Raymundo
Cassani Gonzalez

Curriculum Vitae

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Education

May 2013 –
Nov 2018
INRS-EMT, University of Quebec
Multimedia/Multimodal Signal Analysis and Enhancement (MuSAE Lab),
Ph.D. in Telecommunications.
Research topic: Digital signal processing for EEG-based Alzheimer's disease assessment.

Aug 2010 –
Dec 2012
National Polytechnic Institute (IPN), Mexico
Department of Graduate Studies and Research (SEPI),
M.Sc. in Microelectronics Engineering.
CONACyT scholarship.
Research topic: Use of adaptive filters to remove respiration-induced noise from ECG signal.

Aug 2003 –
Dec 2007
National Polytechnic Institute (IPN), Mexico
School of Electrical and Mechanical Engineering (ESIME) Culhuacan,
Bachelor's in Electronics and Communications Engineering.
Harp Helu scholarship.
Thesis project: ECG signal generator. First place, category Project-Prototype.

Work Experience

Dec 2018 –
Present
INRS-EMT, University of Quebec
Multimedia/Multimodal Signal Analysis and Enhancement (MuSAE Lab),
Research Associate: Jun 2020 - Present,
Postdoctoral Researcher: Dec 2018 - May 2020.
- Biomedical signal processing with applications in health diagnostics.
- Design and development of pipelines (signal acquisition, pre-processing, feature extraction, machine learning and stimulus presentation) for multimodal human-computer interfaces (HCIs) in health, entertainment and mental workload assessment applications.
- Integration of non-invasive sensors for EEG, ECG, EOG and EMG signals in VR/AR systems.
- EEG-based brain-computer interfaces (BCIs).

May 2015 –
Aug 2015
Sensaura Tech, *Canadian start-up focused on affective computing using wearable devices.*
Consultant for hardware and signal processing.
- Assessment and comparison of wearable devices and algorithms for HR and HRV.

Jan 2013 –
Apr 2013
TKME Monitoreo, *Mexican company with expertise in monitoring facilities for data centers.*
R&D Engineer.
- Design and development of TKmE 5.0 software.
- Integration of RFCode technologies into TKmE software.

| Mar 2010 – Jul 2010 | **IGSA Solutions by Dalkia**, *Mexican company dedicated to electric energy services.* *Maintenance Engineer.* |

- General maintenance to UPS, backup electric generators and HVAC systems.
- Create and update procedures for UPS equipment and data acquisition using Cellwatch software.

| Dec 2007 – Feb 2009 | **Teksar Labs**, *Mexican company focused on satellite technology and data centers and facilities.* *R&D Engineer.* |

- Design and development of TKME 3.0 software.
- Creation of proprietary monitoring technology PTL.

Internships

| Jan 2012 – Jul 2012 | **Research Centre at Sacré-Coeur Hospital, Université de Montréal**, *Visiting Research Intern, as M.Sc. Student.* |

- Comparison of methods to calculate QTc, and evaluate drug-induced QTc changes in patients.
- Development of method to measure and correct QT interval in patients with atrial flutter.

| Feb 2007 – Dec 2007 | **National Institute of Cardiology**, *Main research institute in Mexico and Latin America.* *Research Intern, as Undergraduate Student.* |

- Design of research devices to measure blood pressure, PPG and ECG signals.
- Design and built of an ECG signal generator, which was presented as Bachelor's thesis project.
- Design and built of a USB Data Acquisition System (SIEVARTWIN), presented as conference paper.

| May 2006 – Aug 2006 | **Teksar Labs**, *Mexican company focused on satellite technology, data centers and facilities.* *Research Intern, as Undergraduate Student..* |

- Assessed electric power quality in facilities of the Government of Baja California.
- Coordinated, tested and certified signal strength of more than 200 VSATs. installed all over Mexico. Trained 10+ personnel on troubleshooting satellite reception issues.

Languages

Spanish, *written and spoken at a native proficiency level*.

English, *written and spoken at a full professional proficiency level*.

French, *written and spoken at a working professional proficiency level*.

