

# Edgar Rojas-Muñoz

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Early career Faculty exploring the uses of Mixed Reality for the Social Good. Interests include Mixed Reality for healthcare, cultural preservation and accessible workplaces, and education.

## Previous Employment

- School of Performance, Visualization, and Fine Arts (PVFA)** **College Station, TX**  
*Assistant Professor* *August 2022–Ongoing*  
Member of the Visual Computing and Computational Media section of the School. Lead researcher in various projects related to Mixed Reality and Human-Computer Interaction. Director of the Laboratory for Mixed and Extended User Realities (LEMUR). Mentor to graduate and undergraduate students from multiple disciplines.
- School of Computing, Costa Rica Institute of Technology (IC-TEC)** **Cartago, Costa Rica**  
*Lecturer* *July 2021–June 2023*  
Lecturer for a variety of courses, including: Introduction to Mixed Reality, Introduction to Programming, and Senior Design Project. Part of various multidisciplinary Mixed Reality projects for the Social Good.
- Intelligent Systems and Assistive Technologies Laboratory (ISAT)** **West Lafayette, IN**  
*Research Assistant (Advisor: Dr. Juan Pablo Wachs)* *August 2016–August 2020*  
Responsible for a large variety of tasks, the main one being a surgical telementoring project sponsored by the Department of Defense. As a part of a large research team with diverse backgrounds, the project tasks include the development of an augmented reality platform for surgical telementoring, the design of experiments, among others. In addition, working on a doctorate thesis project that explores how to evaluate the collaboration between agents through the understanding of their gestures.
- Intelligent Systems and Assistive Technologies Laboratory (ISAT)** **West Lafayette, IN**  
*Research Assistant (Advisors: Dr. Juan P. Wachs; Dra. Paola Vega Castillo)* *October 2015–February 2016*  
Researched and developed a large-scale interactive display based in touch inputs. The device was one of the main components of a telementoring system used by expert surgeons to transfer surgical expertise remotely.
- eScience Group at Costa Rica Institute of Technology** **Cartago, Costa Rica**  
*Undergraduate Research Assistant (Advisor: Dr. Franklin Hernández-Castro)* *February 2014–October 2015*  
Lead researcher in the development and use of a Display Wall with Alioscopy autostereoscopic screens. The work included generation of 3D content and user experiences for the Display Wall, such as intangible interfaces using Wii Remotes and Microsoft Kinects. In addition, the work included the maintenance of the laboratory visualization clusters.

## Education

### Academic Qualifications.....

- Purdue University** **West Lafayette, IN**  
*Doctor in Philosophy, School of Industrial Engineering* *2016–2020*  
GPA: 3.75/4.00
- Costa Rica Institute of Technology** **Cartago, Costa Rica**  
*Licenciatura<sup>1</sup> in Computer Engineering, Academic Area of Computer Engineering* *2010–2016*  
Class Rank #3

<sup>1</sup>A Licenciatura is a degree technically higher than a Bachelor's degree but technically lower than a Master's degree.

## Service

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### International Conferences.....

- **26th ACM International Conference on Multimodal Interaction (ICMI 2024)**

*Visa Chair, Registration Chair; To be held November 2024*

ACM ICMI is the premier international forum for multidisciplinary research on multimodal human-human and human-computer interaction, interfaces, and system development. This appointment is related to organize the conference in Costa Rica, together with a local and international team.

- **Exploring Virtual Reality Learning Environments, at Frontiers in Education (FIE) 2023**

*Workshop Organizer; October 2023*

This workshop introduced attendees to immersive Virtual Reality Learning Environments (VRLE). Attendees had several headsets available to engage in the VRLE. Developers and users were available for discussion and questions.

- **30th, 31st & 32nd IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR)**

*Program Committee member; 2023 & 2024, to be held March 2025*

IEEE VR is the premier international event for the presentation of research results in the broad areas of virtual, augmented, and mixed reality. This appointment is related to oversee the paper reviewing process of multiple submissions to the conference.

