

# Liana Valdes

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## RESEARCH & PROFESSIONAL INTERESTS

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Storage, Distributed Systems, Caching Algorithms, ML for Systems, Systems for ML, OS, Team Leadership, Innovation, Motivation, Empathy, Technology, Networking, Creativity, and Relationship Building.

## EDUCATION

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<b>Florida International University</b>	<b>21 August 2017 - 16 December 2023</b>
<i>Doctor of Philosophy in Computer Science (CS)</i>	Miami, FL
<i>Advisor: Eminent Scholar Chaired Professor Raju Rangaswami.</i>	GPA: 3.83/4.0

*Graduate Relevant Courses:* Operating Systems (COP-5614), Analysis of Algorithms (COT-6405), Theory of Computation (COT-5310), Computer Communication and Networking Technologies (TCN-5030), Introduction to Algorithms (COT-5407), Secure Application Programming (CEN-5079), Data Base Management Systems (COP-5725), Introduction to Machine Learning (CAP-5610), Advanced Software Engineering (CEN-5010), Data Visualization (CAP-5738).

<b>Florida International University</b>	<b>21 August 2017 - 17 December 2022</b>
<i>Master of Science in Computer Science (CS)</i>	Miami, FL
<i>Advisor: Eminent Scholar Chaired Professor Raju Rangaswami.</i>	

<b>Technological University of Havana “José Antonio Echeverría” (CUJAE)</b>	<b>1 September 2009 - 28 July 2014</b>
<i>Bachelor of Science in Electronics and Telecommunications Engineering</i>	Havana, Cuba
<i>Faculty of Telecommunications Engineering (FIT).</i>	GPA: 4.48/5

*Undergraduate Relevant Courses:* Linear Algebra and Analytical Geometry, Drafting, Political Economics of Capitalism, Philosophy and Society, Mathematics I, Mathematics II, Molecular Physics and Mechanics, Computerized and Automated Office Systems (Elective), Programming I, Introduction to Engineering Project, Chemistry, Electric Circuits I, Electric Circuits II, Electromagnetism and Optics, Analog Electronics I, Communication Statistics, Quantum Physics, Materials and Components, Probability and Statistics, Advanced Programming (Elective), Programming II, Differential Equations and Series, Sociopolitical Theory, Electrical Circuits III, Digital Electronics I, Digital Electronics II, Analog Electronics II, Analog Electronics III, Principles of Communications I, Principles of Communications II, Virtual Instrumentation (Elective), Transmission Lines, Research Methodology, Numerical Methods, Microprocessors I, Social Issues in Science and Technology, Digital Signal Processing, Field Theory, Antennas, Optical Communications, Telephone Communication, Accounting and Finance, Principal of Communications III, Network Management (Elective), Microprocessors II, Radio Electronics I, Radio Electronics II, Radio Propagation, Networks 1, Networks 2, Network Simulators (Elective), Transmission System, Microprocessor Systems, Business Administration, Satellite Communications (Elective), Principles of Television, Network 3, and IP Telephone (Elective).

## RESEARCH PROJECTS

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<b>Extending storage systems   Seagate Technology &amp; SyLab (FIU)</b>	<b>August 2021</b>
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- Designed TxFuse, a novel architecture that uses feature plugins to enhance storage systems.
- Designed the transactional coupling and reliable notification techniques to develop plugins and create a storage feature plugin taxonomy.
- Evaluated feature plugin prototypes based on system performance and development complexity.

- A distributed caching for data centers | SyLab, ModLab, DAMRL (FIU) & HASLab (UMinho)** **May 2020**
- Designed CaaS, a novel, distributed, and generalized caching for computing infrastructures in data centers.
  - Improved hit rate and the service's and microservice's reading and writing performance with cache replacement.
  - Designed a simulation framework to model a CaaS system with different components.
- ML systems for optimality analysis of cache replacement | SyLab, ModLab, & BioRG (FIU)** **August 2019**
- Designed ML systems to be close to the optimal performance of cache replacement.
  - Analyzed the optimality of cache replacement for systems.
- ML systems for storage caches | SyLab, ModLab, BioRG (FIU) & VISA (ASU)** **August 2018**
- Analyzed production workloads from different cloud service providers.
  - Designed ML systems LeCaR and CACHEUS that achieve higher hit rates than classic cache replacement algorithms for production workloads.
  - Reduced the cost of accessing SSD-based caches by reducing the number of writes we performed on the devices.

