



Carlos Loza

PhD – Machine Learning Scientist – Fulbright Scholar

Experience

2021–present **Data Scientist**, *One Drop*, New York, NY.

Leverage Data Science and Machine Learning techniques to provide actionable insights to people dealing with chronic conditions.

Projects and main activities:

- Probabilistic modeling (with exogenous variables) of biomedical time series.
- Data cleaning/wrangling of user health-related records via Snowflake and pandas on AWS EC2 machines.
- Contribution (code review, maintenance) to an established codebase via Git.

Achievements:

- Development of python modules that integrate deep learning and probabilistic modeling of time series.

2021–present **Research Engineering/Scientist Professional**, *The University of Texas at Austin*, Austin, TX.

Provide data-driven insights to Computational Neuroscience projects at the Colgin Lab as a Machine Learning Scientist freelancer.

Projects and main activities:

- Predictive modeling of hippocampal spikes during exploration tasks.

Achievements:

- Part of the multidisciplinary team behind the manuscript, “Hippocampal place cell sequences differ during correct and error trials in a spatial memory task” published in Nature Communications.

2020–2021 **Machine Learning Researcher**, *The University of Texas at Austin*, Austin, TX.

Postdoctoral fellow in charge of algorithm design for modeling and real-time detection of gamma oscillations in rodent hippocampus at the Colgin Lab.

Projects and main activities:

- Probabilistic modeling of single-channel EEG applied to sleep spindles detection.
- Design of Bayesian networks that combine probabilistic models and deep learning.
- Probabilistic modeling of neural spikes during spatial exploration tasks.

Achievements:

- Increase in 30% of the AUC of precision–recall curve of EEG sleep spindles detection.
- Consolidation and versioning of code from past projects at the Colgin Lab.

- 2017–2020 **Machine Learning Researcher**, *Universidad San Francisco de Quito*, Quito.
 Development of supervised and unsupervised learning algorithms applied to biosignals, images, and chemometrics.
Projects and main activities:
- Unsupervised learning of prototypical patterns in EEG, ECoG and LFP.
 - Predictive modeling applied to Chemometrics.
 - Sparse modeling applied to Computer Vision.
 - Robust estimation applied to sparse coding and dictionary learning.
- Courses taught (Affiliated to Mathematics department):
- Differential, Integral, and Multivariate Calculus.
 - Applied Statistics.
- Achievements:
- 10 peer-reviewed papers as first (most of the times sole) author during a 2.5–year tenure.
 - Redesign of Statistics course to meet demands from Math and Psychology departments.
- 2013–2017 **Graduate Research Assistant**, *University of Florida*, Gainesville, FL.
 Part of collaborative and solo projects at Computational NeuroEngineering Lab (CNEL) involving the intersection between machine learning and neuroscience.
Projects and main activities:
- Clustering of time series applied to audio signals.
 - Prediction of hand movement directions via EEG-based Brain–Computer Interfaces.
 - Robust sparse coding exploiting Correntropy.
 - Robust dictionary learning applied to image processing.
 - Unsupervised learning of reoccurring patterns in EEG, ECoG and LFP.
- Achievements:
- Design of novel generative models for neuronal signals.
- 2010–2012 **Associate Professor**, *Universidad San Francisco de Quito*, Quito.
Courses taught (Affiliated to Electrical Engineering department):
- Digital Signal Processing.
 - Digital Processing of Images and Audio Signals.
 - Satellite Navigation Systems.
 - Differential, Integral, and Multivariate Calculus.
 - Linear Algebra.
- Achievements:
- Design of advanced signal processing courses.
 - Dissertation chair for four undergraduate students.
- 2009–2009 **Research Intern**, *Magneti Marelli*, Turin, Italy.
 Summer internship at the Telematics department.
Projects and main activities:
- Development of efficient and portable automotive security systems that integrate GPS and GSM technologies.
- 2008–2008 **Research Intern**, *University of Dundee*, Dundee, United Kingdom.
 Summer internship (IAESTE) at Nick Hine's lab. Affiliation: School of Computing.
Projects and main activities:
- Prototype of Arduino-LabVIEW interface for a project that encourages children to learn about technology via playful, tangible products.
- 2007–2007 **Research Intern**, *Ghent University*, Ghent, Belgium.
 Summer internship (IAESTE) at IBBT.
Projects and main activities:
- Software developer of a web browser for mobile devices.

