

ALEJANDRO E. GONZALEZ-ARAYA

Curriculum Vitae

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Software engineer with five years of experience in Cloud Computing Infrastructure and Hypervisors, three years experience with Container Engines and Orchestration technologies. Focused on performance characterization, resource provisioning and scaling. With eight years of professional experience with Java and more than ten years of experience with Linux as well as experience in Internet-of-things, Edge Computing and Big Data; I strive to improve performance and system efficiency.

PROFESSIONAL EXPERIENCE

Research Assistant – University of Puerto Rico – Mayaguez, PR **Seasonal, Aug 2017 – May 2021**

- Cloud Computing: Improving Virtualized Data Center Resource Efficiency Using Dynamic Container Placement Strategies.
 - Designed and developed a container orchestration platform for cloud and edge environments that uses container live migration to improve performance of running CPU-intensive workloads by up to 15%.
 - Developed an optimized container live migration toolset that can quickly migrate network-bound containers with filesystem support as well as a resource monitoring tool that supports live-migrating containers.
 - Developed a methodology to process system and container resource information to design a machine learning model for container resource provision and forecasting.
 - Developed infrastructure automation scripts to deploy, customize and manage the experimental setup on a cloud computing cluster for OpenStack to support Deep Learning and Cloud Computing research.
- Edge Computing: Resource provisioning for mobile ARM64 devices using container live migration.
 - Linux kernel configuration, building and setup to enable container live migration on edge and mobile ARM64 devices.
- Software Defined Networks: Cloud computing infrastructure design and development to test software defined networks.
 - Bare-metal cluster deployment, installation and configuration of VMware ESXi and VMware-NSX-T.
 - Designed the network topology, performed packet tracking, network troubleshooting and performance analysis.
- Cloud Computing Using Embedded Devices: Performance analysis of virtualization techniques on ARM devices.

Intern, Digital Combat Systems – Department of Navy (NAVSEA) – Dahlgren, VA **Internship, May 2019 – Aug 2019**

- Designed and developed automation software for the deployment of realtime performance monitoring tools for distributed virtualized tactical systems.
- Developed technical documentation for the installation and configuration of the developed software as well as provided training to the Virtual Test Environment (VTE) Lab team on how to operate said software.

Business Analyst – Excellere Consulting Associates Inc. – San Juan, PR **Contract, Aug 2018 – Dec 2018**

- Gather project requirements, identify risks, handle organizational dependencies and project development workflow for Claro PR.

Software Developer Analyst – Netwave Equipment Corp. – San Juan, PR **Full Time, Feb 2017 – Jul 2017**

- Gathered project requirements and designed application modules and databases. (MSSQL, ASP.NET, Oracle DB)
- Analyzed and improved the performance of existing database queries and stored procedures.

Software Developer – Nustream Communications Inc. – San Juan, PR **Internship & Contract, 2013, 2014, 2016**

- Systems Development – Health Insurance Administration (3/2016 – 8/2016)
 - Development of new modules to support new health insurance regulations (Java, Bash)
 - Database development and system automation for new modules (Java, MySQL, Linux)
 - Data structures and algorithms performance analysis and optimization (Java)
- Systems Support and Development – Health Insurance Administration (1/2014 – 3/2014)
 - Development of automatic report generator software and support (Java, Jasper server)
 - Database and system setup/support. (MySQL server, Linux Server)
 - Troubleshooting analysis.
- Systems Development – Health Insurance Administration (8/2013 – 12/2013)
 - Software analysis for system migration and new system workflow.
 - Development of system automation software with email notifications (Java, Bash, MySQL, POP/IMAP)
 - Application filesystem migration and development. (Java, Bash, Linux)
- Internship, Systems Development – Health Insurance Administration (6/2013 – 8/2013)
 - Internship developing the Health Insurance Administration Systems (ASES)
 - Software analysis for system migration and new system workflow.
 - Application scripting design and development and system software development. (Java, Bash)

System Administrator – Zelig Inc. **Seasonal, 2012 – 2015**

- Deployment and administration of Linux Hosting server for e-commerce store. (CentOS Linux Server)
- Administration of user accounts and email services. (POP/IMAP, MySQL)
- Development of e-commerce store (PHP, CSS, HTML, MySQL, WordPress)

PUBLICATIONS & POSTERS

A. Gonzalez, E. Arzuaga, “HerdMonitor: Monitoring Live Migrating Containers in Cloud Environments” 2020 IEEE International Conference on Big Data (Big Data), 2020

A. Gonzalez, E. Arzuaga, “Container Resource Provisioning in Cloud Environments Using Machine Learning and Live Migration” Poster presented at: NU SHARE 2019 Conference, Northeastern University, Boston Massachusetts, March 21, 2019

EDUCATION

MS in Computer Engineering – University of Puerto Rico, Mayaguez **Aug 2017 – Jun 2021**

- **Master Thesis:** *Distributed Resource Provisioning for Containers Using Machine Learning and Live Migration*
- **Relevant Courses:** High Performance Computing, Machine Learning, Human Computer Interaction, Deep Learning, Artificial Intelligence, Big Data, Data Science and Mining.

