Liana Valdes Rodriguez

Ph.D. Graduate
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Research Interests

Storage Systems, Distributed Systems, Caching Algorithms, ML for Systems, Systems for ML, Artificial Intelligence, Team Leadership and Operating Systems.

Education

Florida International University **Aug. 2017 - Dec. 2023**
Doctor of Philosophy in Computer Science *Miami, FL*
Advisor: Eminent Scholar Chaired Professor Raju Rangaswami GPA 3.83/4.0

Graduate Relevant Courses: Operating Systems, Analysis of Algorithms, Theory of Computation, Computer Communication and Networking Technologies, Introduction to Algorithms, Secure Application Programming, Principles of Database Management Systems, Machine Learning, Advanced Software Engineering, Data Visualization.

Florida International University **Aug. 2017 - Dec. 2022**
Master of Science in Computer Science *Miami, FL*
Advisor: Eminent Scholar Chaired Professor Raju Rangaswami GPA 3.83/4.0

Technological University of Havana "José Antonio Echeverría" (CUJAE) Sep. 2009 - Jul. 2014
Bachelor of Science in Telecommunications and Electronics Engineering *Havana, Cuba*
Faculty of Telecommunications Engineering GPA 4.48/5.0

Research Projects

Extensible Distributed Storage Systems | SyLab (FIU) & Seagate Technology **Aug. 2021**

- Designed and developed TxFuse, a novel architecture that extends distributed storage systems with storage features implemented as plugins.
- Designed transactional coupling and reliable notifications mechanisms using a message queue system and RESTful API to efficiently develop features that have reduce development complexity and are independently deployed as containerized applications and stateless microservices.
- Compared storage features such as Compression, Backup, Encryption, Semantic Enhancer and Logger with the counterparts in MinIO based on observed latency breakdown using Grafana and Prometheus.
- Evaluated different prototype storage plugins, built atop the MinIO distributed object store, based on system performance (latency and throughput) and development complexity (total lines of code (LOC) and MacCabe's cyclomatic complexity metric).
- Designed the storage-local mechanism to offload plugin functions and run them in the server-side execution context.

Distributed Caching for Cloud Data Centers | SyLab, ModLab, DAMRL (FIU) & HASLab **May 2020**

- Designed and developed CaaS, a novel, generic, shareable and distributed caching service for multiple storage system cloud interfaces.
- CaaS improved hit rate from 4% to 96% when compared with a local cache using write-through policy for CloudVPS storage traces. It also reduced read latency by 5% to 25% and write latency by 99%.
- Designed and developed a read/write protocol that creates transactions of writes distributed across the servers to ensure they are ordered correctly.
- Designed and developed a write-back protocol that writes data back to the back-end storage consistently.
- Designed novel QoS algorithms for latency and throughput reservation and optimization.

- Designed and developed a system simulation framework that models the CaaS system including models for clients, servers, one coordinator and the storage layer. Servers simulate the Raft consensus protocol.

ML Systems for Caching Algorithms | SyLab, ModLab, BioRG (FIU) & VISA (ASU) **Aug. 2018**

- Characterized and analyzed common production storage workloads across different sources and cloud service providers.
- Designed and developed ML algorithm LeCaR, a novel cache replacement algorithm that uses reinforcement learning to model the cache replacement problem and achieve outstanding performance when compared with the state-of-the-art caching algorithms.
- Designed and developed a general ML framework, CACHEUS, and its experts, SR-LRU and CR-LFU, that consistently perform best in 47% of cases and have no difference with the best in 40% of cases, while being worse that the compared cache replacement algorithms in only 13% of the cases with effect size of less than 0.31.
- The CACHEUS framework simplifies the LeCaR model by eliminating the discount rate and adapting the learning rate hyperparameters.

Publications & Presentations

Project Silica: Towards Sustainable Cloud Archival Storage in Glass | SOSP'23 **Oct. 2023**

Liana Valdes in Acknowledgement, The 29th ACM Symposium on Operating Systems Principles.

Infusing Pub-Sub Storage with Transactions | HotStorage'22 **Jul. 2022**

Liana V. Rodriguez, John Bent, Tim Shaffer, and Raju Rangaswami, The 14th ACM Workshop on Hot Topics in Storage and File Systems. Paper and Presentation.

CORTX and FDMI | CORTX Meet the Architect Series Presentation **Nov. 2022**

Liana V. Rodriguez, Seagate Technology.

Unifying the Data Center Caching Layer - Feasible? Profitable? | HotStorage'21 **Jul. 2021**

Liana V. Rodriguez, Alexis Gonzalez, Pratik Poudel, Raju Rangaswami and Jason Liu, The 13th ACM Workshop on Hot Topics in Storage and File Systems. Paper and Presentation.

Learning Cache Replacement with CACHEUS | FAST'21 **Feb. 2021**

Liana V. Rodriguez, Farzana Yusuf, Steven Lyons, Eysler Paz, Raju Rangaswami, and Jason Liu, Ming Zhao, Giri Narasimhan, The 19th USENIX Conference on File and Storage Technologies. Paper.

Learning Cache Replacement with CACHEUS | First Annual FIU SCIS Research Day **Oct. 2019**

Liana V. Rodriguez, Farzana Yusuf, Steven Lyons, Eysler Paz, Raju Rangaswami, Jason Liu, Ming Zhao, and Giri Narasimhan. Poster Presentation.

Driving Cache Replacement with ML-Based LeCaR | HotStorage'18 Paper **Jul. 2018**

Giusseppe Vietri, *Liana V. Rodriguez*, Wendy A. Martinez, Steven Lyons, Jason Liu, Raju Rangaswami, Ming Zhao, and Giri Narasimhan, the 10th USENIX Workshop on Hot Topics in Storage and File Systems. Poster Presentation.