## PUBLICATIONS

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- Project Silica: Towards Sustainable Cloud Archival Storage in Glass.** **October 2023**  
*Liana Valdes, in Acknowledgement, The 29th ACM Symposium on Operating Systems Principles, SOSP'23.*
- 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, and Giri Narasimhan, 19th USENIX Conference, FAST'21.*
- Driving Cache Replacement with ML-Based LeCaR** **July 2018**  
*Giuseppe Vietri, Liana V. Rodriguez, Wendy A. Martinez, Steven Lyons, Jason Liu, Raju Rangaswami, Ming Zhao, and Giri Narasimhan, USENIX Workshop, HotStorage'18.*

## PRESENTATIONS

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- CORTX and FDMI | CORTX Meet the Architect Series** **November 2022**  
*Liana V. Rodriguez and John Bent.*
- Infusing Pub-Sub Storage with Transactions | HotStorage'22 Presentation** **July 2022**  
*Liana V. Rodriguez, John Bent, Tim Shaffer, and Raju Rangaswami.*
- Unifying the Data Center Caching Layer - Feasible? Profitable? | HotStorage'21 Presentation** **July 2021**  
*Liana V. Rodriguez, Alexis Gonzalez, Pratik Paudel, Raju Rangaswami and Jason Liu.*
- Learning Cache Replacement with CACHEUS | Poster Annual FIU SCIS Research Day** **October 2019**  
*Liana V. Rodriguez, Farzana Yusuf, Steven Lyons, Eysler Paz, Raju Rangaswami, Jason Liu, Ming Zhao, and Giri Narasimhan.*
- ANX: Caching with Anxiety | Poster Annual FIU SCIS Research Day** **October 2019**  
*Steven Lyons, Liana V. Rodriguez, and Raju Rangaswami.*
- Driving Cache Replacement with ML-Based LeCaR | HotStorage'18 Poster session** **July 2018**  
*Giuseppe Vietri, Liana V. Rodriguez, Wendy A. Martinez, Steven Lyons, Jason Liu, Raju Rangaswami, Ming Zhao, and Giri Narasimhan.*

## EXPERIENCE

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### **Team Leader | Florida International University, FL, US**

**August 2018 - December 2023**

- Helped communicate the teams' goals, develop and implement plans and strategies, and delegate responsibilities to team members. I also worked when roadblocks inevitably emerged while resolving a project problem, analyzing problems objectively, brainstorming solutions, evaluating alternatives, and implementing the optimal approach.
- Monitored the team's performance, measuring their output, reviewing progress against set targets, and providing feedback where necessary. I identified the inefficiencies and areas that required improvement by coaching team members and evaluating how the team completed tasks and achieved their goals.
- As a team leader, I helped motivate team members and worked to keep them engaged whenever I noticed a decline in their enthusiasm so that the team's productivity grew.

### **Graduate Research Assistant / GAANN Fellowship | FIU, FL, US**

**August 2017 - December 2023**

- Analyzed production storage workloads and discovered workload patterns called workload primitives. As a result, I studied how these workloads function in the real world using a classification based on the composition of primitive workload types. I computed metrics to characterize the production storage workloads. For a one-week trace from MSR, Cambridge, 3.29% of the requests were write operations, and the unique and reuse footprints were 89.24% and 2.22%, respectively. My research dives into the intricacies of the data and examines the effects of different factors, providing valuable insights. This approach has improved cache performance in novel cache replacement algorithms capable of adapting to the data and tailored solutions to meet workload needs.
- Furthermore, we designed ML systems for cache replacement, LeCaR, and CACHEUS, which enhance storage caching performance. When evaluating a sample trace from MSR, Cambridge, LeCaR, and CACHEUS algorithms outperform state-of-the-art caches, including LRU and ARC, with hit-rate values of 93.61% and 94.38%, respectively.
- Designed CaaS, a distributed caching service that improves hit-rate and service's and microservice's reading and writing performance. CaaS outperforms an SSD-based local cache commonly deployed in the data centers. The hit rate of CaaS is 96% for a one-day trace from Cloud VPS provider, outperforming the local cache hit rate of 4%. In these systems, ensuring data consistency, scalability, high availability, disaster recovery, and fault tolerance are addressed to guarantee optimal performance and reliability.

