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Updated: March, 2023

Luis Quintero

PhD Scholar, Stockholm University

Research Interests

User modeling in immersive interactive environments
Virtual reality (VR) and extended reality (XR)
Machine learning for time-series data
Physiological and physical measurements with wearable sensors

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Employment

2019–2023   **Doctoral Researcher**, *Stockholm University*, Stockholm, Sweden
Department of Computer and Systems Sciences, (DSV). Member of the Data Science Group 🔗. Conducted research on behavioral user modeling in VR environments, detecting emotional states and other human factors from wearable sensors' data using algorithms for time series classification.

2018–present   **Founder/Technical Lead**, *PortalSense*, Manizales, Colombia
Startup aiming to transform real estate communication in developing countries with interactive archviz in VR. Responsible for the project's vision and product development. Website [SPA] 🔗.

Summer 2019   **Research Assistant**, *Stockholm University*, Stockholm, Sweden
Department of Computer and Systems Sciences, (DSV). Member of the Data Science Group 🔗. Developing a web platform to showcase application of explainability algorithms on healthcare data.

2017–2019   **Consultant/Developer**, *Independent Contractor*, Remote
Designed and developed VR applications for professional training (*USA*), architectural visualization (*Colombia*), and healthcare (*Sweden*). Details of these projects available on my website 🔗.

Spring 2017   **Research Assistant**, *NeuroRehabLab-Interactive Technologies Institute*, Madeira, Portugal
Developed several frameworks in Unity to aid mental and physical well-being through interactive applications exploiting heart rate and respiration sensors to profile the users physical conditions.

2015-2017   **Bioengineering Professional**, *BIOS (Center for Bioinformatics)*, Manizales, Colombia
Implemented custom hardware-software interfaces for large-scale displays using body-worn devices. Supported an applied research project on automated quality control with computer vision algorithms.

Education

2019–2023   **PhD. Computer and Systems Sciences**, *Stockholm University*, Stockholm, Sweden
Department of Computer and Systems Sciences (DSV).
DISSERTATION: User Modeling for Adaptive Virtual Reality Environments (Soon) 🔗.
Personalization from behavioral and physiological time series.

2017–2019   **MSc. Health Informatics**, *Karolinska Institutet*, Stockholm, Sweden
Department of Learning, Informatics, Management and Ethics (LIME).
DISSERTATION: Facilitating Technology-based Mental Health Interventions with Mobile Virtual Reality and Wearable Smartwatches. 🔗 *Heart Rate Variability Analysis in Slow-Breathing Exercises.*

2010–2015	**BSc. Electronics Engineering**, *National University (UNAL)*, Manizales, Colombia

GPA: 4.4/5.0 — Ranked 3rd among graduated students, and top-best in national engineering exam.
Emphasis on signal processing, hardware programming, control theory, and telecommunications.

2009–2010	**Associate Degree on Computer Systems**, *Unitécnica*, Manizales, Colombia

Principles of computer systems, web development, databases and software/hardware configuration.

Teaching

2020–2023 Teaching Assistant, *Stockholm University*, Stockholm, Sweden
Lab tutor in the following courses for students at master's level:
- *Data Mining with Python* for the course DAMI. 140h/year.
- *Introduction to Data Mining* for the course DSHI. 75h/year.
- *Building Virtual Reality Applications with Unity* for the course DET. 20h/year.

Spring 2016 Lecturer, *Caldas University*, Manizales, Colombia
Course leader for 19 undergraduate students in: *Microprocessors architecture*. 64h.

Spring 2016 Lecturer, *Unitécnica*, Manizales, Colombia
Course leader in: *App development with Unity*, 70h. *Introduction to Databases*. 40h.

2012-2014 Undergraduate Teaching Assistant, *National University*, Manizales, Colombia
Lab tutor for undergraduate students in the courses:
- *Dynamic Systems and Control*. (Autumn 2012, Spring 2013). 64h/term.
- Communication Systems (Autumn 2014). 64h.

Qualifications & Skills

Languages	English (C1 —IELTS= 7.0), Spanish (Native), Swedish (Limited), Portuguese (Limited).
Programming	C#, C++, Python, MatLab, LaTeX.
Frameworks	Unity, OpenXR, Scikit-Learn, OpenCV, Qt.
Hardware	Meta Quest, Vive VR headsets, Polar ECG, Myo EMG, Emotiv EEG, embedded systems.
Research	Academic writing, teaching, data science, systems development, electronics, HCI.

Publications

Research Projects

Complete description of my research projects is on my personal website 🔗.
Complete list of publications available on my Google Scholar 🔗.

🖹 Dissertations

[1] **Quintero, L.** 2019a. "Facilitating Technology-based Mental Health Interventions with Mobile Virtual Reality and Wearable Smartwatches". Master's Thesis. Stockholm University. 1-61.

📄 Journal Articles

[1] **Quintero, L.**, Fors, U., and Papapetrou, P. 2023b. "Personalized feature importance ranking for affect recognition from behavioral and physiological data". In: *IEEE Transactions on Games*, pp. 1–10.

