

# Xuning Hu

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## Education

<b>Xi'an Jiaotong-Liverpool University (XJTLU)</b>	2022/09 – 2026/06 (Expected)
BSc in Information and Computing Science	Suzhou, China
<ul style="list-style-type: none"><li>Major GPA: 3.82/4.00</li><li>Major Courses: Computer Graphics, Computer Network, Software Engineering, Decision Computation and Language, Computer Systems, Databases, Java Programming, Discrete Mathematics and Statistics, Operating Systems Concepts, Algorithmic Foundations and Problem Solving, Artificial Intelligence</li></ul>	

## Publications

<b>[ISMAR' 24] Xuning Hu</b> , Yan, X., Wei, Y., Xu, W., Yue, L., Liu, Y., & Liang, H.-N. (2024). "Exploring the Effects of Spatial Constraints and Curvature for 3D Piloting in Virtual Environments." 2024 IEEE International Symposium on Mixed and Augmented Reality. <b>Accepted</b>
<b>[SUI' 24] Darbar, R., Xuning Hu</b> , Yan, X., Wei, Y., Liang, H.-N., Xu, W., & Sarcar, S. (2024). "OnBodyQWERTY: An Empirical Evaluation of On-Body Tap Typing for AR HMDs." ACM Symposium on Spatial User Interaction. DOI: <a href="https://doi.org/10.1145/3677386.3682084">10.1145/3677386.3682084</a> <b>Accepted</b>
<b>[SI3D' 24] Chen, B., Yan, X., Xuning Hu</b> , Kao, D., & Liang, H.-N. (2024). "Impact of Tutorial Modes with Different Time Flow Rates in Virtual Reality Games." ACM Symposium on Interactive 3D Graphics. DOI: <a href="https://doi.org/10.1145/3651296">10.1145/3651296</a> <b>Accepted</b>
<b>[PACMHCI' 24] Shi, R., Wei, Y., Xuning Hu</b> , Liu, Y., Yue, Y., Yu, L., & Liang, H.-N. (2024). "Experimental Analysis of Freehand Multi-Object Selection Techniques in Virtual Reality Head-Mounted Displays." ACM Interactive Surfaces and Spaces. DOI: <a href="https://doi.org/10.48550/arXiv.2409.00982">10.48550/arXiv.2409.00982</a> <b>Accepted</b>
<b>[CHI' 25] Zhang, H., Xiao, Y., Huang, J., Yan, X., Xuning Hu</b> , Zheng, Y., Li, N., & Feng, T. (2025). "N-ary Gaussian Model: Modeling Pointing Uncertainty Across Task Scenarios Using an Automated Multi-Gaussian Modeling Pipeline." Conference on Human Factors in Computing Systems. <b>Under Review</b>
<b>[VR' 25] Xuning Hu</b> , Xu, W., Wei, Y., Zhang, H., Huang, J., & Liang, H.-N. (2025). "Optimizing Moving Target Selection in VR by Integrating Proximity-Based Feedback Types and Modalities." The 32nd IEEE Conference on Virtual Reality and 3D User Interfaces. <b>Under Review</b>
<b>[VR' 25] Xu, W., Wei, Y., Xuning Hu</b> , Stuerzlinger, W., Wang, Y., & Liang, H.-N. (2025). "Predicting Ray Pointer Landing Poses in VR Using Multimodal LSTM-Based Neural Networks." The 32nd IEEE Conference on Virtual Reality and 3D User Interfaces. <b>Under Review</b>

## PATENTS

Interactive control methods, devices, equipment, and storage media for VR game tutorials. CN118416465A (granted)
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## Research Experience

<b>The Hong Kong University of Science and Technology   Computational Media Lab</b>	2024/02 – present
Advisor: <a href="#">Prof. Hai-Ning Liang</a>	
Remote Research Assistant	
<b>Chinese Academy of Sciences   The Institute of Software</b>	2024/06 – 2024/10
Advisor: <a href="#">Prof. Jin Huang</a>	
Research Assistant	
<b>Xi'an Jiaotong-Liverpool University   X-CHI Lab</b>	2023/05 – 2024/02
Advisor: <a href="#">Prof. Hai-Ning Liang</a>	
Research Assistant	