- **1st Costa Rican SIGCHI Summer School**

*Organizing Committee member; February 2023*

This Summer School will provide attendees with first-hand experiences on the use of HCI technologies for Sustainable Local Tourism. The theme is "Towards Sustainable Local Tourism with HCI".

- **Challenges in Modeling and Representation of Gestures in Human Interactions, at the 15th IEEE International Conference on Automatic Face and Gesture Recognition (FG2020)**

*Special Session Co-organizer; November 2020*

This special session will focus on fundamental challenges related to how to model and represent gestures. Specifically, it is focused on challenges associated with the gestures' morphology, phonology, semantics; affective properties, motor characteristics; cognitive aspects, pragmatics, and singularity.

- **VAR4Good, at International Symposium on Mixed and Augmented Reality (ISMAR) 2018**

*Workshop Co-organizer; October 2018*

This workshop presents and promotes research that intends to solve real-world problems using Virtual and Augmented Reality. It provides a platform to discuss challenges and opportunities to create Virtual and Augmented Reality for Good: VR/AR that helps humankind and society in more impactful ways.

### Organizations & Committees.....

- **ACM SIGCHI, Costa Rica Chapter**

*Treasurer, Founding Member; September 2022–August 2024. Vice-Chair; August 2024–Ongoing*

This local SIGCHI Chapter is committed to promoting the development and research in the Human-Computer Interaction field in Costa Rica.

- **School of Performance, Visualization & Fine Arts**

*Faculty Search committee member; 2022–2024*

Part of multiple committees in charge of recruiting both Tenure/Tenure-Track and Academic Professional Track Faculty in the different section of the School of PVFA.

- **School of Performance, Visualization & Fine Arts**

*Bachelor of Science in Visualization Foundation Courses committee member; 2022–2023*

This committee is concerned with redesigning the content of the foundation courses of the Bachelor of Science in Visualization program.

- **Federation of Students of Costa Rica Institute of Technology**

*Financial Affairs Committee Member; 2011–2012.*

This committee evaluated and assigned the budget to be allocated for every student organization of the Costa Rica Institute of Technology.

- **Costa Rican Student Association at Purdue (CRiSAP)**

*Secretary, Founding Member; November 2019–November 2020*

This student organization encourages the Costa Rican community to pursue their professional and personal development at Purdue University. Additionally, the organization organizes and sponsors activities to foster the well-being of Costa Rican students working and studying at Purdue University.

- **Human Factors and Ergonomics Society Purdue University Student Chapter (HFES)**

*Vice President; August 2017–August 2018*

This student organization promotes and advances the understanding of human factors involved in the design, manufacture, and use of machines, systems, environments and devices of all kinds. This is accomplished through the interchange of knowledge in the behavioral, biological, and physical sciences and in industrial, computer science and other relevant engineering disciplines.

- **Computer Engineering Student Board**

*Secretary of Academic Affairs; 2013–2014. President; 2012–2013. Vice President, 2011-2012*

This student organization advocates for the rights and well-being of all the students from the Computer Engineering major at Costa Rica Institute of Technology. Tasks encompassed mentoring, staff selection, classes accreditation, collaboration with other student organization, among others.

## Others.....

- **Introduction to Customer Discovery**

*Entrepreneurship Team Member; 2019*

The National Science Foundation Midwest Node Introduction to Customer Discovery program gives participants a working knowledge of how to think about their ideas from a business and customer perspective, as well as how to properly conduct customer discovery interviews; the first step in any commercialization process.

- **Young Life**

*Club Leader; 2009–2016*

Young Life is an international parachurch ministry. Tasks included organizing camps for youth groups, organize weekly meetings with a team of leaders, among others.

## Publications

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- Cabrera-Araya, R.T., **Rojas-Muñoz, E.** (2024). *INDYvr: Towards an Ergonomics-based Framework for Inclusive and Dynamic Personalizations of Virtual Reality Environments*. 23rd IEEE International Symposium on Mixed and Augmented Reality, WA, USA. (Pre-Print).
- Sancho-Jiménez, L.F., Treviño-Villalobos, M., González-Quirós, R., **Rojas-Muñoz, E.**, Walsh-Zúñiga, Y. (2024). *Designing Meaningful Tourism Experiences to Promote Ecotourism in Protected Areas Using Augmented Reality*. 7th International Congress on Environmental Intelligence, Software Engineering, and Electronic Mobile Health, Panamá. (Pre-Print (Spanish)).

