Milton O. Candela-Leal

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Education

Tecnológico de Monterrey *Monterrey, Mexico*
BS in Biomedical Engineering 2020 - Dec 2024
- Highest honors (*Summa Cum Laude*) and highest award for co-curricular success (*Excellence Diploma*); *Borrego de Oro* in professional development.

Research Experience

NSF IUCRC BRAIN Center, Tecnológico de Monterrey *Monterrey, Mexico*
Research Assistant Mar 2021 - Jul 2023, Fall 2024
Advisor: Prof. Mauricio A. Ramírez-Moreno, PhD
Projects: Biometrics (EEG, ECG, CV) and Machine Learning to predict:
Mental fatigue (2021); engineering interest (2021); emotion (2023).
- Force prediction through pose estimation keypoints and RNN (2022).
- Cognitive load in chess (2023); closed-loop BCI for attention (2024).

Boston Children's Hospital, Harvard Medical School *Boston, MA, USA*
Research Intern Aug 2023 - Jul 2024
Advisor: Prof. Kiho Im, PhD
Projects: Fetal MRI subplate segmentation (attention U-Net); non-linear qMRI for congenital heart disease classification; MICCAI FeTA Challenge 2024.

NSF IUCRC BRAIN Center, University of Houston *Houston, TX, USA*
Research Intern Spring 2022
Advisor: Prof. Jose L. Contreras-Vidal, PhD
Project: EEG functional connectivity and bisprectrum analysis between actors.

Publications

(† indicates equal contribution)

Candela-Leal M.O., Alanis-Espinosa, M., Murrieta-González, J., ... Ramírez-Moreno M.A. (*accepted*). Neurocognitive Insights into STEM Learning: An Integrated Analysis of Bandpower and Functional Connectivity among Youth. Acta Psychologica

Ramírez-Moreno, M.A., Hernández-Mustieles, M.A., **Candela-Leal, M.O.**, ... Lozoya-Santos, J.J. (*accepted*). Workplace Measures of Mental Fatigue. In V.B. Patel (Eds.), The Scientific Basis of Fatigue.

Mandujano-Granillo, J.A., **Candela-Leal, M.O.**, Ortiz-Vazquez, J.J., ... Lozoya-Santos, J.J. (2024). Human-Vehicle Interfaces: A Review for Autonomous Electric Vehicles. IEEE Access, 12, 121635–121658. doi:10.1109/ACCESS.2024.3450439

Blanco-Ríos, M.A.†, **Candela-Leal, M.O.**†, Orozco-Romo, C., ... Ramírez-Moreno, M.A. (2024). Real-time EEG-based Emotion Recognition for Neurohumanities: Perspectives from Principal Component Analysis and Tree-based Algorithms. Frontiers in Human Neuroscience, 18, 1319574. doi:10.3389/fnhum.2024.1319574. PubMed PMID:38545515

Candela-Leal, M.O., Gutiérrez-Flores, E.A., Presbítero-Espinosa, G., ... Ramírez-Moreno, M.A. (2022). Multi-Output Sequential Deep Learning Model for Athlete Force Prediction on a Treadmill Using 3D Markers. Applied Sciences, 12(11), 5424. doi:10.3390/app12115424

Lozoya-Santos, J.J., Ramírez-Moreno, M.A., **Candela-Leal, M.O.**, ... Ramirez-Mendoza, R.A. (2022). Current and Future Biometrics: Technology and Applications. In R.A. Ramirez-Mendoza, J.J. Lozoya-Santos, R. Zavala-Yoé, ... H.G. Gonzalez-Hernandez (Eds.), Biometry: Technology, Trends and Applications (1st ed., pp. 1–30). Boca Raton, FL: CRC Press. doi:10.1201/9781003145240-1 ISBN: 9781003145240

