Erdem Murat

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First-year Computer Science Ph.D. student with expertise in research, virtual reality, machine learning, and game design.

Education

George Mason University **Fairfax, VA**
Ph.D. in Computer Science *August 2023 - Current*
B.S & M.S in Computer Science *August 2018 - May 2023*

Experience

Graduate Student Researcher **January 2022 – Present**
Design Computing and eXtended Reality (DCXR) Lab *George Mason University*

- Research in extended reality, machine learning, and game design with the aim of publishing in top academic conferences.

Graduate Teaching Assistant **August 2023 – Present**

- Fall 2023: CS 325 Game Design, CS 425 Game Programming I *George Mason University*

Publications

Predicting Users' Difficulty Perception in Virtual Reality Games **November 2023**
***Erdem Murat**, Liuchuan Yu, Siraj Sabah, Haikun Huang, Lap-Fai Yu* IEEE Transactions On Games - Under review

- Addressed issues in VR games and experience design by adapting decades of non-VR research.
- Proposed a novel application that predicts users' perception of difficulty in a VR game by having them play four levels, collecting data, and using a pre-trained machine learning model to form personalized predictions over all levels.
- Obtained IRB certificate, collected gameplay, user, and medical wristband data through 70+ user studies. Trained a recurrent neural network to understand relationships between collected user data, gameplay data, and game parameters.

Understanding Online Education User Experience in the Metaverse: A Systems Perspective **October 2023**
*Ruizhi Cheng, **Erdem Murat**, Lap-Fai Yu, Songqing Chen, Bo Han* IEEE VR - Under review

- Proposed a novel analytic method that combines qualitative and quantitative analysis with end-to-end network measurements to understand user experience in VR education and detect bottlenecks to optimize system performance.
- Deployed a Mozilla Hubs server-client with custom scripts to host 5 graduate level lectures remotely in VR, record performance metrics through an API, conduct surveys, and use all data to conduct an in-depth systems anaylsis.

Machine Learning Automation for Virtual Reality - Master's Thesis **December 2022**

- Addressed limitations in VR development research and proposed a solution to improve human-computer interaction.
- Devised a machine learning solution that accurately predicts user perception of difficulty in a VR game.

Projects

Why Did the Chicken Cross the Road? - Virtual Reality Game | *Unity, C#, Python, VS Studio*

- Designed and developed a game that is complete, optimized, and ready to be used in research and user testing.
- Used MCMC to automate difficulty adjustment and create a user experience that is challenging and addictive.

Virtual Reality Education | *AWS, JavaScript, Python, Distributed Systems, Code Profiling, Networking*

- Utilized AWS to deploy a private WebVR server on an AWS EC2 instance to conduct user studies on user experience.
- Used Glances to monitor resource utilization and tcpdump to capture and analyze the server network traffic.

VR Sports Simulation System | *Unity, C#, Plastic SCM, VS Studio*

- Developed a VR simulator that works by attaching controllers to the feet for sports.
- Devised formulas and scripts to enhance ball physics by making calculations on the trajectory, curve, and contact points.
- Developed a system with built-in data collection tools, including eye-tracking, to be used in industry sports research.

Test the Heights - Virtual Reality Game | *Unity, C#, VS Studio*

- Utilized interactive systems to craft a thrilling and immersive experience in a solo-developed game.

Computer Vision Based Lane Detection for Driving Simulator | *CUDA, YOLO, Pytorch, Tensorflow*

- Designed a real-time solution that detects the user's car and lanes in a driving simulator and steers the car.
- Used YOLO, CV, and performance optimization techniques to create a solution that is robust, fast, and efficient.

Motion Planning for A Multi-Robot System | *ROS, Gazebo, Python, A.I, SLAM*

- Used Gazebo and ROS to create a multi-robot setting with obstacles and motion-planning for autonomous movement.

Virtual Reality Quality Assurance Tester Tool | *UI, QA Testing, Unity, C#, Python*

- Created a developer tool for VR game quality assurance with 3-D replay, camera settings, and intuitive UI.
- Devise NLP solutions for understand sentiment in user response.

Technical Skills

Languages: Python, C#, C++, C, Java, JavaScript, SQL
Game Engines: Unity, Unreal
Softwares/Tools: Visual Studio, OpenGL, Git/GitHub, Plastic SCM, Microsoft 365, Photoshop

Related Voluntary Experience

Global Co Lab Network — July 2022 – Present

Virtual Reality Director

- Created virtual reality environments for the Co Lab to host conferences and present fieldwork addressing social issues.
- Mentored 3 youth teams, with one of them being winners, in developing educational and entertaining VR environments for the UN SDG Metaverse Competition.
- Winner in the adult team for the UN SDG Metaverse Competition, presented work at the United Nations Science Technology and Innovation Forum.

Reviewer — January 2023

IEEE VR 2023

Cyber Bytes Foundation — June 2022 – July 2022 & June 2023

VR Development Instructor

- Developed a comprehensive, 5-day curriculum with 30 hours of educational content to teach virtual reality and game development to a classroom of 20 students.
- Harnessed knowledge based on the newest technology obtained through academic experience, research, seminars, and conferences to construct content directly from the industry.