

# 孟佳辉

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## 教育背景

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| 南加州大学 (University of Southern California)     | 2023.08 – 2024.12 |
| 电气工程硕士学位 (Electrical Engineering)             | GPA: 3.94 / 4.0   |
| 香港理工大学 (The Hong Kong Polytechnic University) | 2019.08 – 2023.05 |
| 互联网及多媒体科技 (一等荣誉) 理学学士学位                       | GPA: 3.61 / 4.0   |

## 工作经历

香港理工大学 | 副项目员 (Project Associate) 2025.01 – 至今

- 负责一款已申请专利的 AI 辅助 AR 手卫生应用的端到端交付，覆盖数据流程、模型集成、后端服务与临床培训场景下的产品部署。
- 独立在 1 个月内完成核心功能交付，替代原预计约 6 个月的外包开发工作量，显著加快项目验证与落地节奏。
- 搭建多阶段机器学习系统，覆盖数据采集、预处理、训练、优化与跨平台推理，支持手机、桌面端、边缘设备及 AR 眼镜的在线与离线运行。
- 推动方案在香港 20+ 家医院落地试点，支持机构采用与采购沟通，并在 ICPIIC、IICC 及医管局大会进行对外展示。
- 技术栈：Python、PyTorch、TensorFlow、OpenCV、AWS、Unity、C#、AR Foundation、Docker、REST APIs、SQLite/MySQL。

香港理工大学 | 研究助理 (兼职) (Research Assistant (Part-time)) 2022.01 – 2024.10

- 设计并部署高分辨率室内接触关系建模 AI 平台，覆盖数据工程、检测与跟踪流水线、云端服务及社区级分析工作流。
- 构建面向实际部署的计算机视觉与时空建模流程，用于生成接触图谱与风险信号，支撑香港场景下的公共卫生决策。
- 建模分析人-地点间接接触与人-人直接接触两类传播路径的相对风险，将研究结果转化为可解释的业务洞察。
- 方法与工具：时空建模、多目标跟踪、风险评分、隐私保护数据处理。  
Python、PyTorch、Flask/FastAPI、AWS。

## 技术能力

- 编程语言：Python、Node.js、C++、Java、C#、JavaScript、HTML、PHP
- 机器学习与计算机视觉：PyTorch、TensorFlow、Scikit-learn、OpenCV、计算机视觉、时空建模、图神经网络、深度学习、机器学习
- LLM 与 AI Agent：RAG、Prompt Engineering、上下文结构化、检索精炼、微调
- 后端与部署：AWS、Docker、Flask/FastAPI、REST APIs、Unity、AR Foundation、SQLite/MySQL、NoSQL

## 项目经历

## Health Agent 与结构化 EHR 图谱系统

2025 – 至今

- 构建本地健康咨询 AI Agent，基于 FastAPI、React 以及 SQLite/PostgreSQL，支持多用户档案、持久化会话、医生式多轮问诊、报告导出与图谱关联分析。
- 设计以结构化临床实体为核心的 EHR 后端与统一图谱关系模型，支持围绕患者、就诊、疾病、观察结果、用药、报告及派生关联进行 LLM 工具调用。
- 实现图查询与记录解析 workflow，支持摘要、时间线、活动问题、检验趋势、邻居查询、路径搜索与罕见关联检索，按任务拉取相关上下文而非将全量病历直接塞入 prompt。
- 组织 Prompt 模板与模型接入路由，默认支持 Codex CLI 并兼容 HTTP API 回退，在保证安全性的同时尽量减少冗余用户上下文与 token 消耗。

## 南加州大学 | 优化算法对神经网络泛化能力的影响

2024.09 – 2024.12

- 系统评估不同优化算法（SGD / Adam / L-BFGS）对神经网络泛化能力的影响，搭建可复现实验流程（数据加载、训练、评估、对比分析）。
- 在统一网络结构与训练预算下，对比各方法在测试准确率、收敛速度、稳定性（对超参数敏感度）与计算成本上的差异，形成量化结论与可视化结果。
- 从噪声鲁棒性角度分析优化器表现（如梯度噪声、训练扰动对性能的影响），总结不同优化策略在鲁棒性与效率之间的权衡。

## 南加州大学 | TrojanMap

2024.01 – 2024.05

- 使用 C++ 开发地理信息系统（GIS），对 USC 及周边地图进行建模与查询。
- 实现核心数据结构（Node、TrojanMap 类）用于表示地点与路径，支持自动补全、按类别检索与位置查询等功能。
- 采用 Dijkstra 与 Bellman-Ford 算法计算节点间最短路径，保障实时导航查询效率。
- 使用暴力枚举、回溯与 2-opt 优化求解旅行商问题（TSP），降低路径计算复杂度。
- 融合动态规划与 BFS 进行环检测，并使用 Union-Find 高效完成连通性检查，提升系统稳定性与用户体验。
- 熟练掌握图结构数据建模、最短路径算法、动态规划与路线规划优化方法。

