

Milton O. Candela-Leal

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EDUCATION

- Tecnológico de Monterrey** - Monterrey, Mexico 2020 - Dec 2024
BSc in Biomedical Engineering (95/100 = 3.8/4.0 GPA)
- International Baccalaureate** - Monterrey, Mexico 2018 - 2020
Math HL, Psychology SL, Physics SL, ...
Thesis: [Film & Psychology] *Harry Potter and the Prisoner of Azkaban* (2004), a Cultural and Ideological Instructor of the Millennial Viewer

RESEARCH EXPERIENCE

- Tecnológico de Monterrey** - Monterrey, Mexico Mar 2021 - Jul 2023, Fall 2024
NSF IUCRC BRAIN Center
Advisor: Prof. Mauricio A. Ramírez-Moreno, PhD
Projects: Cognitive state prediction via biometrics (EEG, ECG, Computer Vision) and machine learning: Mental fatigue, interest in STEM, emotion.
- Force prediction employing Computer Vision's keypoints and RNN.
- Harvard Medical School** - Boston, MA, USA Aug 2023 - Jul 2024
Boston Children's Hospital
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.
- University of Houston** - Houston, TX, USA Spring 2022
NSF IUCRC BRAIN Center
Advisor: Prof. Jose L. Contreras-Vidal, PhD
Project: EEG functional connectivity and bispectrum analysis between actors.

JOURNAL ARTICLES

(† indicates equal contribution)

- 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](https://doi.org/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](https://doi.org/10.3389/fnhum.2024.1319574). PubMed PMID:[38545515](https://pubmed.ncbi.nlm.nih.gov/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](https://doi.org/10.3390/app12115424)
- 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](https://doi.org/10.3390/ijerph182211891). PubMed PMID:[34831645](https://pubmed.ncbi.nlm.nih.gov/34831645/)

BOOK CHAPTERS

- 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](https://doi.org/10.1201/9781003145240-1). ISBN: 9781003145240.

CONFERENCE PROCEEDINGS

- Candela-Leal, M.O.**, Lozoya-Santos, J.J., Ramírez-Moreno, M.A. (*accepted*). Task Completion Time Estimation via EEG Theta Bandpower during Chess-Based Problem-Solving. In *IEEE-EMBS BHI*. Houston, TX: 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 *15th EDUCON* (pp. 665-675). Kos, Greece: IEEE. doi:[10.1109/EDUCON60312.2024.10578738](https://doi.org/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 3rd FEI-WS (pp. 142-150). Monterrey, Mexico: IEEE. doi:[10.1109/IEEECONF56852.2023.10104757](https://doi.org/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 6th North American IEOM (pp. 2959-2970). Monterrey, Mexico: IEOM (**best undergraduate paper award**). doi:[10.46254/NA06.20210487](https://doi.org/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 1st FEI-WS (pp. 33-40). Monterrey, Mexico: IEEE. doi:[10.1109/IEEECONF53024.2021.9733772](https://doi.org/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 1st FEI-WS (pp. 26-33). Monterrey, Mexico: IEEE. doi:[10.1109/IEEECONF53024.2021.9733770](https://doi.org/10.1109/IEEECONF53024.2021.9733770)

INVITED TALKS

- Candela-Leal, M.O.** (2024, September). Decoding Cognitive Performance: From Chess Puzzles to STEM Classrooms. Presented to senior undergraduate students at Cognitive Neuroscience minor, Tecnológico de Monterrey, Monterrey, Mexico [\[slides\]](#)
- Candela-Leal, M.O.**, & Valdivia-Padilla, A. (2024, August). Digital Twins in Education: Enhancing Student Well-being and Academic Performance with Biometric Insights and Machine Learning. Presented at U21 Health Sciences Group Annual Meeting, Amsterdam University Medical Centers, Amsterdam, Netherlands. (Theme: Data Driven Health Care and Teaching) (**student speaker award**) [\[slides\]](#)
- Candela-Leal, M.O.** (2023, April). Computer Vision and Facial Recognition. Presented to senior undergraduate computer science students at Computing Seminar course, Universidad Autónoma de Nuevo León (UANL) [one of Mexico's top eight universities], Monterrey, Mexico [\[slides\]](#)

UNDER REVIEW

- Candela-Leal, M.O.**, Alanis-Espinosa, M., Murrieta-González, J., ... Ramírez-Moreno, M.A. (*under review*). Neurocognitive Insights into STEM Learning: An Integrated Analysis of Bandpower and Functional Connectivity among Youth. SAGE Open
- Ramírez-Moreno, M.A., Romero-Días, D.C., **Candela-Leal, M.O.**, ... Lozoya-Santos, J.J. (*under review*). Workplace measures of mental fatigue. In The Scientific Basis of Fatigue. Academic Press-Elsevier

