ERDEM MURAT

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Innovation-driven Computer Scientist with expertise in research, virtual reality development, machine learning, and game development. Strong C#, Python, Unity, C/C++, Java, and 3D math skills.

Education

George Mason University   **Fairfax, VA**
Ph.D. in Computer Science   *August 2023*
M.S in Computer Science   *January 2022 - May 2023*
- Advisor: Prof. Craig (Lap-Fai) Yu.
- Leading member and Secretary of the Computer Science Graduate Students Association (CSGSA).

B.S in Computer Science   *August 2018 - Decemeber 2021*

Experience

Design Computing and eXtended Reality (DCXR) Lab   **January 2022 – Present**
Graduate Student Researcher   *George Mason University*
- Conducted research in extended reality, machine learning, game design, and virtual reality systems with the aim of publishing in the top academic conferences.
- Collaborated with lab members on research, and attended seminars, conferences, and related events.
- Developed games and simulation systems with a research focus on user experience, game design, and machine learning.

Publications

Predicting Users' Difficulty Perception in Virtual Reality Games   **2023**
Erdem Murat, Liuchuan Yu, Siraj Sabah, Haikun Huang, Lap-Fai Yu   Under review
- 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.
- Addressed issues in VR games and experience design by adapting decades of non-VR research.
- 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 User Experience of Online Education in Metaverse: A Systems Perspective   **2023**
Ruizhi Cheng, **Erdem Murat**, Lap-Fai Yu, Songqing Chen, Bo Han   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*
- As the sole developer, I designed and developed all game elements to produce a product that is complete, optimized, and ready to be used in research and user testing.
- Conducted research and user studies to design an experience that is fun, challenging, and addictive.
- Trained a custom machine learning regressor to predict user perception of difficulty during gameplay, as well as likely predictions for perception of all other levels.
- Used MCMC optimization to automate difficulty adjustment difficulty to create a user experience that is addictive and continuously challenging.

Virtual Reality Education | *AWS, JavaScript, Python, Distributed Systems, Code Profiling, Networking*
- Utilized Amazon Web Services to deploy a private Mozilla Hubs server on an Amazon AWS EC2 instance (t3.medium) to conduct user studies on user experience.
- Used Glances to monitor resource utilization and tcpdump to capture and analyze the server network traffic.
- Created an API to collect client-side data sent by scripts and used collected data to detect and debug performance bottlenecks as well as devise solutions for better performance.

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.

VR Soccer Simulation System | *Unity, C#, Plastic SCM, VS Studio*
- Developed a soccer VR simulator that works by attaching controllers to the feet of the user to kick a virtual ball.
- Wrote scripts to enhance the physics realism of the virtual ball by making various calculations on the trajectory, curve of the ball, and foot contact points.
- Developed a system with built-in data collection tools, including eye-tracking, to be used in industry sports research.

Motion Planning for A Multi-Robot System | *ROS, Gazebo, Python, A.I, SLAM*
- In a team of 3, used Gazebo and ROS to create a multi-robot environment with obstacles and motion-planning to allow for autonomous robot movement.
- Used Continuous Conflict-Base Search to build a motion planner's pipeline for multi-robot navigation without collisions.

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.
- Performed user-testing to get feedback from users in various stages of the game to optimize the final product.

Lightweight Solution for Road Sign Detection | *Pytorch, Keras*
- Designed a lightweight solution that detects road signs and classifies them with over 98% accuracy.

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

Other Related Experiences

Global Co Lab Network   **July 2022 – Present**
Virtual Reality Director (Part-time)
- Created virtual reality environments for the Co Lab to host conferences and present fieldwork addressing social issues.
- Mentored 3 youth teams in developing educational and entertaining VR environments for the UN SDG Metaverse Prize.
- Presented work at the United Nations Science Technology and Innovation Forum.

Reviewer   **January 2023**
IEEE VR 2023

Cyber Bytes Foundation   **June 2022 – July 2022**
Builidng in VR Instructor   **June 2023**
- 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.