Ramírez-Moreno, M.A., Carrillo-Tijerina, P., **Candela-Leal, M.O.**, ... Lozoya-Santos, J.J. (2021). Evaluation of a Fast Test Based on Biometric Signals to Assess Mental Fatigue at the Workplace—A Pilot Study. International Journal of Environmental Research and Public Health, 18(22), 11891. doi:10.3390/ijerph182211891. PubMed PMID:34831645

Conference Proceedings

Ramírez-Arceo, G.A., **Candela-Leal, M.O.**, Tudon-Martinez, J.C., ... Lozoya-Santos, J.J. (2025). Innovative Spaces with Advanced Technologies such as Research Activity Simulators for

Engineering Education. In Proceedings of the 16th Global Engineering Education Conference (EDUCON). London, United Kingdom: IEEE

Candela-Leal, M.O., Aguilar-Herrera, A.J., Ramírez-Moreno, M.A., ... Lozoya-Santos, J.J. (2024). Conscious Technologies Projects as a Hub for Real Life Challenges in Engineering Education. In Proceedings of the 15th EDUCON. Kos, Greece: IEEE. doi:10.1109/EDUCON60312.2024.10578738

Candela-Leal, M.O., Martínez-Díaz, D., Orozco-Romo, C., ... Ramírez-Moreno, M.A. (2023). Biomechanics Digital Twin: Markerless Joint Acceleration Prediction Using Machine Learning and Computer Vision. In Proceedings of the Future of Educational Innovation-Workshop Series: Data in Action. Monterrey, Mexico: IEEE. doi:10.1109/IEEECONF56852.2023.10104757

Candela-Leal, M.O., García-Briones, J.M., Olivas-Martínez, G., ... Lozoya-Santos, J.J. (2021). Real-time Biofeedback System for Interactive Learning using Wearables and IoT. In Proceedings of the 6th International Conference on Industrial Engineering and Operations Management. Monterrey, Mexico: IEOM **(best undergraduate paper award)**. doi:10.46254/NA06.20210487

Olivas-Martínez, G., **Candela-Leal, M.O.**, Ocampo-Alvarado, J.C., ... Ramírez-Moreno, M.A. (2021). Detecting Change in Engineering Interest in Children through Machine Learning using Biometric Signals. In Proceedings of the Machine Learning-Driven Digital Technologies for Educational Innovation Workshop. Monterrey, Mexico: IEEE. doi:10.1109/IEEECONF53024.2021.9733772

Aguilar-Herrera, A.J., Delgado-Jimenez, E.A., **Candela-Leal, M.O.**, ... Ramirez-Mendoza, R.A. (2021). Advanced Learner Assistance System's (ALAS) recent results. In Proceedings of the Machine Learning-Driven Digital Technologies for Educational Innovation Workshop. Monterrey, Mexico: IEEE. doi:10.1109/IEEECONF53024.2021.9733770

Invited Talks

Decoding Cognitive Performance: From Chess Puzzles to STEM Classrooms, 2024
Cognitive Neuroscience minor, Tecnológico de Monterrey - School of Humanities and Education

Computer Vision and Facial Recognition, 2023
Computing Seminar course, UANL - School of Physics and Mathematics

Selected Presentations

Oral Presentations

Digital Twins in Education: Enhancing Student Well-being and Academic Performance with Biometric Insights and Machine Learning. *U21 Health Sciences Group 2024 Annual Meeting*, Amsterdam University Medical Centers (Amsterdam, Netherlands) **(student speaker award)** 2024

High-resolution Fetal Subplate Automatic Segmentation. *FNNDSC Research Symposium*, Boston Children's Hospital (Boston, MA) 2024

CHD Fetal Brain Analysis using Combined Quantitative MRI Features and Custom-build Loss Functions. *FNNDSC Research Symposium*, Boston Children's Hospital (Boston, MA) 2024

Biomechanics for the Digital Twin of Performance: Study Cases. *Conscious Technologies for Smart Communities Workshop* (Virtual) 2021

