Tianrui Hu

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EDUCATION

Beijing University of Posts and Telecommunications (BUPT) Beijing, China
Master of Science in Digital Media Technology *Sep. 2022 - Present*
Weighted GPA (core courses): 92.74, Major Rank: 2.
Core courses: Human–Computer Interaction(91)/Advanced Computer Graphics(95)/Matrix Theory and Methods(97)/Quantum Imaging(99)/Deep Reinforcement Learning

BUPT & Queen Mary University of London Beijing, China
Bachelor of Science with Honours *Sep. 2018 - Jun. 2022*
First Class in Telecommunications Engineering with Management

PUBLICATIONS

- Yanjia Li, **Tianrui Hu**, Yi-Fan Cao, Huamin Qu and Sicheng Song, *SupplySim: Learning to Simulate Supply Chain Networks with Graph-Based Multi-Agent Systems for Education.*- To be reviewed by **UIST25**.
- **Tianrui Hu**, Taizhou Chen and Kening Zhu, *AirThumb: Supporting Mid-air Thumb Gestures with Built-in Sensors on Commodity Smartphones.*- Accepted by **CHI'25 LBW**.
- **Tianrui Hu** and Wenjun Hou, *Gaze-Adaptive Subtitles for 360° Videos in Virtual Reality.*- Accepted by the 10th **International Conference on Virtual Reality** in 2024.
- Hongrun Wang, **Tianrui Hu**, Yuze Gao, and Wenjun Hou, *LordofChange: A Haptic Sliding Controller with Changeable Tactile Textures.*- Accepted by 21st **EuroXR** International Conference in 2024.
- Linkai Lv, **Tianrui Hu**, Hongrun Wang and Wenjun Hou, *A Spatial Reality Display–Based Serious Game for Chemistry Experiment Behavioral Skills Training.*- Accepted by electronics.

RESEARCH EXPERIENCE

HKUST: VisLab Feb. 2025 – Present
Advisor: Professor Huamin QU *HongKong, China*

SupplySim: Learning to Simulate Supply Chain Networks with Graph-Based Multi-Agent Systems for Education

- Built the frontend for SupplySim, an agent-based supply chain knowledge teaching system, and visualized agents as nodes in the frontend interface.

City University of Hong Kong: MEI Lab May. 2024 – Dec. 2024
Advisor: Professor Kening ZHU *HongKong, China*

Project: ModiTex: Flexible Metamaterial for Altering the Users' Surface Tactile Sensation through Pneumatically-Actuated Pixelated Textures

- Collaborated with partners in the silicone rubber based tactile hardware assembly and testing phases, ensuring accurate construction and functionality of experimental setups.
- Supported the development of practical applications based on design, and helped create detailed reports on the process.

Project: Airthumb: Ultrasonic based mobile phone mid-air gesture recognition method

- Conducted Android development, using various Android sensors for comprehensive data (IMU & sound data) recording, and designed a user study to accurately collect and record signals for analysis.
- Built a back-end and data analysis platform using Python to manage, process, and analyze collected data, contributing to the development of robust signal machine learning recognition systems.
- Designed and implemented machine learning frameworks using SVM and neural networks, including Transformer models, to enhance recognition accuracy, and rigorously tested each model's performance.

BUPT: Beijing Key Laboratory of Network System and Network Culture Sep. 2022 – Present
Advisor: Professor Wenjun HOU *Beijing, China*

Project: Gaze-Adaptive Subtitles for 360° Videos in Virtual Reality

- Developed a novel gaze-adaptive subtitle placement method based on eye movements, which reduced the issues of eye strain and missed information in VR videos.
- Based on reading relative behavior and heuristic method, implemented a reading behavior recognition system to dynamically position subtitles, reducing occlusion and improving visibility, with user studies using eye-tracking metrics and questionnaires.
- Demonstrated that the adaptive subtitle method significantly reduces eye fatigue and enhances viewing experience, with varying performance based on video types, particularly improving scene-based videos, leading to acceptance at ICVR 2024.

Project: Holographic Display and Interaction in 6G Communication Scenarios

- Explored the limitations of current holographic technology in 6G communication. Developed interactive scenes to enhance user immersion and interaction while researching and optimizing data streaming metrics for improved performance.
- Created multi-modal interactive avatars in holographic environments by integrating large language models with digital virtual human technology. Implemented a virtual human workflow using AIGC, including avatar creation and speech synthesis, and established a back-end platform for Unreal Engine integration.

Project: VR-based AR Hospital Navigation Simulation

- Explored AR indoor navigation in hospitals to address user challenges, investigated future interaction methods and UI displays through VR simulations, and conducted user analysis to assess usability in AR navigation scenarios.
- Implemented gesture-based interactions in Unreal Engine to enhance user experience, experimenting with various methods to improve navigation and interaction within the AR hospital environment.

WORK EXPERIENCES

Sonata Dec. 2023 – Present
Co-founder *Beijing, China*

- Responsible for managing business requirements and consulting on technical implementation strategies, with a focus on software development in the XR field. Led development projects, supervised quality assurance, and handled the maintenance of both software and hardware systems.

Xiaomi Inc Mar. 2022 – Apr. 2022
3D application development. *Beijing, China*

- Developed AR device applications and content using Unity3D. Implemented brightness control within AR interface. Established ARSDK access, enabling Bluetooth finger ring control of AR cursors. Created testing programs, packaged and maintained projects, provided feedback.

Projects

Tencent Computer Graphics & Rendering Project | *UE5 C++ developer, technical artist* Oct. 2023 – May. 2024

- Programmatically creating the entire scene, including realistic elements like landscape, grass, trees, and constructing indoor and outdoor environments. Implementing a weather and seasonal system tailored for the project.
- Optimizing rendering performance for the project.

Tsinghua University Online Exhibition | *Unity3D C# developer, technical artist* Oct. 2022 – Dec. 2022

- Collaborated with the Tsinghua University Student Union and the Academy of Arts & Design for scene modeling, construction, and material production.
- Deployed the project on the web using WebGL, and integrated Pico SDK to deploy the project in VR.

AWARDS

Second Prize, National College Student Digital Media Technology and Creativity Competition *2023*

SKILLS & RESEARCH INTERESTS

Programming: Python, Java, C++, C#, Javascript, OpenGL, Vue, Matlab
Digital Content Creation & Graphics Engine: Unreal Engine, Unity3D, Blender, Substance Painter
Language: Mandarin Chinese (Native), English (IELTS 7.0)
Research Interests: VR/AR Interaction, Eye tracking, Computer Graphics