### **Research Intern | Seagate Technology, Remote, US**

**August 2021 - December 2021**

- Seagate, a leading data storage company, developed CORTX, an open-source object storage solution. The solution facilitates storing and managing massive amounts of unstructured data, such as media files, logs, and backups. CORTX has an integrated software stack comprising several components. I worked on conducting testing to ensure seamless integration and deployment of this software stack. This includes deploying cortx-motr, cortx-hare, cortx-ha, and cortx-s3server.
- Tested the CORTX's software stack and the File Data Manipulation Interface (FDMI). The latter uses plugins to implement storage features. I developed plugins such as a word count program that counts the number of times a word appears in each S3 PUT request to the storage. This plugin is equivalent to a program that polls a directory every 3 seconds and prints the 30 most popular words within each file. The research contributed to developing more robust and cutting-edge storage that can meet the ever-evolving needs of the modern world.
- Conducted a performance study on Motr, a distributed object storage system with advanced features and capabilities deployed at the Jülich Supercomputing Center (JSC) in Germany. The study aimed to analyze the system's performance and evaluate its efficiency. We reported the maximum achievable network and device bandwidth in a Sage platform x86 Motr cluster with sixteen clients and seven server nodes; each server had three tiers (tier-1, tier-2, and tier-3) that have NVMe, SSD, and HDD storage devices, respectively. The results showed 99% and 86% bandwidth utilization for read and write operations in tier-2 compared to the theoretical system limit.

### **Research Intern | Microsoft Research (MSR), Cambridgeshire, UK**

**January 2020 - March 2020**

- As part of Microsoft's Project Silica team, I helped to develop the software stack for a storage system using cutting-edge quartz glass technology. This innovative technology is specifically designed to cater to the requirements of Azure Cloud archival workloads, enabling efficient and cost-effective storage. Unlike traditional storage systems, Project Silica's approach involves storing vast amounts of cold data, creating tiny 'voxels' into quartz glass.

- Designed ML systems that can identify anomalies when tested using real data from the Warner Bros. movie “Superman” written on glass. These systems included isolation forests and encoders as anomaly detection algorithms. These algorithms can help identify unusual patterns in the data, particularly fine-grained errors within one sector (XY plane) and coarse-grained errors within one track (Z direction).

#### **Telematics Specialist B | Telecommunications Company (ETECSA)**

**September 2015 - June 2016**

- Maintained uninterrupted and efficient communication services, crucial for monitoring the core infrastructure of PSTN, ATM, DSL, and public and private VoIP telephone systems. This involves closely observing the hardware, software, and network elements that comprise these systems’ backbone. Any potential issues were detected and resolved promptly by continuously monitoring performance metrics such as speed, latency, uptime, and number of lines interrupted.
- It was also essential to monitor the security of these systems to prevent unauthorized access and data breaches. With a focus on proactive monitoring and maintenance, these critical communication systems were highly reliable and available, ensuring seamless communication for businesses and individuals.
- Conducted a network assessment to ensure the continuous deployment of the fiber-to-the-home (FTTH) networks in Old Havana. This assessment helped to identify the best action to deploy the Optical Transport Network (OTN) devices.
- By utilizing Gigabit Passive Optical Networking (GPON) and Ethernet Passive Optical Networking (EPON) variations of Passive Optical Networking (PON) technology, I helped establish and enhance network infrastructure that meets the community's needs.