## Projects

<b>Modeling User Behaviors For Steering Law in Virtual Reality</b>	2024/01 – 2024/04
Advisor: <a href="#">Prof. Hai-Ning Liang</a>	
<ul style="list-style-type: none"><li>Developed a <b>virtual drone control system</b> in Unity using Oculus and XBOX controllers. The system employed <b>Mesh computation</b> to create paths, incorporating specific constraints on width, height, and curvature.</li></ul>	

- Inspired by the paper Modeling steering within above-the-surface interaction layers (CHI'07), we tested the adaptability of both the **original Steering Law and the weighted Euclidean version under dual-axis width constraints in a 3D environment (Steering Law:  $R^2 = 0.923$ ; weighted Euclidean version:  $R^2 = 0.968$ )**.
- To investigate the effect of the weight coefficient  $\eta$  in the weighted Euclidean model under complex scenarios, we introduced seven curvature-constrained paths. Our findings indicated that the change in the weight coefficient followed a normal distribution curve relative to the curvature radius ( $\eta$ :  $R^2 = 0.84$ ). By combining the weighted Euclidean model with the curvature model and replacing the constant term with a normal distribution function influenced by curvature, **our new model demonstrated a 52.6% improvement in AIC and a 60.6% improvement in  $R^2$  compared to the baseline Euclidean model**.
- Published at ISMAR' 24.

### Exploring Keyboard Input at Different Body Positions During Passthrough

2023/10 – 2024/01

Advisor: Prof. Sayan Sarcar

- Utilized a high-precision **VICON** motion capture camera and reflective markers to accurately capture hand and arm movements (**3D coordinates and rotation**) with real-time communication to the Oculus headset.
- Developed a 3D keyboard in Unity to enable **precise prediction, error correction, and swipe** functionality to improve users' Words Per Minute (WPM) typing speed.
- Compared the performance of keyboards located on the Palm, Back of the hand, Forearm (anterior), Forearm (posterior), and Mid-Air based on three metrics: Text Entry Speed, Word Suggestion Usage, and Error Rates (UER, CER). Using RM-ANOVA for statistical analysis, **we found that the Palm keyboard performed the best with a Words Per Minute (WPM) rate of 20.18**.
- Published at SUI' 24. DOI: [10.1145/3677386.3682084](https://doi.org/10.1145/3677386.3682084)

### Explored the effectiveness of different types of game tutorials in Virtual Reality

2023/08 – 2024/10

Advisor: Prof. Domic Kao and Prof. Hai-Ning Liang

- Developed two types of games in Unity using C# (**a rhythm game and a parkour game**). Four distinct tutorial modes—bullet time, scene pause, filter application, and UI enhancements—were implemented to explore the effectiveness of various teaching methods in helping users master unfamiliar techniques.
- **A between-subjects experiment** was conducted with 59 participants, using learnability, player performance, experience, cognitive Load, and player feedback as evaluation metrics. **Analysis using one-way ANOVA revealed that bullet time significantly enhanced control learnability and reduced cognitive load**.
- Published at SI3D' 24. DOI: [10.1145/3651296](https://doi.org/10.1145/3651296)

### Investigated techniques for multi-object selection in mid-air using hand gestures

2023/05 – 2024/08

Advisor: Prof. Hai-Ning Liang

- Based on VR **hand gesture tracking**, we treated pinching motions of different fingers as independent events. These independent events were used to control various techniques, allowing us to explore the effectiveness of gesture-based switching between techniques.
- Inspired by the paper Fully-Occluded Target Selection in Virtual Reality (TVCG'20), we designed **cone-casting and cross-selection techniques**. We conducted experiments in environments with varying complexity (**target density and number of distractor objects**), using selection time and error rate as evaluation metrics.
- Published at PACMHCI' 24 (ISS). DOI: [arxiv.org/pdf/2409.00982](https://arxiv.org/pdf/2409.00982)

## Technical Skills

**Programming Languages:** C#, C, Java, SQL, Python

**Tools and Frameworks:** Unity, Motion Capture, OpenGL, MySQL, Oculus SDK, Hololens, Git, SPSS, Eye-Tracking

## Extra-Curriculum Experience

<b>Student Volunteer</b> 23nd IEEE International Symposium on Mixed and Augmented Reality (ISMAR)	2023/10
<b>China Undergraduate Mathematical Contest in Modelling</b>	2023/09
<b>RoboMaster Robotics Competition : National Second prize in RoboMaster 2023</b>	2023/03