Education

- 2014–2017 **PhD**, *University of Florida*, Electrical and Computer Engineering.
Dissertation: *A Transient Model for Neuronal Oscillations*
Advisor: Jose C. Principe
GPA: 3.87/4
- 2015–2016 **Master of Science**, *University of Florida*, Biomedical Engineering.
GPA: 3.97/4
- 2012–2014 **Master of Science**, *University of Florida*, Electrical and Computer Engineering.
GPA: 3.84/4
- 2008–2009 **Master of Science**, *Politecnico di Torino*, Navigation and Related Applications.
GPA: 27.02/30
- 2003–2007 **Bachelor of Science**, *Universidad San Francisco de Quito*, Electrical Engineering.
GPA: 3.66/4

Research interests

- Machine Learning Deep learning, probabilistic modeling, computer vision, supervised and unsupervised learning, state space models, hidden Markov models, Bayesian networks, variational inference, time series forecasting and classification.
- Neural Engineering Brain–Computer Interfaces (BCI), neural decoding, biomedical signal processing.
- Signal Processing Image processing, audio processing, transformations, decompositions.
- Robust Estimation Robust (outlier–aware) predictive modeling, robust sparse modeling.
- Data Mining Time series clustering, segmentation, and prediction.

Technical skills

- Computer Science main data structures, algorithms (sorting, searching), complexity (big O).
- Python tensorflow, tensorflow probability, gluons, numpy, pandas, scikit-learn, scipy, matplotlib, seaborn libraries.
- Developer Tools PyCharm, Visual Studio Code, Jupyter Notebooks, Google Colab.
- MATLAB algorithm design and main signal processing and statistical analysis toolboxes.
- SQL Snowflake.
- Docker Docker Desktop, command line.
- Git GitHub, command line.
- LabVIEW signal processing and algorithm design.
- LaTeX manuscript preparation and editing.

Honors, awards, and achievements

- 2021 DAAD Alnet fellowship, German Academic Exchange Service.
- 2021 Early acceptance (top 15%) of manuscript, "Deep neural dynamic Bayesian networks applied to EEG sleep spindles modeling." MICCAI conference (30% acceptance rate).
- 2019 Manuscript selected for special issue, IWANN conference.
- 2017 Student Paper Competition finalist, IEEE EMBS NER conference.
- 2014–2017 Research assistantship, Michael J Fox Foundation, University of Florida.
- 2012–2014 Provost scholarship, University of Florida.
- 2012–2014 Fulbright grant for faculty development, Fulbright Program.
- 2008–2009 ALPIP scholarship, Politecnico di Torino.
- 2007, 2008 IAESTE exchange program trainee, IAESTE.
- 2003–2008 Newton scholarship, Universidad San Francisco de Quito.

Grants and funding

- 2021 Registration waiver (NIH-MICCAI Participation Award): \$290. MICCAI conference.
- 2018–2019 Collaboration Grant: \$10000. Universidad San Francisco de Quito.
- 2018–2019 PoliGrant: \$3689. Universidad San Francisco de Quito.
- 2017 Registration waiver (Paper Competition finalist): \$515. IEEE NER conference.
- 2017 Travel grant: \$350. University of Florida Graduate Student Council.
- 2016 Travel grant: \$500. 4th Minnesota Neuromodulation Symposium.

Scientific memberships

- 2012–present Fulbright scholar
- 2014–present IEEE (Institute for Electrical and Electronics Engineers)
- 2014–present IEEE EMBS (Engineering in Medicine and Biology Society)
- 2018–present IEEE Signal Processing Society
- 2021–present MICCAI Society

Academic services (publons.com)

- 2021 Progress in Neurobiology *Reviewer*
- 2021 MDPI Symmetry *Reviewer*
- 2019 MDPI Entropy *Reviewer*
- 2019–2021 MDPI Applied Sciences *Reviewer*
- 2019 Informatics in Medicine Unlocked *Reviewer*
- 2019 Journal of Integrative Neuroscience *Reviewer*
- 2017 IEEE Transactions on Signal Processing *Reviewer*
- 2019 ICMV *Program Committee*
- 2018–2021 IEEE ICASSP *Program Committee*
- 2018–2021 IEEE MLSP *Program Committee*

Soft skills

Exceptional communication skills.
Able to work effectively in multidisciplinary teams.
Resiliency.

Languages

Spanish Native
English Fluent
Italian Intermediate

Publications

Book Chapters

- 2019 Carlos A Loza and Jose C Principe. The generalized sleep spindles detector: a generative model approach on single-channel EEGs. In *International Work-Conference on Artificial Neural Networks*, pages 127–138. Springer, 2019.
- 2019 Carlos A Loza. A robust fully correntropy-based sparse modeling alternative to dictionary learning. In *International Conference on P2P, Parallel, Grid, Cloud and Internet Computing*, pages 838–847. Springer, 2019.
- 2018 Carlos A Loza. Robust K-SVD: a novel approach for dictionary learning. In *International workshop on artificial intelligence and pattern recognition*, pages 185–192. Springer, 2018.

