

# Jiyao Pu

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## PROFESSIONAL SUMMARY

PhD in Machine Learning from Durham University, specialising in natural language processing, multi-agent systems and reinforcement learning. Developed the Strategy Evaluation Rule (SER) framework, a unified system combining neural rule generation, multi-agent simulation and social-metric evaluation, enabling adaptive, scalable decision-making in complex, dynamic environments. Project experience includes building LLM-based NLP systems, multi-agent coordination driven by reinforcement learning, and architectures for generation, retrieval and agent interaction in cloud environments. Seeking engineering roles in machine learning and NLP where I can contribute to building scalable, production-ready systems that combine multi-agent coordination with strong language intelligence to solve real-world problems. Holding a 3-year UK PSW visa (valid until June 2028).

## EDUCATION

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| • <b>Durham University</b><br><i>PhD in Machine Learning</i>   | <i>Mar 2021 - Jun 2025</i><br>Durham, UK     |
| • <b>Newcastle University</b><br><i>MSc in Computer Science</i><br>◦ Grade: <b>76.6%</b>                             | <i>Sep 2019 - Sep 2020</i><br>Newcastle, UK  |
| • <b>University of Electronic Science and Technology of China</b><br><i>BSc in Electronic Science and Technology</i> | <i>Sep 2012 - Jun 2016</i><br>Chengdu, China |

## SKILLS

- **AI:** NLP, Large Language Models (LLMs), Multi-agent systems, Reinforcement learning, Deep learning, Generative models, Contrastive learning, Zero-/Few-shot learning.
- **Tools:** PyTorch, TensorFlow, LangChain, Hugging Face, Git, Docker, Kubernetes, Spring MVC.
- **Platforms:** AWS, GCP, Unity, Unreal Engine.
- **Programming Languages:** Python, Java, C, C++, C#, SQL, Shell.
- **Additional:** Raspberry Pi, FPGA, DSP, Sensor Integration.

## PROJECTS

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|--|----------------------------|
| • <b>AI Talent Bench</b><br><i>NLP, LLM, Multi-agent, Task Generation Framework, AWS, Web Technologies</i>   | <i>Feb 2025 – Jun 2025</i> |
| ◦ <b>Task:</b> Build a scalable platform to evaluate AI candidates by automatically generating realistic, domain-specific tasks from job descriptions.   |                            |
| ◦ <b>Challenge:</b> Delivering a full-stack prototype within weeks, with the key technical difficulty being how to translate unstructured job descriptions into structured, testable AI tasks.   |                            |
| ◦ <b>Solution:</b> Implemented a server-based system extending the RGN framework with DS agent to build a Task Generator. For financial AI positions, where real datasets cannot be disclosed, the generator automatically selects suitable public time-series datasets (e.g., Google stock data, Geometric Brownian motion, Beijing air quality), decomposes and recombines them, assigns appropriate evaluation metrics, and leverages LLMs to generate descriptive, context-relevant task statements. Adopted an agile development model to rapidly design and iterate. |                            |
| ◦ <b>Result:</b> Delivered a functional prototype that reduced task generation time from weeks to <1 min. The system was externally recognised by the <b>UCL CDI Impact Accelerator</b> , with our team recommended for Cohort 7, highlighting its potential for automated, job-relevant AI candidate evaluation.  |                            |
| • <b>Digital Twin Dreamscape</b><br><i>Reinforcement Learning, Multi-agent, Digital Twin, Raspberry Pi, Python, C#, Unity, OpenCV</i>  | <i>Jun 2023 - Dec 2023</i> |
| ◦ <b>Task:</b> Develop a real-time digital twin system to enable seamless interaction between a robotic car and its virtual representation for research and remote-control applications.   |                            |
| ◦ <b>Challenge:</b> Achieving low-latency synchronisation between physical hardware and its digital twin, while integrating computer vision and multi-agent reinforcement learning for autonomous behaviour.   |                            |
| ◦ <b>Solution:</b> Built an integrated control system on Raspberry Pi for live video streaming and remote web/mobile control. Designed a Unity-based digital twin that mirrored the robotic car's movements. Integrated OpenCV-based target recognition pipelines and implemented reinforcement learning agents for autonomous navigation. Added support for PS5 and Xbox controllers to enhance HCI flexibility. Collected a custom dataset of household objects and applied few-shot learning methods.   |                            |
| ◦ <b>Result:</b> Achieved synchronised physical–virtual control with >95% target-tracking accuracy, <200ms latency, and reliable few-shot object recognition from as few as 3 training images. Showcased as a flagship Hybrid Intelligence Lab demo at Durham University Open Day, Spring Festival, and to visiting investors, highlighting its innovation and real-world potential.   |                            |

### • EyeGaze Smart Wheelchair

Jul 2022 - Dec 2022

*Electric Wheelchair Platform, Camera Module, Python, OpenCV, Eye-Tracking Algorithms, HCI*

