ERDEM MURAT

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Education

George Mason University   **January 2022 – May 2023 (Expected)**
Master of Science in Computer Science   *Fairfax, VA*

George Mason University   **August 2018 – December 2021**
Bachelor of Science in Computer Science   *Fairfax, VA*

Experience

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

- Advisor: Prof. Lap-Fai (Craig) Yu
- Led 3 research projects in various domains, including Virtual Reality (VR), Machine Learning (ML), Game Development & Engineering, Systems Analysis, and Sports Research.
- Received mentorship from Prof. Yu, collaborated with lab members on research, and attended seminars, conferences, and related events.

Global Co Lab Network   **July 2022 – Present**
Virtual Reality Director   *Arlington, VA*

- Created virtual reality hubs for the Co Lab to host conferences and enable remote attendees to virtually view and engage with projects and fieldwork addressing social issues.
- Optimized the prior build by 70% by utilizing functionalities in Blender, Spoke and Photoshop to reduce rendering workload.
- Instructed and mentored 3 teams towards developing innovative and educational VR environments for the UN Sustainable Development Goals (SDG) Metaverse Competition.

Reviewer   **January 2023**
IEEE VR 2023

Cyber Bytes Foundation   **June 2022 – July 2022**
Building in VR Camp Instructor   *Stafford, VA*

- Developed a comprehensive, 5-day curriculum with 30 hours of educational content to teach virtual reality development concepts to 20 students.
- Harnessed knowledge based on emerging VR technology through attending lectures, conducting research, and attending seminars & conferences to construct content from the field of VR.

Academic Research

Understanding User Experience of Online Education in Metaverse: A Systems Perspective   **November 2022**
*Ruizhi Cheng, **Erdem Murat**, Lap-Fai Yu, Songqing Chen, Bo Han*   Paper 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 in system performance.
- Deployed a Mozilla Hubs server-client system and modified open-source code and added scripts to record client-side performance through an API.
- Used Python and Jupyter Notebook to compute, visualize and analyze systems data.
- Gave a VR lecture to 23 Graduate students and later assisted a Meta researcher in using my platform for a seminar.

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

- Developed a system to address a limitation in VR development research and proposed a solution that improves user experience through machine learning to automate the manipulation of experience-affecting parameters in VR.
- Deployed a testing system to record qualitative user data and quantitative performance data.
- Obtained IRB certificate for social and behavioral research and conducted user studies with over 50 participants.
- Used collected data to train a machine learning regressor the relations between game parameters and perceived difficulty with low prediction error (26%).

Projects

Lightweight Solution for Road Sign Detection | *Pytorch, Keras, Computer Vision, Deep Learning*   **January 2023**
- Proposed an improvement to the state-of-the-art in computer vision by designing a lightweight solution that detects road signs and classifies them with over 98% accuracy.
- Developed a lightweight architecture by designing a neural network that is able to work with a limited dataset, using data augmentation and continual learning to improve accuracy from 59% to 98%.

VR Athletics - Foot Tracking VR Simulation System | *Unity, C#, Plastic SCM, VS Studio*   **January 2023**
- Developed a VR foot-tracking system enabling enhanced human-computer interaction for athletes in sports research.
- Implemented a sophisticated physics system by formulating a script-based solution enhancing Unity physics to create a realistic interaction system with the foot and virtual objects like ground, sports balls, and environment objects.

Motion Planning for A Multi-Robot System | *ROS, Gazebo, Python, A.I, Computer Vision, Linux*   **November 2022**
- 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.

Virtual Reality Education | *JavaScript, Distributed Systems, AWS, Code Profiling*   **October 2022**
- Deployed a private Mozilla Hubs server via Amazon Web Services on an AWS EC2 instance (t3.medium) to conduct user studies. Used Glances to monitor its resource utilization and tcpdump to capture and analyze the network traffic on the server side.
- Modified open-source Mozilla Hubs client code and injected custom scripts to track user data and client-side performance.
- 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.

Why Did the Chicken Cross the Road? - VR Game | *Unity, Machine Learning, C#, VS Studio*   **November 2021**
- Implemented procedural-level design and game development techniques to create an immersive and fun game.
- Recorded human motion, medical wristband (E4) data, gameplay progress data, and user ratings to train a machine learning algorithm to predict the perception of difficulty and metrics regarding user performance.
- Proposed a system that uses trained data to generate and accurately predict the difficulty of levels and uses MCMC optimization to manipulate parameters tailored to the intended user experience.

OpenGL Raytracing | *C++, OpenGL, VS Studio*   **May 2021**
- Developed C++ code to render ray-tracing in a 3D scene.
- Applied Phong's reflection model to accurately calculate a scene's reflections, lighting, and shading.

Technical Skills

Languages: Python, C#, C++, C, Java, SQL, HTML/CSS, JavaScript, R, SAS, MATLAB, Assembly
Developer Tools: Unity, Unreal
Libraries for Machine Learning: Numpy, Scikit-Learn, Pytorch, Keras, CUDA-Python, Pandas, Matplotlib, OpenCV
Softwares/Tools: OpenGL, Visual Studio, Git/GitHub, Eclipse, Blender, Microsoft 365, Photoshop, Plastic SCM