INTERNATIONAL CONFERENCE PRESENTATIONS

- Candela-Leal, M.O.**, Gondová, A., You, S., Grant, P.E., & Im, K. (2024, October). FALCONS: Fetal Automatic Landmark Computation and Optimization for Neuroimaging Segmentation. **Poster presentation** at the 27th MICCAI, Marrakesh, Morocco
- Candela-Leal, M.O.**, Lozoya-Santos, J.J., & Ramírez-Moreno, M.A. (2023, October). Real-time Dual-feature Mental Fatigue State SVM Classification using EEG Delta Bandpower [Poster #35]. **Poster presentation** at the 19th IEEE-EMBS BSN, Boston, MA. doi:[10.13140/RG.2.2.30051.12329](https://doi.org/10.13140/RG.2.2.30051.12329)
- Alvarez-Espinoza, G.J., **Candela-Leal, M.O.**, Abrego-Ramos, R., ... Lozoya-Santos, J.J. (2021, October). ALAS: Advanced Learner Assistance System for Engineering Education using Wearable Sensors. **Poster presentation** at the 43rd IEEE-EMBS (p. 5101). <https://embs.org/2021>
- Olivas-Martínez, G., Acosta-Soto, L., **Candela-Leal, M.O.**, ... Lozoya-Santos, J.J. (2021, October). Identifying Engineering Interest in Children through Machine Learning using Biometric Signals. **Poster presentation** at the 43rd IEEE-EMBS (p. 5244). <https://embs.org/2021>

CONFERENCE PRESENTATIONS

Oral Presentations

FNNDS Research Symposium	Boston, MA	2024
Conscious Technologies for Smart Communities Workshop	Virtual	2021
51 th Research and Development Congress	Virtual	2021

Poster Presentations

17 th - 21 st , 24 th Expo Ingenierías at Conexión Tec	Monterrey, Mexico	2021-2024
NSF BRAIN Summer Annual IAB Meeting	Phoenix, AZ	2023
BMEX: Engineering and Health Sciences Symposium	Monterrey, Mexico	2023
NSF BRAIN Summer Annual IAB Meeting	Houston, TX	2022

HONORS AND AWARDS

Diploma of Excellence Award (5% professional development)	Tecnológico de Monterrey	2024
International Diploma (leadership & multilingual proficiency)	Tecnológico de Monterrey	2024
Student Speaker Award (\$1600 USD)	U21 Health Sciences Group	2024
Outstanding Student Award (1% engineering trajectories)	Tecnológico de Monterrey	2023, 2024
1 st Place - Undergraduate Student Paper Competition	6 th North American IEOM	2021
1 st Place - R&D Improvement Proposals (\$250 USD)	18 th 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

SKILLS SUMMARY

Languages	Python (3 years), MATLAB (2 years), R (1 year), Shell (3 months), SQL (3 months) English (C1), German (B1), Spanish
Frameworks	Numpy, Scipy, Pandas, Matplotlib, Scikit-learn, OpenCV, TensorFlow, Keras, BrainFlow FSL, FreeSurfer, MRtrix3, ANTs, NiBabel, PyDicom, IRTK, NUC, TochIO, OSC Lattice, Dplyr, TidyR, Caret, GA, Ggplot, Shiny
Tools	Git, Anaconda, CUDA, CMake, Tableau, Microsoft Excel, G*Power, Overleaf, \LaTeX
Platforms	Linux, ROS, Windows, Arduino, Raspberry

PROJECTS

FeTA Challenge @ MICCAI - Harvard Medical School	2024
<ul style="list-style-type: none">- 7-label dataset (CSF, GM, WM, Ventricles, Cerebellum, Deep GM, Brainstem)- Pre-processed multi-site data; evaluated model zoo performance on in-house data- Trained a MRI U-Net model with spatial, intensity and resolution augmentation	
High-res Fetal Subplate Segmentation - Harvard Medical School	2024
<ul style="list-style-type: none">- Upsampled, aligned, and corrected subplate segmentation in a higher resolution- Implemented Bivariate Gaussian Smoothing (BGS) for step-like borders- Trained a MRI U-Net leveraged by transfer-learning for automatic segmentation	
Non-linear qMRI for CHD Classification - Harvard Medical School	2024
<ul style="list-style-type: none">- Designed Recursive RF importance (RRFi) for feature selection (20,453)- Created a 5-feature kNN model with 0.88 F1-score (0.10 better than baseline)- Discovered and proposed new biomarkers in fetal CHD brain identification	
Unsupervised VAE-GAN for Anomaly - Harvard Medical School	2024
<ul style="list-style-type: none">- Trained an age-informed GAN model in typically developed fetal brains- Detected abnormalities in Ventriculomegaly (VM) fetal subjects (AUC = 90%)- Designed a novel age encoding: Bidirectional Ordinary Encoding (BOE)	
Cognitive Load Dynamics in Chess - Tecnológico de Monterrey	2023
<ul style="list-style-type: none">- Designed, led, and processed 37 chess players under ambient/white noise- Calculated Task Completion Time (TCT) based on EEG biomarker theta C4- Validated TCT with Cognitive Load Theory (CLT), stratifying by chess level	
Real-time Emotion Recognition - Tecnológico de Monterrey (Neurohumanities Lab)	2022-2023
<ul style="list-style-type: none">- Created an 8-channel EEG-based VAD 15 emotion recognition model- Designed a channel selection pipeline using lobe-based PCA and RF- Reduced 32-channel DEAP dataset dimensionality into optimal OpenBCI config	
Digital Twin of the Workspace - Tecnológico de Monterrey	2022
<ul style="list-style-type: none">- Designed a throughput monitoring system via Human Action Recognition (HAR)- Integrated Velodyne LiDAR pointcloud with CV tracking using CCTV footage- Fitted a RNN HAR model (Walking, Running, Jumping) using CV human keypoints	
Brain on Acting - University of Houston	2022
<ul style="list-style-type: none">- Recorded a play using 32-electrode EEG on two actors and the director- Calculated bispectrum signal for the combination of pairs using MATLAB- Assessed the difference in moments of gaze via Wilcoxon Rank-Sum Test	

