

Edgar Rojas-Muñoz

📞 +1 (765) 838-9198 • ✉️ emuoz@purdue.edu • 🌐 erojasmunoz.wixsite.com/home

Research assistant working towards his doctorate's degree. Hard-working and with a broad and strong range of skills technical and interpersonal skills. Eager to learn and ready to tackle any challenge. Expected graduation date: August 2020.

Previous Employment

- **Intelligent Systems and Assistive Technologies Laboratory (ISAT)** **West Lafayette, IN**
Research Assistant (Advisor: Dr. Juan Pablo Wachs) August 2016–Ongoing
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**
Undergraduate Research Assistant (Advisor: Dr. Juan Pablo Wachs) 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.
- **School of Computer Engineering at Costa Rica Institute of Technology** **Cartago, Costa Rica**
Undergraduate Lecturer Assistant (Supervisor: MSc. Eduardo Canessa) February 2014–June 2015
The assistantship included the design, lecturing, grading, and student mentoring of two undergraduate level courses with an average of 40 students each: "Introduction to Coding" and "Coding Workshop".

Education

Academic Qualifications.....

- **Purdue University** **West Lafayette, IN**
Doctor in Philosophy, School of Industrial Engineering 2016–To complete by August 2020
GPA: 3.75/4.00
- **Costa Rica Institute of Technology** **Cartago, Costa Rica**
Licenciatura¹ in Computer Engineering, Academic Area of Computer Engineering 2010–2016
Class Rank #3

Notable Projects.....

- **MAGIC: Multi-Agent Gestural Instruction Comparer** (Doctoral Thesis, completing by Aug 2020)
This project developed an architecture capable of assessing task performance through gesture-related metrics. The architecture leverages a data structure capable of abstracting gestures' morphology, meaning and context. This project allows to compare gestures performed by different agents (e.g. mentor/mentee).

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

- **STAR:** System for Telementoring with Augmented Reality (Research Assistant, completing by Aug 2020)
The goal of this multidisciplinary project is to provide combat medics with real-time assistance using augmented reality. The local medic wears an augmented reality head-mounted display that displays surgical instructions authored by a remotely-located mentor. These annotations are displayed onto the patient's body, at the correct position and depth ([Video](#)).
- **AI-Medic:** Artificial Intelligent Mentor for Trauma Surgery (Research Assistant, completing by Aug 2020)
This project develops an AI agent to assist surgeons through medical procedures. The system uses a tablet to acquire the view of the operating field. These images are used as input for a Deep Neural Network. The network predicts text descriptions representing the instructions to perform in the current step of the procedure. These instructions are then conveyed to the surgeons via text-to-speech ([Video](#)).
- **AppVision:** '*TEC-24h Challenge*'
Team member in a 24-hour entrepreneurship challenge. The business idea consisted of using computer vision techniques to allow people with eyeglass prescriptions to visualize their mobile devices screens' without the need of their glasses.

Extracurricular

International Conferences.....

- **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; To be held on 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.

Student Organizations.....

- **Costa Rican Student Association at Purdue (CRiSAP)**
Secretary; November 2019–Ongoing
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.

- **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.

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

- **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 cricothyroidotomies.* Nature Digital Medicine. ([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.**, 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](#)).
- **Rojas-Muñoz, E.**, Couperus, K., Wachs, J. (2020). *DAISI: Database for AI Surgical Instruction.* ([ArXiv](#)).
- 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](#)).

Awards

- **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. Article to be published in *Tecnología en Marcha*; Cartago, Costa Rica*
- **TEC-24h Challenge**
Winner; 2015. Oral Presentation; Cartago, Costa Rica

Patents

- **Artificially Intelligent Medical Telementoring Failover System**
Provisional U.S. Patent to be filed June 22, 2020.

Dissemination

Presentations and Talks.....

- 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, Denver, Colorado. ([Demo](#)).
- 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, Kissimmee, Florida. ([Poster](#)).
- 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, Orlando, Florida. ([Poster](#)).
- Presented by: Andersen, D., **Rojas-Muñoz, E.**, & Popescu, V. (2016). *STAR – A system for telementoring with augmented reality*. International Meeting on Simulation in Healthcare, San Diego, California. ([Poster](#)).

News Releases.....

- 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](#)
- La Nación. (2019, July 24). Tico desarrolla tecnología con realidad aumentada para atender a soldados heridos. Retrieved from [webpage](#)
- Tecnológico de Costa Rica. (2019, July 19). Realidad aumentada en ejército estadounidense, con sello tico. Retrieved from [webpage](#)
- 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](#)

Technical and Personal Skills

- **Relevant Coursework:** Computer Vision, Statistical Machine Learning, Deep Learning, Interactive Computer Graphics, Design of User Experiences, Human Factors in Engineering, Cognition and Technology.
- **Programming Languages and Softwares:** C/C++, Python, C#, Java. Experienced with Unity Game Engine and Universal Windows Platforms apps.
- **Interpersonal Skills:** Good presentation skills, Leadership, Teamwork, Organized, Hard worker.