Honours and Awards

2020	Early Career Achievement Award - *Canadian Medical and Biological Engineering Society*
2018	Best paper award at conference QoMEX 2018
2015	Awarded finalist at hackathon anglehacks, Montreal, project **MyoDowntime**
2014	Most creative project at hackathon WearHacks 2014, Montreal, project **neuralDrift**

Affiliations

2016 – Present **Canadian Medical and Biological Engineering Society**, *Member and volunteer*, Involved in development of online CMBEC proceedings, and CMBEC44 (2021) organization .

2015 – Present **NeuroTechX**, *Member and volunteer*, Involved as instructor in workshops and prepared material for diffusion of neurotechnologies.

2010 – Present **IEEE**, *Member, and Member of the EMB, Signal Processing and SMC societies*, Involved as volunteer for conferences and workshops.

Workshops and Talks

2020 (Talk) *"Improving mental health across lifespan"*, at CMBES annual general meeting.

2016 (Talk) *"MuLES: quick and simple prototyping for multimodal data"*, at McGill University

2015 (Workshop) *"LabVIEW fundamentals"*, 6 hours; part of the Perswade program, at INRS-EMT

2015 (Workshop) *"Brain-Computer Interfaces"*, 5 hours; at District3, Concordia University

2012 (Workshop) *"LabVIEW design patterns"*, 20 hours; at IPN

Publications

Articles in Referred Journals

2020 **R. Cassani**, G. Novak, T. H. Falk, and A. de Oliveira "Virtual reality and non-invasive brain stimulation for rehabilitation applications: a systematic review," in *Journal of NeuroEngineering and Rehabilitation*, in press, 2020.

2020 I. Albuquerque, A. Tiwari, M. Parent, **R. Cassani**, J. Gagnon, D. Lafond, S. Tremblay, and T. H. Falk "WAUC: A Multi-Modal Database for Mental Workload Assessment under Physical Activity," in *Frontiers in Neuroscience*, in press, 2020.

2020 **R. Cassani**, M. Moinnereau, L. Ivanescu, O. Rosanne, and T. H. Falk, "Neural interface instrumented virtual reality headsets: Toward next-generation immersive applications," *IEEE Systems, Man, and Cybernetics Magazine*, vol. 6, no. 3, pp. 20–28, 2020.

2020 E. M. dos Santos, **R. Cassani**, T. H. Falk, and F. J. Fraga, "Improved motor imagery brain-computer interface performance via adaptive modulation filtering and two-stage classification," *Biomedical Signal Processing and Control*, vol. 57, p. 101812, Mar. 2020

2019 **R. Cassani** and T. H. Falk, "Alzheimer's Disease Diagnosis and Severity Level Detection Based on Electroencephalography Modulation Spectral 'Patch' Features," in *IEEE J. Biomed. Health Inform., pp. 1–1,* 2019.

2018 **R. Cassani**, M. Estarellas, R. San-Martin, F. J. Fraga, and T. H. Falk, "Systematic Review on Resting-State EEG for Alzheimer's Disease Diagnosis and Progression Assessment," *Disease Markers*, vol. 2018, 2018.

2017 **R. Cassani**, T. H. Falk, F. J. Fraga, M. Cecchi, D. K. Moore, and R. Anghinah, "Towards automated electroencephalography-based Alzheimer's disease diagnosis using portable low-density devices," *Biomedical Signal Processing and Control*, vol. 33, pp. 261–271, Mar. 2017.

2014 **R. Cassani**, T. H. Falk, F. J. Fraga, P. A. M. Kanda, and R. Anghinah, "The effects of automated artifact removal algorithms on electroencephalography-based Alzheimer's disease diagnosis," *Frontiers in Aging Neuroscience*, vol. 6, p. 55, 2014.

2014 V. Jacquemet, **R. Cassani González**, M. Sturmer, B. Dubé, J. Sharestan, A. Vinet, O. Mahid-dine, A. R. LeBlanc, G. Becker, T. Kus, and R. Nadeau, "QT interval measurement and correction in patients with atrial flutter: A pilot study," *Journal of Electrocardiology*, vol. 47, pp. 228–235, Mar. 2014.