## 香港理工大学 | 基于深度学习的发动机声音检测

2022.08 – 2023.05

- 开发用于发动机声音事件检测与相关性分析的深度学习神经网络模型，在识别特定发动机故障方面达到 90% 准确率，并将维护响应时间降低 25%。
- 使用梅尔频率倒谱系数（MFCC）进行特征提取，提升模型对不同发动机声音模式的识别与区分能力，使检测精度提升 15%。
- 训练多种 L3-net 变体并对比 ConvNet / ResNet / DenseNet 架构性能，验证 ResNet 在复杂声音识别任务中准确率高出 5%。
- 部署预训练模型并采用迁移学习，将训练与测试时间减少 50%，加速开发迭代并提升整体模型表现。

## 香港理工大学 | Dungeon Mission Game (Unity, C#)

2022.01 – 2022.05

- 共同开发基于浏览器的 Roguelike 游戏（Unity），集成程序化生成与复杂 AI 机制，打造更具沉浸感与动态变化的玩家体验。
- 使用 Photon PUN2 实现多人联机系统，支持最多 50 名玩家实时无缝互动，增强游戏的社交性与竞技性。
- 设计并实现多样化敌人行为的复杂 AI 系统，包括两名具备专属技能的 Boss；提升玩法深度，使

玩家参与度提升 40%，用户好评率提升 25%。

- 作品已发布：<https://simmer.io/@MENG/team-04-dungeon-mission>（累计 100+ 玩家体验）。

## 论文

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- *An AI-empowered Indoor Digital Contact Tracing System for COVID-19 Outbreaks in Residential Care Homes, Infectious Disease Modelling, 2024*

## 专利

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- 中国短期专利：202510682954.3 - 手部卫生检测方法、装置、电子设备及计算机程序产品

## 荣誉

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- 香港理工大学 Junior Researcher Mentoring Programme（2025）
- 校长嘉许名单（Dean's List Honor, 2020–2021）

# Jiahui Meng

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## Education

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**University of Southern California, California, US** Aug 2023 – Dec 2024  
*Master of Science in Electrical Engineering | GPA: 3.94/4.0*

**The Hong Kong Polytechnic University, Hong Kong** Aug 2019 – May 2023  
*Bachelor of Science in Internet and Multimedia Technologies (First Class Honors) | GPA: 3.61/4.0*

## Work Experience

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**The Hong Kong Polytechnic University** Hong Kong  
*Project Associate* Jan 2025 – Present

- Owned end-to-end delivery of a patented AI-assisted AR hand-hygiene application, spanning data pipelines, model integration, backend services, and production deployment across clinical training environments.
- Independently shipped core functionality in one month, replacing an estimated ~6 months of outsourced engineering work and accelerating stakeholder validation for product rollout.
- Built a multi-stage ML system for data collection, preprocessing, training, optimization, and cross-platform inference, supporting mobile, desktop, edge devices, and AR glasses in both online and offline modes.
- Scaled the solution to 20+ hospitals in Hong Kong; supported institutional adoption, procurement discussions, and external presentations at ICPIC, IICC, and Hospital Authority Convention.
- Stack:** Python, PyTorch, TensorFlow, OpenCV, AWS, Unity, C#, AR Foundation, Docker, REST APIs, SQLite/MySQL.

**The Hong Kong Polytechnic University** Hong Kong  
*Research Assistant (Part-time)* Jan 2022 – Oct 2024

- Designed and deployed an AI platform for high-resolution indoor contact mapping, covering data engineering, detection/tracking pipelines, cloud services, and analytics workflows for community-scale operations.
- Built production-oriented CV and spatio-temporal modeling pipelines that generated contact graphs and risk signals for public-health decision support in Hong Kong deployment settings.
- Modeled relative transmission risks across indirect person-to-site and direct person-to-person contact pathways, translating research outputs into interpretable operational insights.
- Methods/Tools:** spatio-temporal modeling, multi-object tracking, risk scoring, privacy-aware data processing. Python, PyTorch, Flask/FastAPI, AWS.

## Technical Skills

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**Languages:** Python, Node.js, C++, Java, C#, JavaScript, HTML, PHP

**ML & CV:** PyTorch, TensorFlow, Scikit-learn, OpenCV, computer vision, spatio-temporal modeling, graph neural networks, deep learning, machine learning

**LLM & AI Agent:** RAG (Retrieval-Augmented Generation), prompt engineering, context structur-

ing, retrieval refinement, LLM fine-tuning

**Backend & Deployment:** AWS, Docker, Flask/FastAPI, REST APIs, Unity, AR Foundation, SQLite/MySQL, NoSQL

## Project Experience

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### Health Agent and Structured EHR Graph System

*LLM Systems / AI Agent Engineering*

Self-Directed

2025 – Present

- Built a local health-consultation AI agent with FastAPI, React, and SQLite/PostgreSQL support, including multi-user profiles, persistent sessions, doctor-style multi-turn intake, exportable reports, and graph-based association analysis.
- Designed a structured EHR backend centered on relational clinical entities and a unified graph-edge model, enabling LLM tool calling over patients, encounters, conditions, observations, medications, reports, and derived associations.
- Implemented graph-query and record-resolution workflows for summary, timeline, active problems, lab trends, neighbor lookup, path search, and rare-association retrieval, fetching only task-relevant context instead of full patient-history prompts.
- Organized prompt packs and provider routing for local agent execution, supporting Codex CLI by default with HTTP API fallback, while keeping prompts modular and user context intentionally minimal for safer and more token-efficient interactions.