- Aguilar, J., Cabrera-Araya, R.T., Callan, C., Friederichs, K., Gonzalez, A., Judkins, B., King, K., Yost, J., **Rojas-Muñoz, E.** (2024). *13th Annual Faculty Submitted Student Work Exhibit*. 51st ACM's Special Interest Group on Computer Graphics and Interactive Techniques (SIGGRAPH), CO, USA. ([Archive](#)).
- Cabrera-Araya, R.T., Chen, Y., **Rojas-Muñoz, E.** (2023). *Don't Walk Away! Virtual Safety Boundaries for Collaborative Virtual Reality Learning Environments*. 53rd IEEE Frontiers in Education, TX, USA. ([Paper](#)).
- Bezanson, K.S., Soberanis, L., Thomas, B., Brooks, R., **Rojas-Muñoz, E.** (2023). *Towards an Intelligent Tutoring System for Virtual Reality Learning Environments*. 53rd IEEE Frontiers in Education, TX, USA. ([Paper](#)).
- Poulter, H., Diebold, L., Kelly, S., Pakalapati, S., Rao, A., **Rojas-Muñoz, E.** (2023). *Cell Tour: Learning About the Cellular Membrane Using Virtual Reality*. 53rd IEEE Frontiers in Education, TX, USA. ([Paper](#)).
- Pham, T., Wang, S., Razook, S., Curran, A., Batra, J.S., **Rojas-Muñoz, E.** (2023). *Crystal Viewpoints: Virtual reality viewpoint design for analytical measurement of crystal structures in Materials Science and Engineering*. 53rd IEEE Frontiers in Education, TX, USA. ([Paper](#)).
- Qazi, M.H., Khan, F., Kim, J., **Rojas-Muñoz, E.** (2023). *Developing a VR-based Training Platform for Emergency Fire Handling Services Using Unity 3D*. 20th IEEE Frontiers in Information Technology, Pakistan. ([Paper](#)).
- Hernández-Campos, M., Guzmán-Arias, L.C., Aguilar-Cordero, J.F., **Rojas-Muñoz, E.**, Leandro-Elizondo, R., Law, Y.C (2023). *Improving Motivation and Learning Experience with a Virtual Tour in an Assembly Line to Learn About Productivity*. *Sustainability*. ([Paper](#)).
- **Rojas-Muñoz, E.** and Wachs, J. (2021). *Assessing Task Understanding in Remote Ultrasound Tasks via Gestural Analysis*. *Pattern Analysis and Applications*. ([Paper](#)).
- **Rojas-Muñoz, E.**, Lin, C., Sanchez-Tamayo, N., Cabrera, M., Andersen, D., Popescu, V., Barragan, J., Zarzaur, B., Murphy, P., Anderson, K., Douglas, T., Griffis, C., McKee, J., Kirkpatrick, A., Wachs, J. (2020). *Evaluation of an augmented reality platform for austere surgical telementoring: a randomized controlled crossover study in cricothyrotomies*. *Nature Digital Medicine*. ([Paper](#)).
- **Rojas-Muñoz, E.** and Wachs, J. (2020). *Assessing Collaborative Physical Tasks via Gestural Analysis*. *Transactions in Human-Machine Systems*. ([Paper](#)).
- **Rojas-Muñoz, E.**, Couperus, K. and Wachs, J. (2020). *The AI-Medic: An Artificial Intelligent Mentor for Trauma Surgery*. *Computer Methods in Biomechanics and Biomedical Engineering*. ([Paper](#)).
- **Rojas-Muñoz, E.** and Wachs, J. (2020). *The MAGIC of E-Health: A Gesture-Based Approach to Estimate Understanding and Performance in Remote Ultrasound Tasks*. 15th IEEE International Conference on Automatic Face and Gesture Recognition, Argentina ([Paper](#)).
- **Rojas-Muñoz, E.** and Wachs, J. (2020). *Beyond MAGIC: Matching Collaborative Gestures using an Optimization-based Approach*. 15th IEEE International Conference on Automatic Face and Gesture Recognition, Argentina ([Paper](#)).
- **Rojas-Muñoz, E.**, Couperus, K. and Wachs, J. (2020). *The AI-Medic: An Artificial Intelligent Mentor for Trauma Surgery*. 14th Augmented Environments for Computer Assisted Interventions workshop, at 23rd International Conference on Medical Image Computing & Computer Assisted Intervention, Peru ([Paper](#)).
- **Rojas-Muñoz, E.**, Couperus, K. and Wachs, J. (2020). *The AI-Medic: A Multimodal Artificial Intelligent Mentor for Trauma Surgery*. Demo at 22nd International Conference on Multimodal Interaction, The Netherlands ([Paper](#)).
- **Rojas-Muñoz, E.**, Cabrera, M. E., Lin, C., Andersen, D., Popescu, V., Anderson, K., Zarzaur, B., Mullis, B., Wachs, J. (2020). *The System for Telementoring with Augmented Reality (STAR): A Head-Mounted Display to Improve Surgical Coaching and Confidence in Remote Areas*. *Surgery* ([Paper](#)).

