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EDUARDO DAVALOS

PROFESSIONAL SUMMARY

Graduate Student Research Assistant with 5 years of experience in computer system development, AI and web technologies, specializing in multimodal data analysis for educational environments. Demonstrates expertise in software engineering, computer vision, machine learning, and data engineering, with a proven track record of publishing over 10 papers and mentoring 5+ undergraduates. Passionate about advancing learning technologies through innovative data solutions and collaborative research.

EXPERIENCE

RESEARCH ASSISTANT - SECURE, AI-ENHANCED COMPUTER SYSTEMS

Aug 2021 - Present
Nashville, TN, USA

Vanderbilt University

♦ SyncFlow: Secure, Cloud-based Multimodal Conferencing and IoT Integration Platform

- ♦ Developed a secure platform combining IoT with cloud-based conferencing to support real-time AR and 3D sensing in browser applications.
- ♦ Implemented authenticated workflows and end-to-end encryption to ensure data integrity and user privacy in cybersecurity-focused environments.
- ♦ Enabled seamless integration of web applications with local sensors, enhancing secure, scalable interactions across various devices and locations.

♦ RedForest: AI-Enhanced E-Learning Platform for Behavioral Analysis

- ♦ Implemented cybersecurity measures to protect user data, creating a safe environment for sensitive educational data.
- ♦ Created an e-learning platform with AI-driven analytics for over 100 users, focusing on scalable, secure solutions for education.
- ♦ Analyzed learner interactions using AI, allowing for deeper insights into behavior to enhance personalized learning experiences.
- ♦ Conducted system co-design and testing sessions with end-users, integrating feedback from educators, students, and other stakeholders early in the development process to ensure the platform met real-world needs.
- ♦ Applied UX/UI best practices to improve user adaptation, resulting in a user-friendly interface that facilitated seamless adoption and engagement.

♦ Research Outcomes

- ♦ Published 10+ papers in AI, Big Data, cybersecurity, and education technology, contributing to advancements in secure systems and scalable learning platforms.
- ♦ Mentored 5+ undergraduate students in research projects focused on AI, systems security, and multimodal data, fostering their academic and professional growth.
- ♦ Developed 3D gaze tracking for multimodal data collection, supporting research with real-time, secure data capture from up to 8 users in mixed-reality environments.

RESEARCH ASSISTANT - COMPUTER VISION

Jul 2019 - Apr 2021
San Antonio, TX, USA

St. Mary's University

- ♦ Conducted advanced research in 6D Pose Estimation, applying computer vision and machine learning to build an AI-driven pose estimation system.
- ♦ Achieved real-time pose estimation at 30+ FPS using a single webcam, enabling practical applications in real-world settings.
- ♦ Developed a custom dataset to train a physics engine, significantly enhancing precision in object recognition and interaction.
- ♦ Optimized pose estimation algorithms to significantly reduce computational costs while preserving real-time processing performance.

STEM TUTOR

St. Mary's University

Aug 2016 - May 2018

San Antonio, TX, USA

- ♦ Tutored over 50 undergraduates in physics, robotics, programming, and engineering, strengthening their problem-solving skills and deepening their understanding of complex concepts.
- ♦ Mentored and guided 100+ high-school students in robotics and coding, fostering teamwork and collaborative skills essential for success in robotics competitions.

EDUCATION

PH.D. IN COMPUTER SCIENCE

Vanderbilt University

Aug 2021 - Present

Nashville, TN, USA

- ♦ Receiving the Full Engineering Graduate Fellowship.

M.S. IN ELECTRICAL ENGINEERING

St. Mary's University

Jul 2019 - Apr 2021

San Antonio, TX, USA

- ♦ Received Full Graduate Research Fellowship
- ♦ Graduated as Summa Cum Laude

B.S. IN ELECTRICAL ENGINEERING

St. Mary's University

Jul 2015 - Apr 2019

San Antonio, TX, USA

- ♦ Received Presidential Scholarship
- ♦ Graduated as Summa Cum Laude

SKILLS

Data Science, Machine Learning, Computer Vision, Real-time Systems, Pose Estimation, AI Platforms, Behavior Analysis, Software Development, Cloud Computing, Data Engineering, Big Data, Deep Learning, Human-Computer Interaction, Natural Language Processing, Software Testing, User Interface Design, Creative Problem Solving, Critical Thinking, Adaptability, Time Management, Presentation Skills, Technical Leadership, Image Processing, Edge Computing, Project Management, User Experience, Networking Skills, Systems Architecture, Interdisciplinary Collaboration.

PROJECTS

REDFOREST

AI-Enhanced E-Learning Platform

- ♦ Developed the platform using **NextJS** and **TypeScript**, ensuring a responsive and scalable frontend with smooth user interactions.
- ♦ Implemented backend functionality with **tRPC** and **Supabase**, providing seamless data retrieval and real-time analytics for user engagement insights.
- ♦ Utilized **PostgreSQL** with **row-level security** to ensure robust data access control, protecting sensitive information at the database level.
- ♦ Applied **data anonymization techniques** to safeguard student privacy, ensuring compliance with educational data protection standards such as FERPA.
- ♦ Project Page: <http://redforest.app>

SYNCFLOW

Secure, Cloud-based Multimodal Conferencing and IoT Integration Platform

- ♦ Developed the platform using **Rust** as the core foundation for its safety and performance benefits, with multi-language bindings to Rust for interoperability and extensibility across other programming environments.
- ♦ Integrated **JWT** (JSON Web Tokens) and **OAuth** for secure authentication, ensuring user data privacy and controlled access across browser and IoT devices.
- ♦ Implemented **end-to-end encryption** using **WebRTC** to maintain data integrity and confidentiality in real-time communication between browser and IoT devices.
- ♦ Project Page: <https://syncflow.live>
- ♦ GitHub Repository: <https://github.com/oele-isis-vanderbilt/SyncFlow>

ACADEMIC SERVICES

REVIEWER FOR CONFERENCES

ACM CHI conference on Human Factors in Computing Systems 2025

International Conference of Learning Representations (ICLR) 2025

IEEE Global Engineering Education Conference (EDUCON) 2025

International Conference on Artificial Intelligence in Education (AIED) 2023

LINKS

Google Scholar: scholar.google.com, Personal Website: edavalosanaya.github.io, GitHub: github.com, ORCID: orcid.org.

