Liana Valdes Rodriguez

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Research Interests

Storage, Distributed Systems, Caching Algorithms, ML for Systems, Systems for ML and Operating Systems.

Education

Florida International University **21 August 2017 - 17 December 2022**
Master of Science in Computer Science *Miami, FL*
Advisor: Eminent Scholar Chaired Prof. Raju Rangaswami GPA: 3.83/4.0

Florida International University **21 August 2017 - 16 December 2023**
Doctor of Philosophy in Computer Science *Miami, FL*
Advisor: Eminent Scholar Chaired Prof. 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 DBMS, Machine Learning, Advanced Software Engineering, Data Visualization.*

Technological University of Havana **1 September 2009 - 26 December 2014**
Bachelor of Science in Electronic and Telecommunications Engineering *Havana, Cuba*
Faculty of Telecommunications Engineering (FIT) GPA: 4.48/5

Undergraduate Relevant Courses: *Linear Algebra and Analytical Geometry, Mathematics I, Mathematics II, Molecular Physics and Mechanics, Computerized and Automated Office Systems, Programming I, Chemistry, Electric Circuits I, Electric Circuits II, Electromagnetism and Optics, Analog Electronics I, Communication Statistics, Probability and Statistics, Advanced Programming, Programming II, Differential Equations and Series. Electrical Circuits III, Digital Electronics I, Digital Electronics II, Analog Electronics I, Analog Electronics II, Principles of Communications I, Principles of Communications II, Virtual Instrumentation, Transmission Lines, Numerical Methods, Microprocessors I, Digital Signal Processing, Field Theory.*

Publications

Infusing Pub-Sub Storage with Transactions **July 2022**
Liana V. Rodriguez, John Bent, Tim Shaffer, and Raju Rangaswami, 14th ACM Workshop, HotStorage'22.

Unifying the Data Center Caching Layer - Feasible? Profitable? **July 2021**
Liana V. Rodriguez, Alexis Gonzalez, Pratik Poudel, Raju Rangaswami and Jason Liu, 13th ACM Workshop, HotStorage'21.

Learning Cache Replacement with Cacheus **February 2021**
Liana V. Rodriguez, Farzana Yusuf, Steven Lyons, Eysler Paz, Raju Rangaswami, Jason Liu, Ming Zhao, Giri Narasimhan, 19th USENIX Conference, FAST'21.

Driving Cache Replacement with ML-Based LeCaR **July 2018**
Giusseppe Vietri, *Liana V. Rodriguez*, Wendy A. Martinez, Steven Lyons, Jason Liu, Raju Rangaswami, Ming Zhao, and Giri Narasimhan, USENIX Workshop, HotStorage'18.

Presentations

CORTX and FDMI | CORTX Meet the Architect Series **November 2022**
Liana V. Rodriguez, John B.

Learning Cache Replacement with Cacheus | Poster First Annual FIU SCIS Research Day October 2019
Liana V. Rodriguez, Farzana Y., Steven L., Eysler P., Raju R., Jason L., Ming Z., Giri N.

Driving Cache Replacement with ML-Based LeCaR | HotStorage'18 Poster session **July 2018**
Giusseppe V., *Liana V. Rodriguez*, Wendy A. Martinez, Steven L., Jason L., Raju R., Ming Z., Giri N.

Research Projects

Caching Algorithms for Storage Caches | SyLab **August 2017**

- Characterize production storage workloads from different cloud service providers.
- Design and develop new cache replacement algorithms to improve the hit rate performance of caches that store data for cloud application workloads. We developed multiple algorithms, in particular, two algorithms: LeCaR and CACHEUS outperform classical cache replacement algorithms. CACHEUS is inspired by LeCaR but overcomes an important flaw by being completely adaptive, with the elimination of all statically chosen hyperparameters, thus guaranteeing high flexibility.
- Identify cache-relevant characteristics that are reported by workload primitive types. We identify four primitive types of workload: LRU-friendly, LFU-friendly, scan, and churn. Workload primitive types vary between workloads, within a single workload over time, and as cache size changes.

Distributed Caching in Data Centers | SyLab **May 2020**

- Design and develop Caching-as-a-Service (CaaS), a distributed and generalized caching service that addresses the requirements of different types of cloud storage production workloads. First and foremost, CaaS is designed as a general cache utility for a variety of store types, including block storage, object storage, file systems, and key-value stores. CaaS integrates into the storage I/O path and is entirely transparent to applications.
- Design and develop CaaS as a writable cache. To achieve durability and fault tolerance, CaaS stores data in a set of nodes, each implemented as a fault-tolerant cluster managed by Raft, a distributed consensus protocol.
- Improve cache read and write latency and performance relative to back-end storage. CaaS performs write-back calls eagerly to improve performance. It also proactively schedules asynchronous eviction calls to deliver faster cache access time to the application and increase available cache space which is then used to cache new writes.
- Implement a simulation framework to simulate the different components of a consistent and writable caching system. The CaaS simulator is a full system simulator that implements the operation of multiple types of components, including clients, servers, the coordinator, and network communication between them.

Extensible Distributed Storage Systems | Seagate Inc. & SyLab **August 2021**

- Design a novel architecture to develop different storage features as plugins that improve the distributed storage system. TxFuse enables the development and deployment of features independently of the storage system.
- Define a taxonomy of plugins that uses transactional coupling and a reliable notification mechanism. We identify three classes of plugins, class A, class B, and class C, which differ in how they interact with the storage system. Plugins execute code in response to client-initiated operations on the storage system.
- Evaluate different plugin prototypes based on performance and development complexity. We count lines of code (LOC) and calculate cyclomatic complexity (CC) per feature in plugins and native features in MinIO.

Experience

Graduate Research Assistant | SyLab, Florida, US **August 2017 - April 2023**

Florida International University

Research Intern | Microsoft Research, Cambridge, UK **January 2020 - March 2020**

- I worked in Microsoft's Silica Project as part of the optics for the cloud initiative that develop a storage stack for glass-based storage.
- Develop machine learning techniques in the software pipeline that works to improve data recovery and error analysis in the system. (**Python, PyTorch, Scikit-learn, Isolation Forest, Encoders**)

Research Intern | Seagate Inc., California, US **August 2021 - December 2021**

- Seagate's object storage solution, CORTX testing integration and deployment of the software stack.
- CORTX Storage Extensible Interface research. (**C, Python, Distributed Consensus & Transactions**)
- Performance study of Motr Object Storage deployed at the *Jülich Supercomputing Center*. (**C, Go, fio, SelfNet**)

Awards

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

Technical Skills

Languages: Python 3.5, C#, C/C++, LaTex, R, Matlab, LabVIEW
Tools: GitLab, Codespace VsCode, Tableau