2013 V. Jacquemet, **R. Cassani Gonzalez**, B. Dubé, A. Vinet, A. L. Blanc, M. Sturmer, G. Becker, T. Kus, and R. Nadeau, "Relevance of individualized qt interval correction in subjects with large heart rate fluctuations," *Journal of Electrocardiology*, vol. 46, no. 4, p. e34, 2013.

2012 **R. Cassani González**, E. B. Engels, B. Dubé, R. Nadeau, A. Vinet, A. R. LeBlanc, M. Sturmer, G. Becker, T. Kus, and V. Jacquemet, "Assessment of the sensitivity of detecting drug-induced QTc changes using subject-specific rate correction," *Journal of Electrocardiology*, vol. 45, pp. 541–545, Nov. 2012.

Articles in Conference Proceedings and Abstracts

2020 **R. Cassani**, A. Tiwari, I. Posner, B. Afonso, and T. H. Falk, "Initial Investigation into Neurophysiological Correlates of Argentine Tango Flow States: a Case Study," in *2020 IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, in press, 2020.

2020 **R. Cassani**, A. Tiwari, and T. H. Falk, "Optimal filter characterization for photoplethysmography-based pulse rate and pulse power spectrum estimation," in *2020 42nd annual international conference of the IEEE engineering in medicine biology society (EMBC), Montreal, QC, Canada, Jul. 2020, pp. 914–917*, 2020.

2020 L. R. Trambaiolli, **R. Cassani**, and T. H. Falk, "EEG spectro-temporal amplitude modulation as a measurement of cortical hemodynamics: an EEG-fNIRS study," in *2020 42nd annual international conference of the IEEE engineering in medicine biology society (EMBC), Montreal, QC, Canada, Jul. 2020, pp. 3481–3484*, 2020.

2020 A. Tiwari, **R. Cassani**, J.-F. Gagnon, D. Lafond, S. Tremblay, and T. H. Falk, "Prediction of stress and mental workload during police academy training using ultra-short-term heart rate variability and breathing analysis," in *2020 42nd annual international conference of the IEEE engineering in medicine biology society (EMBC), Montreal, QC, Canada, Jul. 2020, pp. 4530–4533*, 2020.

2019 B Jesus, **R. Cassani**, M. Cecchi, K. Fadem, W. McGeown, and T. H. Falk, "Exploring predictive models of Alzheimer's disease severity based on resting state EEG and MRI features," in *Poster Presentations at the 10th Canadian Conference on Dementia (CCD)* Québec City, October 3, 2019.

2019 **R. Cassani**, I. Albuquerque, J. Monteiro, and T. H. Falk, "AMA: An Open-source Amplitude Modulation Analysis Toolkit for Signal Processing Applications," in *2019 IEEE global conference on signal and information processing (GlobalSIP), Nov. 2019, pp. 1–4*, 2019.

2019 **R. Cassani**, A. Horai, L. Gheorge, T. H. Falk, "Evaluating the Measurement of Driver Heart and Breathing Rates from a Sensor-Equipped Steering Wheel using Spectro-temporal Signal Processing," in *22nd IEEE Intelligent Transportation Systems Conference*, 2019.

2019 **R. Cassani** and T. H. Falk, "Automated Alzheimer's Disease Diagnosis using a Low-Density EEG Layout and New Features based on the Power of Modulation Spectral 'Patches'," in *2019 IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, 2019.

2019 A. Tiwari, **R. Cassani**, S. Narayanan, and T. H. Falk, "A Comparative Study of Stress and Anxiety Estimation in Ecological Settings Using a Smart-shirt and a Smart-bracelet," in *2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Berlin, Germany, 2019, pp. 2213–2216.

2019 W. McGeown, **R. Cassani**, T. H. Falk, M. Cecchi, K. Fadem, "Neuroanatomical and Neuropsychological Correlates of Resting State EEG Diagnostic Features in Patients with Alzheimer's Disease," abstract *AAIC*, 2019.