- Lin, C., **Rojas-Muñoz, E.**, Cabrera, M., Sanchez-Tamayo, N., Andersen, D., Popescu, V., Barragan, J., Zarzaur, B., Murphy, P., Anderson, K., Douglas, T., Griffis, C., Wachs, J. (2020). *How About the Mentor? Effective Workspace Visualization in AR Telementoring*. 27th IEEE Conference on Virtual Reality and 3D User Interfaces, USA. (Paper).
- **Rojas-Muñoz, E.**, Cabrera, M. E., Andersen, D., Popescu, V., Marley, S., Mullis, B., Zarzaur, B., Wachs, J. (2019). *Surgical Telementoring Without Encumbrance: A Comparative Study of See-through Augmented Reality-based Approaches*. Annals of Surgery (Paper).
- **Rojas-Muñoz, E.** and Wachs, J. (2019). *MAGIC: A Fundamental Framework for Gesture Representation, Comparison and Assessment*. 14th IEEE International Conference on Automatic Face and Gesture Recognition, France (Paper).
- **Rojas-Muñoz, E.**, Cabrera, M. E., Lin, C., Sanchez-Tamayo, N., Andersen, D., Popescu, V., Anderson, K., Zarzaur, B., Mullis, B., Wachs, J. (2019). *Telementoring in Leg Fasciotomies via Mixed-Reality: Clinical Evaluation of the STAR Platform*. Military Medicine (Paper).
- **Rojas-Muñoz, E.**, Andersen, D., Cabrera, M., Popescu, V., Marley, S., Zarzaur, B., Mullis, B., Wachs, J. (2018). *Augmented Reality as a Medium for Improved Telementoring*. Military Medicine (Paper).
- Lin, C., **Rojas-Muñoz, E.**, Cabrera, M., Sanchez-Tamayo, N., Andersen, D., Popescu, V., Barragan, J., Zarzaur, B., Murphy, P., Anderson, K., Douglas, T., Griffis, C., Wachs, J. (2019). *Robust High-Level Video Stabilization for Effective AR Telementoring*. 26th IEEE Conference on Virtual Reality and 3D User Interfaces, Japan. (Paper).
- Andersen, D., Cabrera, M., **Rojas-Muñoz, E.**, Gonzalez, G., Popescu, V., Mullis, B., Marley, S., Zarzaur, B., Wachs, J. (2018). *Augmented Reality Future Step Visualization for Robust Surgical Telementoring. Simulation in Healthcare* (Paper).
- Andersen, D., Lin, C., Popescu, V., **Rojas-Muñoz, E.**, Cabrera, M., Mullis, B., Zarzaur, B., Marley, S., Wachs, J. (2018). *Augmented Visual Instruction for Surgical Practice and Training*. 25th IEEE Conference on Virtual Reality and 3D User Interfaces, Germany. (Paper).
- Lin, C., Andersen, D., Popescu, V., **Rojas-Muñoz, E.**, Cabrera, M., Mullis, B., Zarzaur, B., Marley, S., Anderson, K., Wachs, J. (2018). *A First-Person Mentee Second-Person Mentor AR Interface for Surgical Telementoring*. 17th International Symposium on Mixed and Augmented Reality, Germany. (Paper).
- Dey, A., Billinghamurst, M., Welch, G., **Rojas-Muñoz, E.** (2018). *3rd Virtual and Augmented Reality for Good (VAR4Good) Workshop*. Adjunct at 17th International Symposium on Mixed and Augmented Reality, Germany. (CFP).

