

Erdem Murat

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Ph.D candidate in CS - Generative AI, VR, Simulation & Prototyping, user experience and predictive modeling.

EDUCATION

- **George Mason University**

Ph.D. in Computer Science

B.S & M.S in Computer Science

August 2023 – Current

August 2018 – May 2023

PUBLICATIONS

- **LLM-Driven VR Fire Command Training for Real-Time Emergency Response**

Erdem Murat, Yongqi Zhang, Liuchuan Yu, Siraj Sabah, Lap-Fai Yu

Pending

Journal Paper

- **Developed an LLM-powered VR firefighter commander training simulation**, collaborating with the Fairfax Fire Department, using real-time speech understanding to direct autonomous virtual crews and simulate incident-command decision-making.
- Realistic fireground simulations with AI-driven scene generation, controlling fire severity and victim placement.
- Deployed a local low-latency H200 GPU server hosting coordinated LLM agents for real-time simulation control and continuous scene evaluation with automated after-action reports.

- **LLM-Think-Alouds: Analyzing User Experience in VR Platformers**

Erdem Murat, Yongqi Zhang, Liuchuan Yu, Siraj Sabah, Lap-Fai Yu

[Under Review]

Conference Paper

- Developed an LLM-driven automated multimodal playtesting tool (text, vision, audio) to assess player behavior in VR and produce quantitative emotion estimates for user-experience research.
- Applied Gaussian RBF interpolation and constrained DTW to produce continuous emotion trajectories and robust cross-session similarity metrics, packaged as an interactive analysis tool with UI visualizations for comparative evaluation.

- **Player-Centric Difficulty Prediction for Parameterized VR Platformer Gameplay**

Erdem Murat, Liuchuan Yu, Siraj Sabah, Haikun Huang, Lap-Fai Yu

[Under Review]

Conference Paper

- Trained a recurrent neural network to predict user profiles and perceptions of difficulty over various game levels using limited gameplay and user data.
- Applied Markov Chain Monte Carlo to optimize parameters to target difficulty predictions for rapid prototyping.

- **HieraVisVR: Hierarchical Visual Analytics for Motion-Centric VR Playtesting**

Yongqi Zhang, Erdem Murat, Liuchuan Yu, Haikun Huang, Minsoo Choi, Christos Mousas, Lap-Fai Yu

ACM CHI 26': Visualization & Visual Analytics (Presenting Author)

Conference Paper

- Co-designed and validated HieraVisVR, a hierarchical visual-analytics VR tool that integrates motion, gaze, and event analytics to assess attention and memory, demonstrating strong usability and reliability

- **Predicting Users' Difficulty Perception in a VR Platformer Game**

Erdem Murat, Liuchuan Yu, Siraj Sabah, Haikun Huang, Lap-Fai Yu

ACM Motion, Interaction, and Games 24'

Poster

- **Understanding Online Education in Metaverse: Systems and User Experience Perspectives**

Ruizhi Cheng, Erdem Murat, Lap-Fai Yu, Songqing Chen, Bo Han

IEEE Virtual Reality and 3D User Interfaces 24'

Conference Paper

- Proposed an analytic method combining qualitative & quantitative analysis with end-to-end network measurements to understand user experience in VR education and detect bottlenecks to optimize system performance.

- **Machine Learning Automation for Virtual Reality Games**

Master's Thesis

- Machine learning solution to predict user difficulty perception and address limitations in VR game design

EXPERIENCE

- **Researcher** Arlington, VA
Design Computing and eXtended Reality Lab January 2022 – Present
 - **Research:** Artificial Intelligence, Virtual Reality, Game Design
 - **Advisor:** Prof. Lap-Fai (Craig) Yu
 - **Awards & Funding:** Recipient of research funding from the Center for Advancing Human-Machine Partnership (CAHMP) and the National Science Foundation (NSF).
 - **AI & VR for Firefighter Training and Guidance:** Lead researcher on *Enhancing Firefighter Training with AI-Driven Multimodal VR Guidance*, a CAHMP-funded project integrating AI (vision, text, speech) into VR to assist firefighters in high-risk scenarios.
 - **AI & User Experience in VR:** *GPT-Think-Alouds: Analyzing User Emotion in VR Platformer Games via LLMs* and *Player-Centric Difficulty Prediction for Parameterized VR Platformer Gameplay*, supported by NSF funding.
- **Graduate Teaching Assistant** Arlington, VA
George Mason University August 2023 – Present
 - **Courses:** Computer Networks, Game Programming I & II, Advanced Game Programming, Visual Computing
- **Guest Lecturer** Washington DC
George Washington University February 2026 – March 2026
 - **Course:** CSCI 4454 - Augmented and Virtual Reality
- **Virtual Reality Director** Arlington, VA
Global Co Lab July 2022 – July 2024
 - **VR Development & Education:** Developed VR learning spaces and mentored youth teams in environmental sciences, securing \$15,000 in the UN SDG Metaverse Prize and achieving top results in competitions.
 - **Tech Outreach:** Led outreach for joint United Nations Sustainable Development Goals initiatives in virtual reality and digital innovation, collaborating with Mozilla and Roblox.
- **Unity Developer Intern** Irvine, CA
Collimation May 2024 – September 2024
 - **Mixed Reality Development:** Consulted on the design of a mixed-reality sports system using hand-tracking.

ACADEMIC SERVICES

- **Conference Local Chair:** ACM MIG 2024
- **Conference/Journal Paper Reviewer:** ACM CHI 2026, PRESENCE: Virtual and Augmented Reality (2025), IEEE VR 2023
- **President:** Computer Science Graduate Student Association at George Mason University
- **President:** George Mason University Fuse Graduate Student Council

PROJECTS

- **VR Sports Simulation System:** Developed and deployed a VR system with feet tracking adopted by three Fortune 500 clients, featuring custom physics, a novel interaction model, and integrated data collection for athlete performance research.
- **Computer Vision Based Lane Detection for Driving Simulator:** Using CUDA, YOLO, PyTorch, and TensorFlow libraries, developed a CV-based solution for real-time lane assistance in a driving simulator.
- **Motion Planning for A Multi-Robot System :** Used Gazebo and ROS to create a multi-robot setting with obstacles and motion-planning for autonomous movement.