Experience

Graduate Research Assistant/Teaching Assistant/GAANN Fellowship **Aug. 2017 - Dec. 2023**

SyLab, Florida International University (FIU) *Miami, FL*

- Analyzed real-world storage workloads to identify patterns that can be exploited by caching algorithms.
- Designed and developed ML systems for storage cache replacement, LeCaR and CACHEUS, that improve cache performance when compared with the state-of-the-art cache replacement algorithms.
- Designed and developed CaaS, a novel, distributed caching service that improves the hit rate and read and write latency performance of applications when compared to local caches using write-through policy.
- Designed and developed TxFuse, a novel architecture for developing storage features as plugins.
- Teaching Assistant for the undergraduate Operating Systems course in Fall 2018 and Spring 2019. My responsibilities included grading projects, conducting office hours and assisting students with the Nachos educational OS. I also worked on updating web design and resources for the online course.

Research Intern | CORTX Team **Aug. 2021 - Dec. 2021**

Seagate Technology *Remote, US*

- Worked on Seagate's object storage solution, CORTX, in testing integration and deployment of the software stack using Agile principles, CI/CD Jenkins and Github, and updating relevant documentation.

- Worked on the CORTX Extensible Interface, File Data Manipulation Interface (FDMI), which allows to implement plugins to develop storage features. (**C, Python, Distributed Consensus & Transactions**).
- Conducted a performance study of Motr Distributed Object Storage with advanced features and capabilities, deployed at the *Jülich Supercomputing Center (JSC)*. (**C, Go, fio, SelfNet**).

Research Intern | Project Silica Team **Jan. 2020 - Mar. 2020**
Microsoft Research (MSR) *Cambridgeshire, UK*

- Worked as part of the Silica Project helping in the development of the software stack for a storage system using cutting-edge quartz glass technology.
- Designed and developed ML systems using DL and Unsupervised Learning that can identify anomalies in image data as part of the software pipeline that works to improve data recovery and error analysis in the system. (**Python, PyTorch, Scikit-learn, Isolation Forest, Encoders**).
- Tested the ML model using real image data from the Warner Bros movie "Superman", written on glass. These ML models aim to identify unsual patterns for fine-grained and coarse-grained errors within a sector (XY plane).

Telematics Specialist B | Operations Team **Oct. 2014 - Jun. 2015**
Cuban Telecommunications Company S.A. (ETECSA) *Havana, Cuba*

- Mantained uninterrupted and efficient communication services and monitoring the core infrastructure of public and private PSTN, ATM, DSL and VoIP telephone systems.
- Monitored the security of the telephone systems to prevent unauthorized access and data breaches.
- Conducted network assessments to ensure the continuous deployment of EPON/GPON fiber-to-home network.
- Helped assess and enhance the PSTN network infrastructure to meet the community's needs.

Research Intern/Apprenticeship | RadioElectronics Team **Mar. 2012 - Jul. 2014**
Cuban Radio and Television Broadcasting Company (RadioCuba) *Havana, Cuba*

- Modify UHF/VHF communication modules from PAL to NTSC television standards changing the board layout to improve frequency signal.
- Helped to design RF matching networks for maximum power transfer to 50-ohm load or antenna.(**MATLAB, Signal Processing, E-field Sensors, Spectrum/Network Analysers**).
- Simulated results using MATLAB to visualize the RF signal's properties such as frequency, amplitude and phase.

Honors & Awards

USENIX Student Travel Award FAST'19 & FAST'18 & FAST'23.
CMD-IT/ACM Richard Tapia Celebration of Diversity in Computing Conference Scholarship 2022 & 2024.
Grace Hooper Celebration of Women in Computing FIU Scholarship GHC'19 & GHC'22.
GAANN Fellowship from U.S. Department of Education 2022 & 2023.
USENIX SREcon24 Europe/Middle East/Africa Conference Award 2024.

Teaching

Operating Systems **Aug. 2018 & Jan. 2019**
Florida International University *Miami, FL*

Transmission Systems **2011 - 2012**
Technological University of Havana "José Antonio Echeverría", CUJAE *Havana, Cuba*

Analog Electronics **2010 - 2011**
Technological University of Havana "José Antonio Echeverría", CUJAE *Havana, Cuba*

Societies & Activities

Selected to plan and organize Seagate Global Hackathon. **2021**
Reviewer for the ACM Transactions on Storage (TOS) Journal. **2021 & 2025**
UPsilon Pi Epsilon, UPE and Women in Computer Science, WiCS member. **2019**
Selected as a volunteer for an eight-month teaching program for Google's CS First **2019**

Programming Skills

Technical skills: Cache Replacement Algorithms, Storage Systems, Distributed Systems, Distributed Caching, Machine Learning, Artificial Intelligence, QoS algorithms.
Languages: Python, C#, C/C++, JavaScript, HTML, MySQL, Go, R, R++, Shell, MATLAB, LabVIEW, LaTeX, Visual Basic, High-Level Assembly (HLA).
Developer Tools/Frameworks: Git, GitLab, Docker, VirtualBox, VMWare Workstation, VS Code, Tableu, PyTorch, TensorFlow, Scikit-learn, Microsoft Excel, Microsoft PowerPoint, Gemini CLI, GPT 4.1 client API, LangChain LLM API.

Certifications

CompTIA A+ 220-801 Certification Exam, 2017.
CompTIA A+ 220-802 Certification Exam, 2017.

Languages

Spanish: Fluent.
English: Full Professional Proficiency.