

Hongyu Wang

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Education

Imperial College London — QS World Ranking 2

London, UK

MRes in Medical Robotics and Image Guided Intervention

2024.09 – 2025.09

- **Research:** Next-Action Planning in Surgical Video Analysis
- **Core Modules:** Medical Robotics and Instrumentation; Medical and Surgical Imaging(MSI); Image Guided Intervention (IGI); Sensing, Perception and Neuroergonomics (SPNE).

Xi'an Jiaotong-Liverpool University (XJTLU)

Suzhou, China

BSc in Information and Computing Science

2020.09 – 2024.06

- **GPA:** 3.9/4.0 (Top 5%, First-Class Honours)
- **Award:** University Academic Excellence Award (2022/23)
- **Core Modules:** Linear Algebra, Multi-variable Calculus, Discrete Mathematics & Statistics, Artificial Intelligence, Human-Computer Interaction, Computer Systems & Operating Systems, Algorithm Design & Complexity Analysis, Computer Networks & Security, Software Engineering, Computer Graphics, Database Management, Data Structures & Algorithms
- **Note:** Dual-degree programme; degree awarded by the University of Liverpool, UK. [Detailed Information Link].

Research Experience

Next-Action Planning in Surgical Video Analysis (MRes Thesis, Ongoing)

Imperial College London, UK

Core Developer | **Supervisors:** Prof. Daniel Elson & Prof. Baoru Huang

2025.02 - Present

- Designed a unified video understanding model to overcome task fragmentation in surgical video analysis, allowing simultaneous phase recognition, instrument status detection, and next action prediction from pure visual input.
- Proposed a hybrid architecture combining visual encoders (DINOv2/ResNet, etc) with Bi-directional MSTCN for temporal reasoning, enhanced by a semantic difference fusion module to detect subtle transitions in surgical workflows.
- Introduced uncertainty-weighted multi-task loss and temporal monotonicity regularization, improving stability and generalization.
- Built full pipeline on **Cholec80** dataset, supporting staged training (Backbone → Neck → Fusion → End-to-End). Current results achieved **88%** phase and **97%** tool recognition accuracy, and **77.9%** tool Jaccard, surpassing baseline models without dual-loss optimization.

Real-Time Observer Representation in Co-Located VR Systems

X-CHI Lab – XJTLU

Research Assistant | **Supervisors:** Prof. Hai-Ning Liang

2023.09 - 2024.04

- Led the system design of a co-located VR platform enabling non-HMD observers to assist immersed users via real-time visual presence and voice feedback.
- Developed five visual representation modes for observers (None, Virtual Avatar, Embedded Portrait, Passthrough Window, Panoramic AR) using Unity 3D and Pico 4 SDK.
- Designed a collaborative dual-task interaction combining a Fruit Ninja-style motion game with a voice-based N-back task, simulating cognitive load and communication demands.
- Conducted a controlled within-subjects study (n=40, 20 dyads) evaluating user performance, communication accuracy, co-presence, usability, and affective state across five conditions.
- Results showed that portrait embedding significantly enhanced co-presence and communication efficiency; findings accepted at **IEEE ISMAR 2024** (3rd author).

Passthrough-Aware VR Exergaming in Public Spaces

X-CHI Lab – XJTLU

Research Assistant | **Supervisors:** Prof. Hai-Ning Liang

2023.09 - 2024.04

- Independently developed an interactive VR exergame system with dynamic Passthrough toggling (Unity3D + PICO 4 SDK), enabling real-time awareness of physical environments such as bystanders and obstacles.
- Designed a dual-action “dodge & slice” mechanic inspired by Fruit Ninja, integrating multi-channel feedback (combo

tracker, haptics, visual-audio HIT cues) to support immersive yet context-aware gameplay.

- Led environmental calibration in both controlled lab and public university underpass settings; executed a within-subjects experiment with three conditions (Closed Room, Public, Public+Passthrough), ensuring ecological validity and participant safety.
- Results showed Passthrough significantly improved performance (+6% score) and reduced anxiety levels ($p < 0.05$) in public environments; findings accepted at **IEEE ISMAR 2024** (3rd author).