## Grants, Fellowships, and Awards

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- **Improving Safety for Industrial Graphical User Interfaces of Augmented Reality deployed on Wearable Devices (Phase 2)**  
*American Bureau of Shipping; 2024-Ongoing; \$370K; PI*
- **TX SANEs for the Rural and Under-Served III**  
*United States Department of Health and Human Services; 2024-Ongoing; \$1.5M; Co-Investigator*
- **Buenas - Giving All a Seat at the Table Using Mixed Reality**  
*National Science Foundation; 2023-Ongoing; \$200K; PI*
- **Improving Safety for Industrial Graphical User Interfaces of Augmented Reality deployed on Wearable Devices (Phase 1)**  
*American Bureau of Shipping; 2023-2024; \$565K; PI*
- **Design and validation of a virtual chemistry laboratory for the acquisition of motor and cognitive abilities for the correct usage of specialized equipment**  
*National Council of University Presidents; 2023-Ongoing; €7.7M; Co-Investigator*

- **ASCEND Research Leadership Fellow**  
*Division of Research, Texas A&M University; 2023-Ongoing; \$75K; PI*
- **CELL-VR: Using Collaborative Virtual Reality Learning Environments for In-person, Large-scale Biology Lectures**  
*College of Arts & Sciences, Texas A&M University; 2023-Ongoing; \$8K; PI*
- **Increasing audience engagement and interactions during immersive performances via Augmented Reality**  
*Academy for the Visual and Performing Arts, Texas A&M University; 2023-Ongoing; \$7.5K; PI*
- **Multi-user, accessible multi-sensory Augmented Reality experiences and workshops to increase engagement and interactions during immersive performances**  
*School of Performance, Visualization & Fine Arts, Texas A&M University; 2022-Ongoing; \$15K; PI*
- **Adolescent Child Safety Education Focusing on Pedestrians/Bicyclists Aged 11-14 Years Old**  
*TX Dept. of Transportation/National Highway Traffic Safety Administration; 2022-2023; \$120K; Co-PI*
- **Augmented Information for Costa Rica's Protected Wild Areas**  
*Office of the Vice President for Research and Extension; 2022-2023; \$3.1M; Co-PI*
- **Faculty Success Fellow**  
*Awarded by the National Center for Faculty Development and Diversity; 2022-2023*
- **I.D.E.A (Inclusion, Diversity, Equity, and Accessibility) for a better tomorrow Scholarship**  
*Awarded to attend the 20th IEEE ISMAR; 2021; Bari, Italy*
- **Outstanding Paper Award**  
*Title: The AI-Medic: An Artificial Intelligent Mentor for Trauma Surgery. Awarded at the 14th Augmented Environments for Computer Assisted Interventions workshop, at 23rd International Conference on Medical Image Computing & Computer Assisted Intervention; Peru*
- **Doctoral Consortium Fellowship**  
*Awarded to attend the 14th IEEE FG; 2019. Oral and poster presentation; Lille, France*
- **Student Mobility Fellowship**  
*Awarded to perform Senior Design Project at Purdue University; 2016; Cartago, Costa Rica*

## Patents

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- **Artificially Intelligent Medical Procedure Assessment and Intervention System**  
*U.S. Patent 18/012,529.*

## Dissemination

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### Classwork.....