#### **Research Intern/Apprenticeship | Radiocommunications Company (RadioCuba)**

**March 2012 - July 2014**

- Designed the board layout to modify the Ultra High Frequency (UHF) and Very High Frequency (VHF) communication modules from the Phase Alternate Line (PAL) to the National Television Standard Committee (NTSC) television standards. This modification improved the frequency of the television signal, resulting in a much more precise and higher-quality picture.
- Designed radiofrequency (RF) matching networks that use passive components to achieve maximum power transfer to a 50-ohm or a real-world load, such as a television (TV) antenna. This involves analyzing the properties of the RF signal and determining the best arrangement of passive components to match the load’s impedance.
- Simulated results were obtained with MATLAB, and virtual instrumentation of E-field sensors and spectrum/network analyzers was used. The simulations allowed us to visualize the RF signal’s properties, including frequency, amplitude, and phase.

#### **HONORS & AWARDS**

USENIX Student Travel Award, FAST’18 & FAST’19 & FAST’23.

**September 2018, 2019, and 2023**

GAANN Fellowship from the U.S. Department of Education (ED).

**January 2022 & January 2023**

CMD-IT/ACM Richard Tapia Celebration of Diversity in Computing Conference Scholarship.

**September 2022**

Grace Hooper Celebration of Women in Computing FIU Scholarship.

**October 2019 & September 2022**

#### **LEADERSHIP & ACTIVITIES**

- Selected to plan and organize an event for Seagate’s global CORTX Hackathon, focusing on integration challenges, possible solutions, and open-source software.
- Selected as a participant and anonymous reviewer nationwide for a peer-reviewed journal article for the ACM Transactions on Storage (TOS), the premier journal for publishing advancements in data storage research.
- Selected as a presenter for an annual Women in Computer Science (WiCS) meeting, focusing on sharing experiences and strategies for achieving academic success in computer science.
- Participated in Upsilon Pi Epsilon (UPE) activities, including workshops, presentations, tutorials, and leadership events to develop leadership skills, build industry connections, and achieve academic success.

- Selected as a volunteer for an eight-month teaching program for the Google CS First program, focusing on coding skills and learning computer science concepts using the programming language called Scratch for kids under eight.
- Selected as the team leader for four research projects at SyLab at Florida International University (FIU).

## TEACHING ASSISTANT

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### Operating Systems

Florida International University (FIU)

**August 2018 & January 2019**

Miami, FL

### Transmission Systems II

Technological University of Havana “José Antonio Echeverría” (CUJAE)

**2011 - 2012**

Havana, Cuba

### Analog Electronics I

Technological University of Havana “José Antonio Echeverría” (CUJAE)

**2010 - 2011**

Havana, Cuba

## TECHNICAL SKILLS

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**Languages:** Python, C#, C, C++, Java, Go, R, R++, TeX, Visual Basic, High-Level Assembly (HLA).

**Tools/Frameworks:** Git, GitLab, Docker, Kubernetes, VirtualBox, VMware Workstation, VsCode, Tableau, MATLAB, LabVIEW, LaTeX, Pytorch, TensorFlow, Scikit-learn.

## CERTIFICATIONS

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CompTIA A+ 220-801 Certification Exam.

CompTIA A+ 220-802 Certification Exam.

## LANGUAGE

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**Spanish:** Fluent.

**English:** Fluent and Full Professional Proficiency.

## HOBBIES

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**Music:** Traditional Cuban Music, Country Music, Pop Music, Blues, and Jazz.

**Poetry:** Cuban Poetry, Latino-American Poetry, Spanish Poetry, American Poetry.

**Chess:** Tournaments and Matches, and Titles and Rankings.

**Fitness:** Physical Fitness, Exercise, Training, Walking.

**Animation:** Computer Animation, Disney Animation, Japanese Animation.

## LEADERSHIP SKILLS

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Relationship Building, Emotional Intelligence, Forward-thinking, Problem-solving, Empowerment, Adaptability, Motivation, Innovation, Inspiration, Active Listening, Empathy, Presentation, Authenticity, Honesty, Creativity, Integrity, Decision-making, Accountability, Strategic Thinking, Communication, Coaching, and Management.