Harry Potter and the Prisoner of Azkaban (2004), a Cultural and Ideological Instructor of the Millennial Viewer. *51th Research and Development Congress* (Virtual) 2021

Poster Presentations

FALCONS: Fetal Automatic Landmark Computation and Optimization for Neuroimaging Segmentation. *27th International Conference on MICCAI* (Marrakesh, Morocco) 2024

Real-time Dual-feature Mental Fatigue State SVM Classification using EEG Delta Bandpower. *19th IEEE-EMBS International Conference on BSN*, MIT Media Lab (Boston, MA) 2023

Biometric Cabin for Neurohumanities Lab. *NSF IUCRC BRAIN 2023 Annual Meeting*, Arizona State University (Phoenix, AZ) 2023

Brain on Acting: Neural Dynamics of Actor-Actor Dyads During an Acted Scene. *NSF IUCRC BRAIN 2022 Annual Meeting*, University of Houston (Houston, TX) 2022

Identifying Engineering Interest in Children through Machine Learning using Biometric Signals. *43rd Annual Conference of the IEEE-EMBS* (Virtual) 2021

Digital Twin of Biomechanics: Joint Force Prediction using Video and AI. At the *NSF IUCRC BRAIN 2021 Annual Meeting* (Virtual) 2021

Honors and Awards

Summa Cum Laude, Tecnológico de Monterrey 2024
- Highest academic honors (top 2 in the graduating class).

Excellence Diploma, Tecnológico de Monterrey 2024
- Highest award for co-curricular and academic excellence.

Borrego de Oro, Tecnológico de Monterrey 2024
- Top graduate in professional development, among ∼1,500 Fall 2024 graduates.

International Diploma, Tecnológico de Monterrey 2024
- Global leadership and multilingual excellence through academic achievements.

Student Speaker Award, U21 Health Sciences Group 2024
- One of the two teams that won funding ($1600 USD) to present at U21 HSG '24, selected from MSc/BSc research projects across 21 universities on all continents.

Outstanding Student Award, Tecnológico de Monterrey 2023, 2024
- 1% of all engineering students with the most outstanding trajectories [80/8000].

1st Place - Undergraduate Student Paper Competition, 6th North American IEOM 2021

1st Place - R&D Improvement Proposals ($250 USD), 18th Conexión Tec 2021

Academic Talent Scholarship, Tecnológico de Monterrey 2020

Teaching

German A2 Teacher, Mentoor MX 2022-2024

Middle School Math and Spanish Teacher, Aprendamos Juntos 2021-2022

Independent High School Physics Teacher Fall 2019

FIRST® LEGO® League Mentor, Little Minds Spring 2019

Press

(English) TecScience: Future Classrooms: Real-Time Monitoring of Students' Brain Activity 2025

(Spanish) Conecta: ¡De oro! Reconocen a egresados del campus Mty por formación integral 2024

(Spanish) Conecta: Reconocen su proyecto de aprendizaje con IA y lo llevan a ¡Ámsterdam! 2024

(English) NSF IUCRC BRAIN: BRAIN Center Spring Newsletter (pp. 4, 9-10) 2023

Skills Summary

Languages Python (3 years), R (2 years), MATLAB (1 year), Shell (3 months), SQL (3 months)
English (C1), German (B1), Spanish

Frameworks Numpy, Scipy, Pandas, Matplotlib, Scikit-learn, OpenCV, TensorFlow, Keras, BrainFlow
FreeSurfer, FSL, MRtrix3, NiBabel, ANTs, PyDicom, IRTK, NUC, TochIO, MNE, OSC
Lattice, Dplyr, Tidyr, Caret, GA, Ggplot, Shiny

Tools Git, Anaconda, CUDA, CMake, Tableau, Microsoft Excel, G*Power, Overleaf, LaTeX

Platforms Linux, Ubuntu, ROS, Windows, Arduino, Raspberry