2018 L. R. Trambaiolli, **R. Cassani**, C. E. Biazoli Jr, A. M. Cravo, J. R. Sato, and T. H. Falk, "Resting-Awake EEG Amplitude Modulation Can Predict Performance of an fNIRS-Based Neurofeedback Task," in *2018 IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, Oct. 2018.

2018 **R. Cassani**, M.-A. Moinnereau, and T. H. Falk, "A Neurophysiological Sensor-Equipped Head-Mounted Display for Instrumental QoE Assessment of Immersive Multimedia," in *2018 Tenth International Conference on Quality of Multimedia Experience (QoMEX)*, May 2018. Best paper award.

2018 **R. Cassani**, S. Narayanan, and T. H. Falk, "Respiration Rate Estimation From Noisy Electrocardiograms Based on Modulation Spectral Analysis," in *CMBES Proceedings*, vol. 41, 2018.

2017 M. Estarellas, **R. Cassani**, and T. H. Falk, "Assessment of EEG-based biomarkers of Alzheimer's disease progression," in *Mechanisms, Clinical Strategies, and Promising Treatments of Neurodegenerative Diseases. 13th International Conference AD/PDTM Vienna, Austria, March 29 to April 2, 2017: Abstracts, Neurodegenerative Diseases.*

2015 **R. Cassani** and T. H. Falk, "Automated Alzheimer's Disease Diagnosis Using a Portable 7-Channel Electroencephalography Device," Abstract in *IUPESM World Congress*, (Toronto), 2015.

2015 **R. Cassani**, H. Banville, and T. H. Falk, "MuLES: An Open Source EEG Acquisition and Streaming Server for Quick and Simple Prototyping and Recording," in *Proceedings of the 20th International Conference on Intelligent User Interfaces Companion*, IUI Companion '15, (New York, NY, USA), pp. 9–12, ACM, 2015.

2014 **R. Cassani** and T. H. Falk, "Gaze and BCIs as Gaming Inputs: Opportunities and Open Challenges," in *EyePlay Workshop, CHI-PLAY2014*, p. 4, 2014.

2014 T. H. Falk, H. Banville, S. Bishundayal, **R. Cassani**, A. Clerico, L. Dahmani, R. Gupta, A. Ratnarajah, N. Phillips, and V. D. Bohbot, "EEG-theta modulation is greater in spatial learners than response learners: A scalp-EEG study in young adults tested on a virtual navigation task," in *Neuroscience 2014*, 2014.

2014 **R. Cassani**, T. H. Falk, F. J. Fraga, P. A. Kanda, and R. Anghinah, "Towards automated EEG-Based Alzheimer's disease diagnosis using relevance vector machines," in *5th ISSNIP-IEEE Biosignals and Biorobotics Conference (2014): Biosignals and Robotics for Better and Safer Living (BRC)*, pp. 1–6, May 2014.

2013 **R. Cassani**, J. C. Sanchez, and R. Martinez, "Implementation and evaluation of an adaptive method for reduce the respiration influence on Heart Rate Variability," in *Circuits and Systems (LASCAS), 2013 IEEE Fourth Latin American Symposium On*, pp. 1–4, IEEE, 2013.

2011 **R. Cassani**, P. Mejia, J. A. Tavares, J. C. Sanchez, and R. Martinez, "Adaptive filtering for respiration influence reduction on Heart Rate Variability," in *Electrical Engineering Computing Science and Automatic Control (CCE), 2011 8th International Conference On*, pp. 1–5, IEEE, 2011.

2007 **R. Cassani**, R. Martinez, and O. Infante, "Data acquisition system SIEVARTWIN (in Spanish)," in *30th National Congress of Biomedical Engineering*, 2007.

Book Chapters

2018 **R. Cassani** and T. H. Falk, "Spectrotemporal Modeling of Biomedical Signals: Theoretical Foundation and Applications," in *Reference Module in Biomedical Sciences*, Elsevier, 2018.

Patents

Mar 2009 **Monitor Enterprise, Monitoring System for Energy and Environmental Variables in Data Centers**, *Author Protection Rights Agency of Mexico (IMPI) Reg. Number 03-2009-0223101706000-01*, **Cassani González Raymundo** and Santoyo Delgado Raúl.