[2] Muñoz, J. E. **Quintero, L.** et al. Apr. 16, 2020. "A Psychophysiological Model of Firearms Training in Police Officers: A Virtual Reality Experiment for Biocybernetic Adaptation". In: *Frontiers in Psychology* 11 (April), pp. 1–14.

[3] i Badia, S. B. **Quintero, L.** et al. 2019d. "Toward Emotionally Adaptive Virtual Reality for Mental Health Applications". In: *IEEE Journal of Biomedical and Health Informatics* 23.5, pp. 1877–1887.

👥 Conference Proceedings

[1] Bernsland, M., [. . .], **Quintero, L.**, et al. 2022a. "CS:NO – an Extended Reality Experience for Cyber Security Education". In: *ACM International Conference on Interactive Media Experiences*. Series Title: IMX '22. Aveiro, Portugal, pp. 287–292.

[2] **Quintero, L.** et al. 2022b. "Excite-O-Meter : an Open-Source Unity Plugin to Analyze Heart Activity and Movement Trajectories in Custom VR Environments". In: *IEEE Conference on Virtual Reality and 3D User Interfaces - Abstracts and Workshops (VRW)*, pp. 46–47.

[3] **Quintero, L.** et al. 2021a. "Effective Classification of Head Motion Trajectories in Virtual Reality using Time-Series Methods". In: *IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR)*. Tsinghua, Taiwan, pp. 38–46.

[4] **Quintero, L.** et al. 2021b. "Excite-O-Meter: Software Framework to Integrate Heart Activity in Virtual Reality". In: *IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*. Bari, Italy, pp. 357–366.

[5] Muñoz, J. E. **Quintero, L.** et al. 2021c. "Taxonomy of Physiologically Adaptive Systems and Design Framework". In: *Adaptive Instructional Systems. Design and Evaluation. HCII 2021. Lecture Notes in Computer Science*. Vol. 12792 LNCS. ISSN: 16113349, pp. 559–576.

[6] **Quintero, L.** 2020b. "Understanding Research Methodologies when Combining Virtual Reality Technology with Machine Learning Techniques". In: *13th ACM International Conference on PErvasive Technologies Related to Assistive Environments (PETRA)*. Corfu: ACM Press, pp. 209–212.

[7] **Quintero, L.** et al. 2019b. "Implementation of mobile-based real-time heart rate variability detection for personalized healthcare". In: *IEEE International Conference on Data Mining Workshops, ICDMW*. Vol. 2019-Novem. ISSN: 23759259. IEEE, pp. 838–846.

[8] **Quintero, L.**, Papapetrou, P., and Munoz, J. E. 2019c. "Open-Source Physiological Computing Framework using Heart Rate Variability in Mobile Virtual Reality Applications". In: *IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR)*. IEEE, pp. 126–133.

[9] Muñoz, J. E., Pope, A. T., and **Quintero, L.** 2016. "Integrating Biocybernetic Adaptation in Virtual Reality Training Concentration and Calmness in Target Shooting". In: *Physiological Computing Systems*. Springer International Publishing, pp. 218–237.

📖 Books/Reports

[1] European Commission et al. 2023a. *Extended reality : opportunities, success stories and challenges (health, education)*. Publications Office of the European Union.

Supervision & Advising

Main supervisor in Master's Theses

2023 *Helén Han*: Treatment Adherence in Digital Psychotherapy - Using Machine Learning to Predict Patient No-shows. MSc. Health Informatics, Karolinska Institutet.

Fan Zhang: Exploring the requirements for the design of virtual reality serious games to support people with dementia. MSc. Health Informatics, Karolinska Institutet.

Mi Zhang: Exploring how virtual material appearance with control-display ration drives the weight perception in VR within two-handed input. MSc. Design for Immersive Technologies, DSV, Stockholm U.

Johan Ekman: Comparing learners' engagement of VR and non-VR game for programming purposes. MSc. Design for Immersive Technologies, DSV, Stockholm U.

Co-supervisor in Master's Theses

2022 *Daniel Schulze*: Explainability of personalized stress detection models from wearable-collectible physiological data. MSc. Health Informatics, Karolinska Institutet. Main Superv.: Jaakko Hollmén

Divya Damodaran: Machine Learning for prediction of start and termination of Freezing of Gait in Parkinson's Disease. MSc. Health Informatics, Karolinska Institutet. MS: Jaakko Hollmén

Yujie Xiang: Understanding Heart Rate Responses to Detect Emotional Valence Using Interpretable Machine Learning. MSc. Health Informatics, Karolinska Institutet. MS: Jaakko Hollmén

2021   *Dana Kokey*. Towards detecting arousal level from heart rate information in virtual reality 360-degree videos. MSc. Health Informatics, Karolinska Institutet. MS: Panagiotis Papapetrou