Biomechanical Force Prediction - <i>Tecnológico de Monterrey</i> (<i>Biomechanics for the Digital Twin</i>)	2021-2022
<ul style="list-style-type: none"> - Used OpenPose API and DLT to markerless track an individual's joints - Designed and trained an RNN using Tensorflow and Keras in Python - Predicted the force exerted by using raw human pose keypoints 	
Mental Fatigue Prediction - <i>Tecnológico de Monterrey</i> (<i>Advanced Learner Assistance System [ALAS]</i>)	2021
<ul style="list-style-type: none"> - Feature engineered 4-electrode EEG & ECG wearables features using R - Developed and tuned a ML algorithm that predicted mental fatigue via Python - Used the least amount of combined features (2) to achieve high accuracy (93%) 	
Interest in STEM Prediction - <i>Tecnológico de Monterrey</i> (<i>Talent and Passion Detection Through Biometrics</i>)	2021
<ul style="list-style-type: none"> - Trained ML regression models with biometrics (EEG, ECG, and CV emotions) - Predicted change in vocational interest after a STEM lecture using Python - Validated with STEM-CIS psychometric test, the algorithm achieved 80% accuracy 	

MEMBERSHIPS

SACNAS	March 2024 - March 2025
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AUDITED COURSES

Harvard - Department of Psychology	
PSY 3340 Research Seminar in Cognition, Brain, and Behavior - <i>T. Ullman</i>	Spring 2024
PSY 1322 The Cognitive Science of Making Up Your Mind - <i>T. Ullman</i>	Spring 2024
MIT - Department of Brain and Cognitive Sciences (BCS)	
9.014 Quantitative Methods and Computational Models in Neuroscience - <i>M. Jazayeri</i>	Fall 2023
9.66 Computational Cognitive Science - <i>J. Tenenbaum</i>	Fall 2023

PROFESSIONAL DEVELOPMENT

MIT - Department of Brain and Cognitive Sciences (BCS)	
(Workshop) Exploring New Horizons: Strategies for Success in new Scientific Field	2024
(Symposium) McGovern Institute: Transformational Strategies in Mental Health	2024
(Symposium) McGovern-MEGIN: MEGnificent brain discoveries	2024
Tecnológico de Monterrey	
(Course) Data Science - <i>Crystal System</i>	(150 h) 2022
(Workshop) Biosignal processing in Python - <i>Neuroengineering and Neuroacoustics</i>	2021
(Hackathon) HackMTY	2021
(Hackathon) B-Hack - <i>43th National Biomedical Engineering Congress</i>	2020
(Course) Systemic Change - <i>Ashoka</i>	2020

COURSERA SPECIALIZATIONS

Johns Hopkins University	
Data Science	(288 h) 2021
Neuroscience and Neuroimaging	(42 h) 2020
Health Informatics	(56 h) 2020
Patient Safety	(54 h) 2020
Healthcare IT Support	(20 h) 2021
University of Michigan	
Applied Data Science with Python	(145 h) 2021
DeepLearning.AI	
AI for Medicine	(72 h) 2021
Imperial College London	
Infectious Disease Modelling	(65 h) 2021
Alberta Machine Intelligence Institute	
Machine Learning: Algorithms in the Real World	(41 h) 2020
IBM - edX	
Fundamentals of AI	(80 h) 2020
Rice University	
Fundamentals of Immunology	(69 h) 2020
University of Colorado System	

Applied Cryptography	(34 h) 2020
University System of Georgia	
Six Sigma Green Belt	(49 h) 2020
Duke University	
Excel to MySQL: Analytic Techniques for Business	(109 h) 2021