Willian T. Lunardi

wtlunar@gmail.com

wtlunar.com
+971-55-191-4491

EDUCATION

University of Luxembourg   Luxembourg City, Luxembourg
Doctor of Philosophy (Ph.D.) in Computer Science   2020
Recipient of the Excellent Thesis Award for outstanding research.

PUC of Rio Grande do Sul   RS, Brazil
Master of Science (M.Sc.) in Computer Science   2016
Recipient of two scholarships from Dell in recognition of academic excellence.

University of Passo Fundo   RS, Brazil
Bachelor of Science (B.Sc.) in Computer Science   2014
Recipient of a full scholarship and an undergraduate research scholarship in recognition of academic excellence.

EXPERIENCE

Technology Innovation Institute   Abu Dhabi, United Arab Emirates
Senior Machine Learning Researcher   Jun 2021 – Present

- Developed and implemented an innovative adversarial training method to enhance autoencoder performance in detecting network traffic anomalies, with successful deployment on embedded devices.
- Formulated semi-supervised techniques employing outlier exposure and contrastive learning to learn one-class image representations, subsequently employed in training unsupervised classifiers such as OCSVM and KDE.
- Engineered advanced deep learning approaches for voice recognition and authentication among pre-authorized individuals, incorporating semi-supervised Deep SVDD, outlier exposure, log mel-spectrograms, and raw waveforms, achieving an outstanding 99.9% accuracy on the TIMIT dataset.
- Actively involved in groundbreaking research focused on applying one-class classification techniques to various data types, including images, audio, time-series, and sequences.

University of Luxembourg   Luxembourg City, Luxembourg
Research Associate   Jun 2020 – Jun 2021

- Developed Neural Combinatorial Optimization techniques, harnessing the capabilities of graph neural networks and reinforcement learning to create effective heuristics for solving various optimization problems.
- Created neighborhood functions and metaheuristics for a sophisticated vehicle routing problem, focusing on optimizing the routing and scheduling of delivery vehicles while considering coverage and energy constraints.
- Effectively deployed parallel C++ scheduling and vehicle routing algorithms in an industrial setting for a Germany-based, Europe-wide company, resulting in considerable enhancements in efficiency and productivity.
- Participated in multiple research projects, collaborating with team members and external partners to develop and implement innovative optimization algorithms and mathematical models.
- Mentored and supervised graduate students and early-career researchers, offering guidance on methodology, technical expertise, and scientific writing.

University of Luxembourg   Luxembourg City, Luxembourg
Doctoral Researcher   Jun 2016 – Jun 2020

- As a paid employee at the University of Luxembourg, created innovative MILP and CP models for an industrial scheduling problem, addressing complex availability, overlapping, and sequence-dependent setup constraints.
- Developed groundbreaking optimization algorithms that achieved state-of-the-art results for widely recognized scheduling problems, as demonstrated by publications in over 10 international scientific conferences and journals, including the European Journal of Operational Research and the Computer & Operations Research.
- Worked with companies across Europe to implement and validate the proposed models in real-world scenarios, significantly enhancing production capacity and revenue for several businesses.

Skills

- Strong background in machine learning and deep learning, including neural networks, convolutional neural networks, recurrent neural networks, generative models, and reinforcement learning.
- Knowledge of mathematical optimization techniques, including convex and non-convex optimization, integer programming, mixed-integer programming, constraint programming, and metaheuristics.
- Proficient in programming languages such as Python, C++, C#, Java, and Javascript, with experience developing and deploying machine learning models and algorithms.
- Experience with machine learning frameworks such as PyTorch, Scikit-Learn, and libraries such as NumPy, Pandas, and SciPy.
- Skilled in designing and implementing end-to-end machine learning pipelines, from data preprocessing and feature engineering to model training and evaluation, using state-of-the-art techniques and tools.
- Strong problem-solving skills and ability to analyze complex data and derive meaningful insights.

Additional Information

Dual Citizenship: Brazil and Italy.

Languages: Portuguese (native), English (fluent), Spanish (basic), and Italian (basic).

Programming Languages: Python, C++, Javascript, C#, and Java.

ML Libraries and Frameworks: PyTorch, Scikit-Learn, Numpy, SciPy, among others.

Additional Libraries: OpenMP, Boost (C++), Unity 3D (C#), p5js (JS), processing (Java).

Personal Projects

Adversarial Training for Anomaly Detection: Developed an adversarial training strategy using WGAN and SSIM loss to improve the performance of convolutional autoencoders for anomaly detection. Evaluated the model on benchmark and real-world datasets, achieving near-perfect F1-scores on most malware and 99% on attacks with only two packets as input. With five packets as input, the model can detect DDoS attacks with an F1-score of 91%.

Multivariate Time Series Jamming Detection: Developed a jamming detection system based on multivariate time series analysis using SepConv and GRU models, achieving over 99% accuracy. Implemented custom time series augmentations such as RandomCropResize, Time Warp, and Window Warp and deployed the model on a Raspberry Pi after quantization.

Olympic Games Event Recognition: Used state-of-the-art image models such as EfficientNetV2 to achieve 99% accuracy in recognizing Olympic Games events from images. Implemented well-known image augmentations, including MixUp, CutMix, Hybrids, AutoAugment, RandAugment, and TrivialAugment, and state-of-the-art training recipes.

Semi-supervised Anomaly Detection: Applied the Deep SVDD approach to a custom dataset generated using the p5js data generator for semi-supervised anomaly detection. Evaluated the resilience of the method to corruption resulting from mislabeling anomalies as normal and measured its performance as the number of correctly labeled anomalies increased.

Data Generator for Machine Learning: Created a p5js data generator that allows users to generate data by drawing with a mouse on a canvas. Several shortcuts can be used to define different data types, and the data is saved for use in machine learning applications.

Procedural Placement of Triangles: Implemented a procedural placement of transparent triangles to resemble a target painting and used gradient-free optimizers such as Differential Evolution and Parameter-exploring Policy Gradients with clipped updates to minimize the mean squared error between the drawing and target painting.

Visualization of Metaheuristic Behavior: Developed a p5js project for visualizing the behavior of single-solution metaheuristics on well-known functions such as the Cross-In-Tray Function and Ackley Function.