### Impact of Optimization Algorithms on Neural Network Generalization

*USC Viterbi School of Engineering*

Los Angeles, US

Sep 2024 – Dec 2024

- Conducted a controlled study on how optimization algorithms (SGD, Adam, L-BFGS) influence generalization on CIFAR-10, standardizing model architecture, data pipeline, and training budget to enable fair comparisons.
- Built a fully reproducible experimental workflow (data loading, training, evaluation, logging, and visualization), and reported results across test accuracy, convergence speed, stability, and compute cost.
- Performed robustness-oriented analyses by probing sensitivity to hyperparameters and training noise (e.g., stochasticity from mini-batches/augmentation), highlighting failure modes and practical tuning considerations.
- Quantified trade-offs between first-order and quasi-second-order methods, showing first-order optimizers generally provide a stronger balance of training efficiency and noise robustness under comparable compute constraints.

### TrojanMap Project

*USC Viterbi School of Engineering*

Los Angeles, US

Jan 2024 – May 2024

- Developed a geographic information system in C++ to model and query a map of USC and its surroundings.
- Implemented core data structures (`Node` and `TrojanMap` classes) to represent locations and paths; added auto-completion, category-based search, and location queries.
- Implemented shortest-path solvers (Dijkstra, Bellman–Ford) for efficient real-time navigation queries.
- Solved the Traveling Salesman Problem (TSP) via brute force, backtracking, and 2-opt optimization, reducing path computation complexity.

- Integrated dynamic programming and BFS for cycle detection; used Union-Find for efficient connectivity checks.

### Engine Sound Detection Based on Deep Learning

The Hong Kong Polytechnic University

Hong Kong

Aug 2022 – May 2023

- Developed deep-learning models for engine sound event detection and correlation; achieved 90% accuracy identifying specific engine issues and reduced maintenance response time by 25%.
- Used MFCC feature extraction to improve pattern discrimination; increased detection precision by 15%.
- Trained and compared L3-net variants with ConvNet, ResNet, and DenseNet baselines; found ResNet improved accuracy by 5% on complex sound recognition.
- Applied transfer learning with pre-trained models, reducing training/testing time by 50% and accelerating iteration.

### Dungeon Mission Game (Unity, C#)

The Hong Kong Polytechnic University

Hong Kong

Jan 2022 – May 2022

- Co-developed a browser-based roguelike game in Unity, combining procedural generation and AI mechanics for a dynamic player experience.
- Implemented multiplayer using Photon PUN2, enabling up to 50 concurrent players with real-time interaction.
- Engineered enemy AI behaviors including two unique bosses; contributed to a 40% increase in engagement and 25% improvement in positive reviews.
- Published at [simmer.io/@MENG/team-04-dungeon-mission](https://simmer.io/@MENG/team-04-dungeon-mission) (100+ players).

## Publications & Patent

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**Publication:** Jiahui Meng, Justina Liu, Lin Yang\*, et al. *An AI-empowered Indoor Digital Contact Tracing System for COVID-19 Outbreaks in Residential Care Homes*. *Infectious Disease Modelling*, 2024. [doi:10.1016/j.idm.2024.02.002](https://doi.org/10.1016/j.idm.2024.02.002)

**Patent:** China Short-term patent No. 202510682954.3 (Jun 2025)

## Conferences

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- Finalist (Prix Hubert Tour – Innovation Academy), Oral Presentation, 8th International Conference on Prevention & Infection Control (ICPIC), Geneva, 2025
- Oral Presentation, 9th International Infection Control Conference (IICC), Hong Kong, 2025
- Booth Presentation, Hospital Authority Convention, Hong Kong, 2025

## Honors & Awards

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- PolyU Junior Researcher Mentoring Programme (2025)
- Dean's Honor List of Outstanding Students, The Hong Kong Polytechnic University (2020–2021)

## Leadership

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The Hong Kong Polytechnic University Golden Z Club

Promotion Secretary

Hong Kong

2020 – 2021

- Organized a sign language workshop (50+ participants) and an interview workshop (60+ at-

tendees); improved engagement by 40%.

- Initiated mentoring programs for 50+ South Asian children, improving academic performance by 20%; organized volunteer education activities impacting 100+ children.
- Coordinated social activities and non-profit events with team members.