Alborz Alipour. Outlier Detection in Stock Market Prediction through Anomaly Detection. MSc. Computer and Systems Sciences, Stockholm University. MS: Sindri Magnússon

Samiiha Nalwooga. Knowledge distillation for building accurate plant classification models for mobile devices. MSc. Computer and Systems Sciences, Stockholm U. MS: Sindri Magnússon

Mawada Hamad. The trade-off between performance and compression rate when applying knowledge distillation. MSc. Computer and Systems Sciences, Stockholm U. MS: Sindri Magnússon

Ali Mussayab. Design requirements for Recruiting Contingent Café Baristas with Immersive Virtual Reality Simulations. MSc. Design for Immersive Technologies, Stockholm U. MS: Robert Ramberg

Honors

Research Grants

2023–2026   **Wallenberg Foundation** 🔗, *4.5MSEK*, Project Member
Let us talk about non-verbal communication: Investigation of interpersonal psychotherapeutic interactions and their effect on treatment outcomes using AI and time series analysis.

Industrial Funding

2022–2023   **Fondo Emprender** 🔗, *20kEUR*, Project Leader
Seed funding to startup the company PortalSense in Manizales (Colombia), which develops architectural virtual reality visualization for real estate and public infrastructure projects.

Scholarships

Summer 2022   Donation scholarship for research activities during PhD, awarded by Stockholm University.

2017–2019   Scholarship for Master's studies in Sweden, awarded by the Swedish Institute 🔗

2013–2015   Grant for tuition fees during undergraduate program, by Roberto Rocca Foundation 🔗

Winter 2014   Grant for top undergraduate students to visit China, by Seeds for the future Huawei 🔗

2009–2010   Scholarship for vocational training in computer systems, granted by a private company.

Academic Awards

2015   Ranked 3rd in GPA among undergraduate students - National University of Colombia

2012   Best robot design and programming - VEX Robotics Competition

2009   Ranked 1st among high-school students

Professional Service

Reviewer

Journal   Data Mining and Knowledge Discovery, *Springer*: 2022, 2023

International Journal of Human-Computer Interaction, *Tandford*: 2022

Granular Computing, *Springer*: 2019

Conferences   IEEE VR: 2021

IEEE AIVR: 2020, 2021, 2022

PC Member   IEEE Artificial Intelligence and Virtual Reality (AIVR): 2020-present

Invited Talks and Panels

Feb 2023	**Research visit**, *DIS group at CWI*, Amsterdam, Netherlands
	User Modeling for Adaptive Virtual Reality Environments
Sep 2021	**Invited Panelist**, *Conference EUROSIS GAME-ON*, Portugal, (virtual)
	The Use of Digital Games and AI for Health and Wellbeing
Oct 2020	**Invited Interview**, *Podcast Immersive Learning Network*, USA, (virtual)
	Discussing methodological aspects of combining machine learning in virtual reality research.

Associations & Memberships

2022-2023	Chair of the PhD Council at DSV, Stockholm University.
2021-ongoing	Member of XRCOL: Colombian Association for Immersive, Interactive, and Emerging Tech.
2019-ongoing	Member of SANC: Sweden Alumni Network Colombia - SI Leadership Network.

Press & Blog Articles

Feb 2023	EU Commission: **XR - Opportunities and Challenges in Health and Education** 🔗.
May 2022	SU Blog: **Time-series analysis for behavioural user modelling in VR** 🔗.
May 2019	CFC Blog: **Visit a new construction project in virtual reality** 🔗.

Certifications & Achievements

IRL Courses

2023	**Medical Time Series Mining**, *VAIA - KU Leuven*, Belgium, 16h.
2022	**Entrepreneurial Storytelling**, *SSES*, Sweden, 16h.
2022	**Summer school: AI and Games**, *Modl.ai*, Greece, 40h.
2019	**Introduction to Teaching**, *Stockholm University*, Sweden, 80h.
2018	**Building Innovation Strategies**, *School of Entrepreneurship*, Sweden, 16h.
2016	**Scientific Computing**, *ICT Ministry*, Colombia, 120h.
2016	**Exploring Physiological Data for Interactive Apps**, *BIOS*, Colombia, 16h.
2016	**Fundraising: Tools and Methodologies for Financing Projects**, *BIOS*, Colombia, 16h.
2011	**Computer Maintenance**, *Unitécnica*, Colombia, 120h.
2009	**Electrical Installations**, *SENA*, Colombia, 900h.
2007	**Certificate in English Language**, *Colombo-American Center*, Colombia, 640h.

MOOCs

2016	**A System View of Communications**, *by Hong Kong UST in EdX*, (3 terms).
2015	**Project Management for Professionals**, *by IADB in EdX*.
2015	**Computation Structures: Digital Circuits**, *by MIT in EdX*.
2014	**Introduction to Computer Programming**, *by IIT Bombay in EdX*.
2014	**Fundamentals of Electrical Engineering**, *by Rice University in Coursera*.
2013	**Beginning Game Programming with** `C#`, *by University of Colorado in Coursera*.