Minghua Zheng

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Education

University of Hertfordshire March 2019 – August 2024
PhD in Computer Science with Industry Experience *Hatfield, UK*

- Thesis: Learning to count small and clustered objects with application to bacterial colonies

University of Hertfordshire September 2015 – September 2017
MSc Computer Science (Sandwich) - Distinction *Hatfield, UK*

Fujian University of Technology September 2010 – June 2014
Material Processing and Control Engineering *Fuzhou, China*

Research Interests

Machine/Deep Learning, Computer Vision, Explainable AI (XAI), Large Language Models, Natural Language Processing, AI for Healthcare (COPD, Cardiovascular Risk)

Publications

Zheng, M., Helian, N., Lane, P., Sun, Y., & Donald, A. (2026). Learning to count small and clustered objects with application to bacterial colonies. *Applied Soft Computing*. Currently under review, preprint available at arXiv.

Zheng, M., Helian, N., Lane, P., Sun, Y., & Donald, A. (2026). Investigation of bacterial colony counting with explainable artificial intelligence. *Soft Computing*. Currently under review, preprint available at arXiv.

Zheng, M., Helian, N., Lane, P., Sun, Y., & Donald, A. (2022). Bacterial colony counting could be rapid, adaptive and automated. *Proceedings of Abstracts, School of Physics, Engineering and Computer Science Research Conference 2022*, 44-46. https://doi.org/10.18745/pb.25867.

Lane, P., Helian, N., Bodla, M. H., Zheng, M., & Moggridge, P. (2022). Dynamic hierarchical structure optimisation for cloud computing job scheduling. In J. L. Jiménez Laredo, J. I. Hidalgo, & K. O. Babaagba (Eds.), *Applications of Evolutionary Computation*, 301–316. https://doi.org/10.1007/978-3-031-02462-7_20.

Research Projects

Small and Clustered Objects Counting November 2021 – February 2024

- Collected, cleaned, and annotated a bespoke dataset to support model training.
- Developed two deep learning algorithms to count small and clustered objects with limited training data.
- Integrated a Transformer-based architecture to improve model generalisation.
- Achieved 9.62% MAPE on colony counting while eliminating manual counting effort.
- First-authored a paper (under review) and presented findings at journal clubs and local conferences.

Investigation of Colony Counting with XAI March 2020 – October 2021

- Implemented the best-performing colony-cardinality classification model using PyTorch/TensorFlow.
- Applied Explainable AI (XAI) techniques to interpret and validate the classifier's predictions.
- Generated synthetic colony images using Generative Adversarial Networks (GANs).
- Explored alternative loss functions to mitigate class imbalance.
- Submitted the findings as a journal paper, currently under review.

Text Recognition on Antibiotic Discs March 2019 – September 2019

- Developed a computer vision algorithm to recognise text printed on antibiotic discs from petri dish images.
- Improved recognition accuracy to 95.2% while optimising processing speed.

Load Balancing Algorithms

May 2017 – September 2017

- Implemented Simulated Annealing and Genetic Algorithm approaches to analyse cloud computing load balancing.
- Benchmarked both algorithms against a brute-force baseline.
- Co-authored a paper presenting the findings.

Work Experience

King's College London

March 2025 – Present

Research Associate — *London, UK*

- Analysing and preprocessing clinical data to support AI model development.
- Developing AI algorithms to classify COPD exacerbation types and predict treatment responses.
- Building predictive models to assess cardiovascular disease (CVD) risk following a COPD exacerbation.

University of Hertfordshire

April 2020 – November 2024

Visiting Lecturer (Part-time) — *Hatfield, UK*

- Delivered 50+ lectures and tutorials to undergraduate and postgraduate students on Data Mining and Databases.
- Mentored students by providing feedback on assignments and academic progress.
- Designed course materials and exam scripts for the Data Mining module.
- Supervised 60+ students in completing research projects in software engineering, data science, and AI.

Synoptics Ltd

March 2019 – February 2020

Research Associate — *Cambridge, UK*

- Built a computer vision algorithm to automatically recognise text printed on antibiotic discs from petri dish images.
- Conducted research into in-house colony counting algorithms.
- Liaised between the university and company to coordinate meetings and report on research progress.
- Managed research funding and delivered progress reports that secured further funding.

FDM Group

February 2018 – October 2018

Software Engineer — *China*

- Completed a three-month training programme with FDM in the UK.
- Placed as an FDM consultant at **Standard Chartered Bank**.
- Wrote Shell/Python scripts to optimise workflows and automate repetitive tasks.
- Developed tools to support server configuration and maintenance.
- Coordinated with business and technology stakeholders to support Dev/SIT/UAT environments.

Insurance Collections Bureau Ltd

June 2016 – June 2017

Software Engineer — *Welwyn Garden City, UK*

- Applied VBA to increase the productivity of data entry by 20%.
- Developed a tracing system and optimised database performance.
- Improved the loading and rendering speed of the tracing system by optimising JavaScript.
- Assisted the IT Specialist with developing and deploying new systems.

Technical Skills

Languages: Python, Java, C/C++, PHP, SQL, Shell Scripting

Frameworks/Libraries: PyTorch, TensorFlow, NumPy, Matplotlib, Scikit-learn, OpenCV

Techniques: Deep Learning, Transformers, Generative Adversarial Networks (GANs), Explainable AI (XAI), Large Language Models (LLMs), Few-shot Learning

Others: Data Modelling, Database Administration, Data Visualisation, Linux/Unix/HPC Administration, Web Development, DevOps, Git, Docker, AWS, Azure