PUBLICATIONS

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- ♦ **Davalos, E.**, Alberto Salas, J., Goodwin, A., Zhang, Y., Srivastava, N., Thatigotla, Y., Gonzales, A., & McFadden, S. (2024). Beyond Instructed Tasks: Recognizing In-the-Wild Reading Behaviors in the Classroom Using Eye Tracking. **CHI 2025** (under review, moved to 2nd round)
 - ♦ **Davalos, E.**, Srivastava, N., Zhang, Y., Goodwin, A., & Biswas, G. (2024). GazeViz: A Web-Based Approach for Visualizing Learner Gaze Patterns in Online Educational Environment. **ICCE 2025**
 - ♦ **Davalos, E.**, Zhang, Y., S, A. T., Fonteles, J. H., & Biswas, G. (2024). 3D Gaze Tracking for Studying Collaborative Interactions in Mixed-Reality Environments. **ICMI Companion 2024**
 - ♦ Cohn, C., **Davalos, E.**, Vatrál, C., Fonteles, J. H., Wang, H. D., Ma, M., & Biswas, G. (2024). Multimodal Methods for Analyzing Learning and Training Environments: A Systematic Literature Review. *arXiv preprint arXiv:2408.14491*. **ArXiv**
 - ♦ Zhang, Y., **Davalos, E.**, Su, D., Lou, A., & Noble, J. H. (2024). Monocular Microscope to CT Registration using Pose Estimation of the Incus for Augmented Reality Cochlear Implant Surgery. <http://arxiv.org/abs/2403.07219> **Arxiv**
 - ♦ Fonteles, J., **Davalos, E.**, Ashwin, T. S., Zhang, Y., Zhou, M., Ayalon, E., Lane, A., Steinberg, S., Anton, G., Danish, J., Enyedy, N., & Biswas, G. (2024). A First Step in Using Machine Learning Methods to Enhance Interaction Analysis for Embodied Learning Environments. https://doi.org/10.1007/978-3-031-64299-9_1 **AIED 2024**
 - ♦ **Davalos, E.**, Timalisina, U., Zhang, Y., Wu, J., Fonteles, J. H., and Biswas, G. (2023). ChimeraPy: A Scientific Distributed Streaming Framework for Real-time Multimodal Data Retrieval and Processing, <https://doi.org/10.1109/BigData59044.2023.10386382> **IEEE BigData 2023**
 - ♦ Vatrál, C., Cohn, C., **Davalos, E.**, Biswas, G., Lee, M., Levin, D., Hall, E., & Holt, J. E. (2023). A Tale of Two Nurses: Studying Groupwork in Nurse Training by Analyzing Taskwork Roles, Social Interactions, and Self-Efficacy. <https://doi.org/10.22318/cscl2023.102810> **CSCL 2023**
 - ♦ **Davalos, E.**, Vatrál, C., Cohn, C., Horn Fonteles, J., Biswas, G., Mohammed, N., Lee, M., & Levin, D. (2023). Identifying Gaze Behavior Evolution via Temporal Fully-Weighted Scanpath Graphs. <https://doi.org/10.1145/3576050.3576117> **LAK 2023**
 - ♦ Vatrál, C., Lee, M., Cohn, C., **Davalos, E.**, Levin, D., & Biswas, G. (2023). Prediction of Students' Self-confidence Using Multimodal Features in an Experiential Nurse Training Environment. https://doi.org/10.1007/978-3-031-36336-8_41 **AIED 2023**
 - ♦ Vatrál, C., Biswas, G., Cohn, C., **Davalos, E.**, & Mohammed, N. (2022). Using the DiCoT framework for integrated multimodal analysis in mixed-reality training environments. <https://doi.org/10.3389/frai.2022.941825> **Front.Artif.Intell.**
 - ♦ **Davalos, E.**, & Aminian, M. (2024). FastPoseCNN: Real-Time Monocular Category-Level Pose and Size Estimation Framework. *arXiv preprint arXiv:2406.11063*. **Arxiv**
 - ♦ Munshi, A., Biswas, G., **Davalos, E.**, Logan, O., Gayathri, N., & Rushdy, M. (2022). Adaptive Scaffolding to Support Strategic Learning in an Open-Ended Learning Environment. **ICCE 2022**

INVITED TALKS AND LECTURES

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- ♦ Oral presentation at EngageAI conference at NCState (Fall 2024)
 - ♦ Guest lecturer for the course "Tech Innovation and AI for Learning class" at Vanderbilt University (Fall 2024)
 - ♦ Oral presentation on "Identifying Gaze Behavior Evolution via Temporal Fully-Weighted Scanpath Graphs" at LAK 2023 (Fall 2023)

- ♦ Oral presentation on "ChimearPy: A Scientific Distributed Streaming Framework for Real-time Multimodal Data Retrieval and Processing" at IEEE BigData 2023 (Fall 2023)