, Patent & Paper in Progress

Meirui Jiang, **Anjie Le**, Xiaoxiao Li, Qi Dou, "Personalized Federated Learning for Non-IID Features via Feature Covariance Discrepancy," paper in progress.

Anonymous, "Client-Level Differential Privacy via Adaptive Intermediary in Federated Medical Imaging," paper under review at MICCAI 2023.

Anjie Le, James Bang, Julien Labruyère, Michael Roberts, "RAPID: Radiology Automated Body-part Identification," preprint.

Baodi Bi, **Anjie Le**, Jacques Souquet, "Artificial Intelligence Integrated Diagnostic Platform Device in Ultrasound Modality," patent pending (CARP202211241158, filed 15 December 2022).

Anjie Le, Zhenghao Li, Haoyun Tang, Haobo Yang, "A new breast cancer diagnosis application based on ResNet50," in Proceedings of SPIE 12079, Second IYSF Academic Symposium on Artificial Intelligence and Computer Engineering, 120792K (1 December 2021).

Research-Based Competition Experience

•International Blockchain Olympiad *One of the two representative projects presented at the closing ceremony*

– Proposed a theoretical model for applying **blockchain** technology to the tracking of imported food and conducted the feasibility analysis

•Beijing Applied Maths Essay Competition *Second Prize*

– Proposed a more general model for the Blotto game (a model in **game theory**)

•Beijing Jinpeng Technology Forum *Second Prize*

– Explored the effects of toothpaste with or without fluoride on isolated **human teeth**

•China Adolescents Science & Technology Innovation Contest *Third Prize*

– Explored the effects of different light qualities on the **growth of stonecrops**

Other Experience

•Co-founding AI deployment solution startup *AIer*

– To develop a normative AI deployment solution with federated learning to address concerns on safety, privacy, and personalization.
– Company valued at 5 million RMB.

•Co-founding machine translation startup *Guangqi Technology*

– Developed a machine translation tool utilizing ViT encoder, ResNet backbone, and Transformer decoder, that focuses on formula-intensive academic paper translation.
– Company valued at 1 million RMB.

•Quantum Computing Research *University of Science and Technology of China*

– Presented at the annual ceremony as an outstanding-student representative.
– Invited to join Dr Wenkang Weng's research group.
– Contributed to the Huawei HiQ quantum computing open-source database.

•Computer-Aided Teaching of All Mathematics *University of Cambridge*

– Utilised Python or MATLAB for analyzing statistical distributions, simulating **diffusion equations**, studying **quantum eigenstates**, and practicing **non-linear optimization** and **computational graph theory**.

•Team Guide *International Mathematics Olympiad*

– Led the group during the event, resolving issues and facilitating communication between different parties.

•Marketing *Blue Education*

– Established connections between the company and two high schools in Beijing.