

# LUIZ MANELLA PEREIRA

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## EDUCATION

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### Florida International University - School of Computing and Information Sciences

Miami, FL

Major Advisor: Prof. M. Hadi Amini

*PhD in Computer Science*

#### Tentative Dissertation Title:

*Optimal Transport for Machine Learning: From Federated Learning to Infrastructure Resilience*

**Tentative Graduation:** May 2025

**GPA:** 4.0/4.0

### Florida International University

Miami, FL

*Bachelor of Business Administration in Finance* / *Bachelor of Science in Applied Mathematics*

**Completion:** May 2018 | Dec 2020

**GPA:** 3.87 / 4.0

## RESEARCH & FELLOWSHIPS

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### Publications:

- **Luiz Manella Pereira**, Luis Caicedo Torres, M. Hadi Amini, "Topological Data Analysis for Network Resilience Quantification," Springer Nature Operations Research Forum, Article 29, vol. 2, no. 2, pp.1-17, 2021.
- **Luiz Manella Pereira**, S.S. Iyengar, M. Hadi Amini, "On the Impact of the Embedding Process on Network Resilience Quantification," 2021 IEEE CPS - International Conference on Computational Science and Computational Intelligence
- Ahmed, Khandaker Mamun; Ghareh Mohammadi, Farid; Matus, Manuel; Shenavarmasouleh, Farzan; **Manella Pereira, Luiz**; Ioannis, Zisis; and Amini, M. Hadi "Towards Real-time House Detection in Aerial Imagery Using Faster Region-based Convolutional Neural Network ", IPSI Transactions on Internet Research, vol. 19(2), pp. 46-54, 2023. <https://doi.org/10.58245/ipsi.tir.2302.06>

### Preprint and Under Work:

- Luis Caicedo Torres, **Luiz Manella Pereira**, M. Hadi Amini, "A Survey on Optimal Transport for Machine Learning: Theory and Applications," arXiv, 2021
- **Luiz Manella Pereira**, M. Hadi Amini, "OT-Based Domain Alignment as a Preprocessing Step for Federated Learning"
- **Luiz Manella Pereira**, M. Hadi Amini, "Heterogeneous Federated Reinforcement Learning using Wasserstein Barycenters"

### Publication Awards:

- 2021 Operations Research Forum (ORFO) Best Paper Award - "Topological Data Analysis for Network Resilience Quantification"

### Solid lab

Miami, FL

*Ph.D. Fellow*

May 2020 – Present

- Led the construction of a survey paper on how optimal transport is being applied in machine learning and what theoretical breakthroughs will allow it to become mainstream and permeate real-life problems
- Contributed to the project that integrated artificial intelligence and machine learning for healthcare which was supported by the Florida Department of Health

### FIU - CAESCIR

Miami, FL

*Ph.D. Fellow*

May 2020 – August 2022

- Participated in research projects that leveraged advanced computing tool to study our nation's critical infrastructures

- Developed a novel method to quantify network resilience of abstract networks using topological data analysis, optimal transport, and algebraic topology

## EXPERIENCE

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**National Nuclear Security Administration - MSIIP | ORISE**  
*Machine Learning Research Intern - Savannah River National Lab*

**Miami, FL**  
*June 3rd 2024 – August 23<sup>rd</sup> 2024*

- Will be working on developing reinforcement learning algorithms for robotics problems
- Will develop robotics skills through hands-on work with servos, sensors, wireless communication, and Arduino programming

**Algo-nomics LLC**  
*Quantitative Researcher and Machine Learning Engineer*

**Miami, FL**  
*June 2018 – March 2024*

- Performed full-stack software engineering roles such as building full-scale finance software using HTML, CSS, JS, Python, Microsoft Azure, Stripe, and Auth0
- Performed quantitative research in the hybrid space of finance, mathematics, statistics, and machine learning
- Constructed and tested optimized portfolios using FML, mathematics/statistics, and portfolio theory
- Improved execution system speeds by ~75% to run mid-frequency strategies that trade in the 0.5-2 second time frame
- Programmed control systems for ultra-realistic simulation and backtesting environments which handle large combinations of algorithms and leverage tick data and level 2 data to embed microstructure models
- Implemented various deep learning pipelines (e.g., LSTM, Transformers) to build novel predictive tools for financial risk management
- Created and implemented a custom Retrieval Augmentation Generation pipeline with LLM for document Q&A with built-in filtration of hallucinated responses

**Man Numeric**  
*Quantitative Research Intern*

**Boston, MA**  
*May – August 2019*

- Performed quantitative analysis on alpha factors to improve energy sector models and sub-industry models
- Graphically displayed inherent problems to vendor factor data as a result of statistical data analysis using Python
- Researched, categorized, and back-tested ~400 factors as part of an in-sample/out-of-sample research study

## CERTIFICATES

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- NVIDIA –Fundamental of Deep Learning
- NVIDIA – Generative AI with Diffusion Models
- NVIDIA – Building Transformer-Based Natural Language Processing Applications
- NVIDIA – Building Conversational AI Applications
- NVIDIA – Data Parallelism: How to Train Deep Learning Models on Multiple GPUs
- NVIDIA – Model Parallelism: Building and Deploying Large Neural Networks
- FIU – International Bank Management
- Bloomberg – Bloomberg Market Concepts

## SKILLS, ACTIVITIES & INTERESTS

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- **Languages:** Fluent in Portuguese and proficient in Spanish
- **Computer:** Microsoft Word, Excel, PowerPoint, Excel VBA, Bloomberg
- **ML/AI:** Tensorflow, Keras, PyTorch, HuggingFace, langchain, Sk-learn
- **Programming:** Python, C++, SQL, MongoDB, Git, Numpy, Pandas, Jupyter Notebooks, RPi
- **Technologies:** CUDA, OpenMP, Azure Cloud and DevOps
- **Web Technologies:** Django, Flask, HTML, CSS, JavaScript, NodeJS, Electron, Express, Stripe, Auth0
- **Interests:** Mathematics, Engineering, Neuroscience, Robotics, Augmented Reality, Autonomous Systems
- **Accomplishment:** Retired World Class International Figure Skater for Brazil