Passthrough-Enhanced VR Exergaming in Shared Environments

X-CHI Lab – XJTLU

Research Assistant | Supervisors: Prof. Hai-Ning Liang

2023.03 - 2023.09

- Designed and implemented a passthrough-enabled VR exergame using Unity3D and PICO 4 SDK, enabling real-time blending of physical surroundings with virtual interactions.
- Extended traditional Fruit Ninja gameplay with “crouch-to-avoid” mechanics and multi-channel feedback (real-time scoring, haptics, UI), improving user reactivity and immersion.
- Conducted a 2×2 within-subjects experiment (space type × passthrough mode) with 24 participants; collected multimodal data (Polar OH1, questionnaires, interviews).
- Results showed 6% score improvement and reduced social anxiety in high self-conscious users under passthrough conditions. Published in **IEEE TVCG 2024** (2nd author).

Exploring the Impact of Audience Familiarity on Player in VR Exergames

X-CHI Lab – XJTLU

Research Assistant | Supervisors: Prof. Hai-Ning Liang

2022.09 - 2023.04

- Built a virtual audience generation system combining facial modeling (Avatar Maker Pro), body shape synthesis, and voice sampling to simulate four NPC conditions (Familiar/Unfamiliar Faces × Familiar/Unfamiliar Voices).
- Designed a real-time audience feedback mechanism using score-based triggers for speech + animation; NPCs dynamically express encouragement or disappointment, simulating social co-presence.
- Augmented a Fruit Ninja-style exergame with a “fog-clearing” squat task (Steam Particle System) to induce cognitive interference and increase exertion.
- Integrated multimodal feedback (real-time CSV score logging, haptics, HIT UI, sound cues) to enhance behavioral traceability and gameplay pacing.
- 2×2 user study revealed that consistent audience familiarity (face+voice) improved scores (+7.2%) and reduced perceived fatigue/anxiety ($p < 0.05$). Published in **IEEE ISMAR 2023** (4th author).

Publications

- Z. Guo, W. Xu, **H. Wang**, T. Wan, N. Baghaei, C.-H. Lo, and H.-N. Liang, “Enhancement of Co-located Shared VR Experiences: Representing Non-HMD Observers on Both HMD and 2D Screen,” *2024 IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*, Bellevue, WA, USA, 2024, pp. 239-248, doi: 10.1109/ISMAR62088.2024.00038.
- Z. Guo, H. Deng, **H. Wang**, A. J. Y. Tan, W. Xu, and H.-N. Liang, “Exploring the Impact of Passthrough on VR Exergaming in Public Environments: A Field Study,” *2024 IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*, Bellevue, WA, USA, 2024, pp. 229-238, doi: 10.1109/ISMAR62088.2024.00037.
- Z. Guo, **H. Wang**, H. Deng, W. Xu, N. Baghaei, C.-H. Lo, and H.-N. Liang, “Breaking the Isolation: Exploring the Impact of Passthrough in Shared Spaces on Player Performance and Experience in VR Exergames,” *IEEE Transactions on Visualization and Computer Graphics*, vol. 30, no. 5, pp. 2580-2590, 2024, doi: 10.1109/TVCG.2024.3372114.
- Z. Guo, W. Xu, J. Zhang, **H. Wang**, C.-H. Lo, and H.-N. Liang, “Who’s Watching Me?: Exploring the Impact of Audience Familiarity on Player Performance, Experience, and Exertion in Virtual Reality Exergames,” *2023 IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*, Sydney, Australia, 2023, pp. 622-631. doi: 10.1109/ISMAR59233.2023.00077.

Academic Service

IEEE ISMAR 2023 (International Symposium on Mixed and Augmented Reality)

Online

Volunteer

2023.10 - 2023.10

- Collaborated with fellow volunteers to design and build the virtual scene for the ISMAR 2023 online meeting using the Gather platform, ensuring an engaging and immersive online environment for participants.

- Took an active role in decorating the virtual scene to create an appealing and conducive atmosphere for the conference, enhancing the overall participant experience.
- Acted as a knowledgeable guide throughout the **IEEE ISMAR 2023** meeting, offering assistance and direction to attendees to facilitate their seamless participation in the online event.

Language & Technical Skills

- **Languages:** Mandarin (native), English (fluent, IELTS 6.5/6.0)
- **Programming:** Python, MATLAB, C#, Java, JavaScript, MySQL, Bash, HTML/CSS
- **Frameworks & Libraries:** PyTorch, Scikit-learn, Hugging Face Transformers
- **Platforms & Tools:** Linux, Windows, Git
- **XR Hardware Experience:** PICO, HTC Vive, Oculus Quest, Oculus Rift
- **Software:** Figma, Unity
- **Documentation:** Markdown, L^AT_EX
- **AIGC & Generative AI:** Comfy UI, Ollama, GPT-SoVITS, Prompt Engineering