Book Chapters (Accepted, to appear)

- 2021 Carlos A Loza and Jose C Principe. EEG models and analysis. In Nitish V. Thakor, editor, *Handbook of Neuroengineering*. Springer, 2021.

Articles

- 2021 Chenguang Zheng, Ernie Hwaun, Carlos A Loza, and Laura Lee Colgin. Hippocampal place cell sequences differ during correct and error trials in a spatial memory task. *Nature communications*, 12(1):1–14, 2021.
- 2019 Carlos A Loza. RobOMP: Robust variants of orthogonal matching pursuit for sparse representations. *PeerJ Computer Science*, 5:e192, 2019.
- 2019 Carlos Loza, Chandan Reddy, Shailaja Akella, and José Príncipe. Discrimination of movement-related cortical potentials exploiting unsupervised learned representations from ECoGs. *Frontiers in Neuroscience*, 13:1248, 2019.
- 2017 Carlos A Loza, Michael S Okun, and José C Príncipe. A marked point process framework for extracellular electrical potentials. *Frontiers in systems neuroscience*, 11:95, 2017.

Conference Proceedings

- 2021 Carlos A Loza and Laura L Colgin. Deep neural dynamic Bayesian networks applied to EEG sleep spindles modeling. In *Medical Image Computing and Computer Assisted Intervention – MICCAI 2021*, page to appear. Springer International Publishing, 2021.
- 2019 Carlos A Loza and Jose C Principe. Sparse wave packets discriminate motor tasks in EEG-based BCIs. In *2019 9th International IEEE/EMBS Conference on Neural Engineering (NER)*, pages 639–642, 2019.
- 2019 Carlos A Loza. Robust variants of dictionary learning exploiting m-estimators. In *2019 IEEE CHILEAN Conference on Electrical, Electronics Engineering, Information and Communication Technologies (CHILECON)*, pages 1–6, 2019.
- 2018 Carlos A Loza and Jose C Principe. Robust estimation of shift-invariant patterns exploiting correntropy. In *2018 IEEE Third Ecuador Technical Chapters Meeting (ETCM)*, pages 1–6. IEEE, 2018.
- 2018 Carlos A Loza and Jose C Principe. The embedding transform. a novel analysis of non-stationarity in the EEG. In *2018 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pages 3112–3115. IEEE, 2018.
- 2017 Carlos A Loza, Jonathan B Shute, Jose C Principe, Michael S Okun, and Aysegul Gunduz. A marked point process approach for identifying neural correlates of tics in tourette syndrome. In *2017 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pages 4375–4378. IEEE, 2017.
- 2017 Carlos A Loza and Jose C Principe. Unsupervised robust detection of behavioral correlates in ECoG. In *2017 8th International IEEE/EMBS Conference on Neural Engineering (NER)*, pages 509–512. IEEE, 2017.
- 2016 Carlos A Loza and José C Principe. Transient model of EEG using gini index-based matching pursuit. In *2016 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 724–728. IEEE, 2016.
- 2016 Carlos A Loza and Jose C Principe. A robust maximum correntropy criterion for dictionary learning. In *2016 IEEE 26th International Workshop on Machine Learning for Signal Processing (MLSP)*, pages 1–6. IEEE, 2016.
- 2016 Carlos A Loza and Jose C Principe. Generalized correntropy matching pursuit: a novel, robust algorithm for sparse decomposition. In *2016 International Joint Conference on Neural Networks (IJCNN)*, pages 1723–1727. IEEE, 2016.
- 2016 Carlos A Loza and Jose C Principe. Estimation and modeling of EEG amplitude-temporal characteristics using a marked point process approach. In *2016 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pages 3720–3723. IEEE, 2016.
- 2014 Carlos A Loza, Gavin R Philips, Mehrnaz Kh Hazrati, Janis J Daly, and Jose C Principe. Classification of hand movement direction based on EEG high-gamma activity. In *2014 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, pages 6509–6512. IEEE, 2014.

- 2014 Goktug T Cinar, Carlos A Loza, and Jose C Principe. Hierarchical linear dynamical systems: A new model for clustering of time series. In *2014 International Joint Conference on Neural Networks (IJCNN)*, pages 2464–2470. IEEE, 2014.

Abstracts

- 2017 Carlos A Loza and Jose C Principe. ECoG behavioral correlates based on neuromodulation rates. In *2017 Minnesota Neuromodulation Symposium*, page 163, 2017.
- 2016 Carlos A Loza and Jose C Principe. A transient model for neuronal oscillations. In *2016 Minnesota Neuromodulation Symposium*, page 181, 2016.