- **Task:** Enable hands-free navigation for mobility-impaired users by integrating eye-tracking control into a traditional electric wheelchair.
- **Challenge:** Translating noisy, real-time gaze data into accurate and reliable movement commands, while ensuring low latency, user safety, and intuitive interaction.
- **Solution:** Built a vision module with a mounted camera to capture real-time eye images. Implemented OpenCV-based eye-tracking algorithms to analyse gaze direction and map it to navigation commands. Collaborated with users with disabilities to co-design an HCI "interaction language," where distinct eye-movement patterns (e.g., prolonged gaze, blink sequences) correspond to different wheelchair commands. Designed a responsive control interface linking these gaze patterns with the wheelchair's motor drivers.
- **Result:** Achieved >92% accuracy in gaze-command recognition with <150ms processing delay, enabling smooth and intuitive wheelchair navigation. The co-designed interaction system significantly improved user comfort and control confidence. Demonstrated as an assistive-technology prototype for inclusive HCI, receiving strong positive feedback in user trials.

### • Laser Beam Combining via LCOPA Control

Sep 2014 - Jun 2015

*FPGA, DSP, LCOPA, VHDL, Image Processing, Target Recognition*

- **Task:** Design and implement a hardware-software control system to enable real-time laser beam combining with LCOPA technology, ensuring precise optical alignment for object recognition and beam steering.
- **Challenge:** Achieving real-time video acquisition and object recognition on resource-constrained FPGA and DSP platforms, while maintaining high-precision optical phase modulation for beam alignment.
- **Solution:** Built an FPGA-based video acquisition pipeline and implemented DSP-driven image processing algorithms for multi-class object recognition. Designed and deployed an LCOPA control module in VHDL for real-time optical phase adjustment, integrating image processing and feedback control loops to optimise beam alignment accuracy.
- **Result:** Validated prototype achieved 93.5% recognition accuracy across 30 object categories (150 test images) and <5mm alignment error at 3m distance. The system provided reliable real-time beam combining, successfully delivered under the University Innovation and Entrepreneurship Training Program (Innovation Fund, 2014), and documented in the research report "Research on Laser Beam Combining Based on Liquid Crystal Optical Phased Array" (May 2015).

## EMPLOYMENT EXPERIENCE

### • Application Solutions Engineer

Jul 2016 – Mar 2019

- China Mobile Communications Group Yunnan Co., Ltd., Chuxiong Branch, Enterprise & Government Client Department*
- "Hemu" project, a home-intelligent monitoring system integrating computer-vision capabilities such as fall detection, abnormal-sound alerts, day-night scene adaptation, object detection and basic behaviour analysis. Refined feature performance by guiding data collection, analysing edge-device constraints and optimising models for real-world deployment scenarios.
  - "Hejiating" project, a family-services content platform supporting keyword search, ranking, recommendation and targeted advertising. Improved query parsing, high-frequency term analytics and personalised content delivery through NLP-driven relevance scoring and lightweight retrieval approaches.
  - Designed and iterated an internal training-management system enabling progress tracking, content publishing, online assessments and automatic grading. Contributed to question-bank structuring, error-pattern analysis and targeted revision workflows to enhance learning efficiency and overall system usability.

## PUBLICATIONS

C=CONFERENCE, J=JOURNAL, T=THESIS

- [J.1] Pu, J., Duan, H., Zhao, J. and Long, Y., 2023. Rules for Expectation: Learning to Generate Rules via Social Environment Modelling. *IEEE Transactions on Circuits and Systems for Video Technology*.
- [C.1] Gao, R., Wan, F., Organisciak, D., Pu, J., Duan, H., Zhang, P., Hou, X. and Long, Y., 2023. Privacy-enhanced zero-shot learning via data-free knowledge transfer. In 2023 IEEE International Conference on Multimedia and Expo (ICME) (pp. 432-437). IEEE.
- [T.1] Pu, J., 2025. Hybrid Intelligence in Evolving Games: Automated Rule Design, Strategy Evolution, and Evaluation Optimisation for Intelligent Societies. PhD thesis, Durham University.

## MANUSCRIPTS IN PREPARATION

S=IN SUBMISSION, M=MANUSCRIPT

- [M.1] Triadic Reciprocal Dynamics: The AI Framework for Social Rule Evolving. Plan to submit *Nature Machine Intelligence* for consideration.
- [M.2] Integrating Extrinsic and Flow Intrinsic Rewards for Adaptive Rule Generation in Dynamic Environment. Plan to submit *Nature Humanities and Social Sciences Communications* for consideration.
- [S.1] Flow-Centric Rule Design: Evolving Rules for Optimal Difficulty and AI Skill Balance. Submitted to *ACM Multimedia 2025*.