BS in Computer Engineering – University of Puerto Rico, Mayaguez **Aug 2013 – Jan 2017**

- **Capstone:** *Internet-of-things Pet Habitat monitoring and control system.*
- **Relevant Courses:** Cloud Computing Infrastructure, Database Systems, Software Security, Microprocessor Interfacing, Engineering Research, Network Routing Fundamentals.

BS in Computer Engineering – University of Puerto Rico, Bayamon **Aug 2010 – Jul 2013**

- Articulated Transfer Program, College of Engineering Mayagüez

High School Diploma – Colegio San Jose, San Juan **Aug 2004 – May 2010**

- Outstanding Accomplishment Award on Computer Science AP (2009)

PROJECTS

- **Herd:** Container orchestration platform for resource provision of Cloud and Edge environments. (2018-2021)
 - **Herd Compute:** Container Live Migration Engine
 - Employs an optimized and parallelized container live migration sequence that supports network connected containers and container file system transfer with minimal downtime. (Java, CRIU, Docker/Podman, MQTT, Linux)
 - **Herd Monitor:** Compute Infrastructure Resource Monitor
 - Customizable and lightweight multithreaded software that monitors the performance of live-migrating containers and scales to support hundreds of containers (see publications). (Java, PCP, MQTT)
 - **Herd Control:** Compute Infrastructure Resource Provisioning Engine
 - Employs container live migration and placement policies that improve, in real-time, the performance of running CPU-intensive workloads by up to 15% and database-intensive workloads by up to 45%. (Java, MQTT, XGBoost, TPC-C)
- **Siph-io:** Cloud-based minimalist News Feed with auto generated content (2016)
 - Design, development, and implementation of a scalable SaaS cloud model (JavaEE, REST, MySQL, AngularJS).
 - Design and deployment of cloud infrastructure (OpenStack, VMware, Linux).
 - Performance analysis, load balancing, scalability, optimization and benchmarking.
- **DynoCloud:** Internet-of-things Pet Habitat monitoring and control system. (2016)
 - Design, develop, and implementation and Internet-of-Things (IoT) system to monitor and control pet habitat enclosures (JavaEE, REST, MySQL, MQTT, Linux).
 - First Chance at Commercialization Award - Texas Instruments Innovation Challenge 2016.
- **EPM:** Internet-of-things Electronic Parking Meter (2015)
 - Design and development of an embedded (TI CC3200) IoT automated parking payment system for a local startup.
 - Project won First Place Award (Technology) at Justas Empresariales Universitarias (2015).
 - Project won Second Place Award at UPRM OpenCapstone 2015.

LEADERSHIP EXPERIENCE

- **Teaching Assistant** – University of Puerto Rico, Mayaguez: Aug 2017 – Dec 2019
 - Operating Systems course (4 terms): Lectured and developed new laboratory assignments on Concurrency, Synchronization, Kernel Scheduling, Kernel Memory Management, Linux Kernel Modules and Drivers.
 - Advanced Programming course (1 term)
- **Research Lead** – University of Puerto Rico, Mayaguez: Jun 2019 – July 2019
 - Lead a group of undergraduate research students on software defined networks and cloud computing infrastructure.
- **Project Manager** – Capstone: Software team and lead programmer for Internet-of-things software systems. (DynoCloud)
- **Technology Lead** – EnterPRize, Justas Empresariales Universitarias, I-Corps Puerto Rico – PR, Jan 2015 – May 2016
 - Research for a scalable and profitable business startup (EMP)

WORKSHOPS

Cyber Security Workshop – University of Puerto Rico, Mayaguez **May 12, 2015**

- Lecturer at “*To Be or Not to Be Hack. That’s the Question!*” workshop
 - DNS, ARP, DNS Poisoning Demo

OTHER TECHNOLOGICAL INTERESTS

Amateur Radio Operator – General Class License: WP4PKD **May 2015**

- Acquainted with digital data radio transition modes, Software Defined Radio (SDR) and shortwave radio listening.
- Communication Theory course in UPR Mayaguez (fall 2015)

SKILLS

Expertise: Java/JavaEE · Python · C Embedded Programming · Bash Scripting · RHEL/Debian Linux · Docker, Compose, Podman.
Frameworks and tools: JAX-RS · Jackson · Jupyter · XGBoost · Pandas · NodeJS · Git · JDB · Valgrind · MQTT · NoSQL · Go.