Nicolás Astorga

Research Scientist · ML Engineer

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Summary

6+ Years of experience in ML research with a main focus on generative models, representation learning, semi-supervised learning and time series. ∼ 6 month of experience as ML engineer. Currently I am working part-time in ALeRCE and part-time as a research assistant in collaboration with Pablo Huijse. There is a lot of research work that is not published yet (and not here), but you can have an idea by looking my blog page.

Education

University of Chile — *Santiago, Chile*

M.Sc. Computer Science — *August 2021 - Present*

M.Sc Electrical Engineering — *2020-2021*

Electrical Engineering — *2013-2021*

B.Sc. in Computer Science — *2013-2019*

B.Sc. in Electrical Engineering — *2013-2020*

B.Sc. in Mechanical Engineering — *2013-2020*

Research experience

Harvard University — *Cambridge, United States*

Research Internship — *Jan. 2019 - Aug. 2019*

- Research internship at the Institute for Applied Computational Science (IACS), Harvard, with Pavlos Protopapas professor.
- Worked on a new clustering method called MPCC that enjoys the high generative capacities of GANs and the inference capabilities of VAEs. We published this work in ECCV 2020.
- Exploration of generative modeling techniques such as BigGAN, ProgressiveGAN, SplittingGAN, etc. Exploration of semi-supervised and clustering techniques like VAT, Triple GAN, badGAN, DeepCluster, etc.

University of Chile — *Santiago, Chile*

Research Assistant at Laboratory of Computational Intelligence — *March. 2016 - Present*

- Research assistant at Laboratory of Computational Intelligence, University of Chile, with Pablo Estévez professor.
- Applied In formation Theoretic Learning for period estimation using periodograms. March 2016 - July 2016 research period.
- Research on Deep semi-supervised learning methods applied into light curves classification for VVV survey. I explored techniques like Ladder networks, Auxiliary Deep Generative Models, K-means, Gaussian Processes, and T-SNE. Aug. 2016 - March 2017 research period.
- Research on techniques that improve the posterior capacity of VAEs; *i.e.* Importance Weighting, Normalising Flow, Inverse Autoregressive Flow, etc. March 2017 - July 2017 research period.
- Research on Gaussian Mixture priors in VAEs. We applied Variational Deep Embedding (VaDE) to HITS survey and estimated the noise of the data. We published and a present this work on IJCNN conference. Aug. 2017 - Aug. 2018 period.
- Development of a new clustering model called MPCC. Oct. 2018 - Dec. 2019 period.
- Development of ML theory about generative models that considers an inference model. This theory is also part of my master's thesis "Generative-inference models: theory and application". March 2020 to present period.

University of Chile — *Santiago, Chile*

Research Assistant at Smart Reliability and Maintenance Integration Laboratory — *Jan. 2017 - Sept. 2018*

- Research on SRMI Lab with Enrique López Droguett professor.
- Worked on practical applications of neuronal networks for crack classification and segmentation. We published two papers with this research.
- Research on Deep Kalman Filter and other deep state space models with the objective of change the transition model into known physical transitions.

University Austral of Chile — *Valdivia, Chile*

Research internship — *Jan. 2020 - Feb. 2020*

- Research in the Informatic Institute with professor Pablo Huijse.
- Research on a new scalable convolutional autoencoding architecture for variable length time series. It also can be used for data augmentation since this model amortizes Gaussian processes.

Work experience

ALeRCE (Automatic Learning for the Rapid Classification of Events) *Santiago, Chile*

MACHINE LEARNING ENGINEER *Feb. 2022 - Present*

- I put ML models in production so they can be used inside all ALeRCE pipeline. This includes lifting infrastructure, create models images (docker) and use kubernetes to deploy the images. Sometimes I also help in the development of other services not related to ML.
- I create training sets for machine learning using pyspark. This includes obtaining data (from data bases) and crossmatch it with catalogs that have labels available.
- I also train ML models, which I can not disclose fow now.

Publications

- **Nicolas Astorga**, Pablo Huijse, Pavlos Protopapas and Pablo A. Estévez. "MPCC: Matching Priors and Conditionals for clustering", European Conference on Computer Vision (ECCV), Glasglow, 2020.
- **Nicolas Astorga**, Pablo Huijse, Pablo A. Estévez, Francisco Forster, "Clustering of astronomical transient candidates using deep variational embedding", Proceedings of the International Joint Conference on Neural Networks (IJCNN), Rio de Janeiro, Brazil, 2018.
- Francisco Forster **et al**. "The Automatic Learning for the Rapid Classification of Events (ALeRCE) Alert Broker". Submitted to AAS.
- Pablo Huijse, **Nicolas Astorga**, Pablo A. Estévez, Giuliano Pignata, "Latent representations of transients from an astronomical image difference pipeline using VAE", Proceedings of the European Symposium on Artificial Neural Networks (ESANN), Bruges, Belgium, 2018.
- Ceena Modarres, **Nicolás Astorga**, Enrique López, Enrique and Viviane Meruane, "Convolutional neural networks for automated damage recognition and damage type identification", Article in Structural Control and Health Monitoring, 2018.
- **Nicolás Astorga**, Enrique López and Viviane Meruane, "Computer vision for structural damage quantification: A novel residual deep learning based approach: A Deep Learning Based Model", Proceeding of European Safety and Reliability Conference (ESREL), 2018.
- Guarda, Luis and **Astorga, Nicolás** and Droguett, Enrique and Moura, Marcio and Ramos Martins, Marcelo, "Drowsiness Detection Using Electroencephalography Signals: A Deep Learning Based Model", Proceeding of Probabilistic Safety Assessment & Management (PSAM), 2018.

Other academic activities, awards and conferences

2020 **Paper presentation,** oral online presentation in ECCV2020.

2018 **Paper presentation,** at IEEE World Congress on Computational Intelligence (WCCI), Rio de Janeiro, Brazil.

2022 **Master full grant,** Conicyt scholarship for master programs: Full scholarship granted by the Chilean government for payment of tuition fees and personal expenses.

2019 **Speaker,** speaker in Legacy Survey of Space and Time (LSST) workshop Chile 2019, La Serena.

2018-2020 **Hackaton,** Hackaton Valdivia, October 2018. Hackaton LSST La Serena, March 2019. And Hackaton Concepción, January 2020.

201[3, 7, 8] **Outstanding student,** it is given to top student (top 7%) of the career.

2018-2019 **Participant,** I participated in Latin American Summer School in Computational Intelligence (EVIC) with full grant. In EVIC 2019 I participated in the poster competence obtaining **2nd place**.

2019-2022 **Teaching assistant,** I give lectures, homeworks and lead projects for the master course "Neural network and information theory for learning'. I have lead projects on: semi-supervised learning, causal learning, contrastive learning, etc.

2022 **Paper reviewer,** reviewer in Neurocomputing journal.

Skills

ML tools Pytorch, Pytorch-lightning, Tensorflow, Raytune, Matlab, Seaborn, Scikit-learn, Holoview

Programming Python, JAVA, R, LaTeX, Octave, Matlab, C, C++, Pyspark

DevOps AWS, Docker, Kubernetes, Terraform

Languages Spanish (native), English