- **VIST 677 / CSCE 650 - Virtual Reality**  
*Spring 2023, Spring 2024; Texas A&M University, College Station, TX*
- **VIST 678 - Augmented Reality**  
*Fall 2022, Fall 2023, Fall 2024; Texas A&M University, College Station, TX*
- **IC 1802 - Introduction to Programming**  
*Spring 2022; Costa Rica Institute of Technology, Alajuela, Costa Rica*
- **IC 1803 - Programming Workshop**  
*Spring 2022; Costa Rica Institute of Technology, Alajuela, Costa Rica*
- **CA 2125 - Computing Elements**  
*Spring 2022, Fall 2021; Costa Rica Institute of Technology, Alajuela, Costa Rica*
- **IC 6099 - Introduction to Virtual Reality**  
*Fall 2021; Costa Rica Institute of Technology, San Carlos, Costa Rica*

o **IC 8842 - Capstone Project**

Fall 2021; Costa Rica Institute of Technology, Alajuela, Costa Rica

Presentations and Talks.....

- o Presented by: **Rojas-Muñoz, E.** (2024) *Buenas - Giving All a Seat at the Table Using Mixed Reality*. National Science Foundation Directorate for Computer and Information Science and Engineering Minority-Serving Institutions Research Expansion Program (NSF CISE-MSI) Awardees Meeting; CO, USA. ([Presentation](#))
- o Presented by: **Rojas-Muñoz, E.** (2022) *The AI-Medic: Towards Autonomous, Attention Based Surgical Telementoring*. Military Health System Research Symposium; FL, USA. ([Poster](#)).
- o Presented by: **Rojas-Muñoz, E.** (2020) *The Use of Augmented Reality in Medical Telementoring*. Virtual presentation for the Costa Rican National Advanced Computing Collaboratory, part of the National High Technology Center (CNCA-CeNAT); Costa Rica. ([PPT](#)).
- o Presented by: Couperus, K., **Rojas-Muñoz, E.**, & Wachs, J. (2019). *Augmented Reality for decision support and telementoring in the military*. Presented at the American College of Emergency Physicians Scientific Assembly; CO, USA. ([Demo](#)).
- o Presented by: Wachs, J., & **Rojas-Muñoz, E.** (2019). *A Portable and Self-contained Approach for Surgical Telementoring: Towards Remote, Point of Injury Care*. Military Health System Research Symposium; FL, USA. ([Poster](#)).
- o Presented by: Andersen, D., **Rojas-Muñoz, E.**, & Popescu, V. (2017). *See-What-I-Do: Increasing mentor and trainee sense of co-presence in trauma surgeries with the STAR platform*. International Meeting on Simulation in Healthcare; FL, USA. ([Poster](#)).
- o Presented by: Andersen, D., **Rojas-Muñoz, E.**, & Popescu, V. (2016). *STAR – A system for telementoring with augmented reality*. International Meeting on Simulation in Healthcare; CA, USA. ([Poster](#)).

News Releases.....

- o HealthCareBusiness News. (2020, July 30). Lifelike simulations show that augmented reality could save lives in war zones. Retrieved from [webpage](#)
- o Purdue University. (2020, July 27). Augmented reality tool shown to help surgeons remotely guide first responders in battlefield-like scenarios. Retrieved from [webpage](#)
- o The Costa Rica News. (2019, July 24). Did you know that a Costa Rican engineer is helping to develop the augmented reality technology in the US army? Retrieved from [webpage](#)
- o La Nación. (2019, July 24). Tico desarrolla tecnología con realidad aumentada para atender a soldados heridos. Retrieved from [webpage](#)
- o Tecnológico de Costa Rica. (2019, July 19). Realidad aumentada en ejército estadounidense, con sello tico. Retrieved from [webpage](#)
- o Purdue University. (2018, September 5). Purdue develops 'augmented reality' tools to help health care workers save lives in war zones, natural disasters, rural areas. Retrieved from [webpage](#)