

# Alex Fuerst

(440) - 669 - 5865

fuersta.2013@gmail.com | linkedin.com/in/alex-fuerst | github.com/aFuerst

## OBJECTIVE

---

Tackling the inefficiencies of systems computing at any scale, and looking to enable new computing opportunities with systems. The tech stack at all levels, from Virtualization and OS, to Distributed Systems, are prime for accelerating clouding computing.

## EDUCATION

---

<b>Computer Engineering, PhD</b> <i>Indiana University, Intelligent Systems Engineering</i>	Expected May 2024 Major GPA 3.9
<b>Computer Engineering, MS</b> <i>Indiana University, Intelligent Systems Engineering</i>	Dec 2023 Major GPA 3.9
<b>Computer Science, Bachelor of Science</b> <i>Xavier University</i>	May 2017 Major GPA 3.6
<b>Diploma with Honors</b> <i>Medina High School</i>	May 2013 Major GPA 3.6

## PUBLICATIONS

---

**Alexander Fuerst**, Abdul Rehman, and Prateek Sharma. Ilúvatar: A Fast Control Plane for Serverless Computing. *HPDC 2023*.

Abdul Rehman, **Alexander Fuerst**, and Prateek Sharma. FaasMeter: Energy-First Serverless Computing. *Submitted, NSDI 2024*.

**Alexander Fuerst**, and Prateek Sharma. Locality-aware Load-Balancing For Serverless Clusters. *HPDC 2022*.

**Alexander Fuerst**, Stanko Novakovic, Inigo Goiri, Gohar Irfan Chaudhry, Prateek Sharma, Kapil Arya, Kevin Broas, Eugene Bak, Mehmet Iyigun, and Ricardo Bianchini. Memory-Harvesting VMs in Cloud Platforms. *ASPLOS 2022*.

**Alexander Fuerst**, and Prateek Sharma. FaasCache: Keeping Serverless Computing Alive With Greedy-Dual Caching. *ASPLOS 2021*.

**Alexander Fuerst**, Ahmed Ali-Eldin, Prashant Shenoy, and Prateek Sharma. Cloud-scale VM-deflation for Running Interactive Applications On Transient Servers. *HPDC 2020*.

## EXPERIENCE

---

<i>Google, Inc.</i>	<i>Mountain View, California</i>
<b>Software Engineering Intern</b>	Summer 2023

- Worked on advanced KVM-based virtualization technologies
- Explored techniques to seamlessly upgrade VMMs and hypervisors
- Modified kernel, hypervisor, and VMM to test possibilities
- Developed proof-of-concept experiments to show feasibility of designed techniques

<i>Microsoft Research</i>	<i>Redmond, Washington</i>
<b>Research Intern</b>	Summer 2021

- Analyzed modern hypervisors performance under various runtime conditions
- Modified hypervisor and guest OS to improve guest VM memory resizing

- Improved resource utilization in Azure without impact to VMs
- First author on published research paper that resulted from this work

*Indiana University*

*Bloomington, Indiana*

**Research Assistant**

2021-Present

- Identify opportunities for enhancing existing cloud computing systems
- Developed cutting-edge techniques and algorithms to improve systems
- Design experiments and analyzed results into useable data
- First author on several published papers

*Indiana University*

*Bloomington, Indiana*

**Associate Instructor**

2019-2020

- Assisted with Engineering Cloud Computing & Distributed Computing Engineering course work
- Create assignments and exams given to students
- Host lab and office hours to discuss project design and assist with student questions

*Hyland Software*

*Westlake, Ohio*

**Developer 1**

2017-2018

**Developer 2**

2018-2019

- Develop a cloud application capable of handling thousands of daily users
- Troubleshoot complex issues of multiservice SaaS application running in production
- Upgrade application to run cross-platform on Windows and Linux
- Modernize application CI/CD pipeline to improve time-to-deployment and rollback

*Xavier University*

*Cincinnati, Ohio*

**Teaching Assistant**

2016

- Work with students during class exercises
- Host office hours answering questions and giving guidance on assignments

*Xavier University*

*Cincinnati, Ohio*

**Student Technician Tier II**

2013-2016

- Troubleshoot complex technology issues and provide onsite service and repair for faculty, staff and public computing
- Provide software, hardware and network problem resolution
- Handle tickets escalated from Tier I

*Salisbury University*

*Salisbury, Maryland*

**NSF REU Researcher**

Summer 2016

- Applied emerging parallel computing models using GPU and CPU parallelism with NVIDIA's CUDA
- Tackled data and compute-intensive problems in geographic information systems
- Presented findings to GIS professionals and Salisbury Faculty

*Critchfield, Critchfield & Johnston, Ltd.*

*Medina, Ohio*

**Paralegal Intern**

August 2012-June 2013

- Prepared and delivered documents to county offices
- Finalized legal binders for delivery to clients

## PRESENTATIONS

---

Ilúvatar: A Fast Control Plane for Serverless Computing. HPDC 2023. Slides

Locality-aware Load-Balancing For Serverless Clusters. HPDC 2022. Slides Video

Memory-Harvesting VMs in Cloud Platforms. ASPLOS 2022. Slides Video

FaaSCache: Keeping Serverless Computing Alive With Greedy-Dual Caching. ASPLOS 2021. Slides Video

Cloud-scale VM-deflation for Running Interactive Applications On Transient Servers. HPDC 2020. Slides Video

## PROJECTS

---

### Ilúvatar FaaS Control Plane

An open-source, fast, jitter-free control plane for Serverless function execution written in Rust. Ilúvatar provides a significant reduction in overhead compared to popular open-sourced examples. Additionally, it enables unique usability and extensibility, to accelerate FaaS research.

### FaaSCache

Introduced caching insights into the Function-As-A-Service paradigm. Enhanced the open source FaaS application OpenWhisk using Greedy-Dual caching. Reduced cold-start overhead for functions by up to 3x and can reduce constrained system resources by up to 30%.

### Dynamically Typed Racket Compiler

A scratch built compiler supporting a subset of statically typed and dynamically typed Racket.

### Tensorflow NanoParticle Simulator

Implementation of the Lennard-Jones potential in a simulated cube and electrostatic forces of colliding ions in a confined nano-channel. The simulator Achieved performance similar to MPI/C++ code performing the same simulation.

### Jae OS

Just Another Educational Operating System. A port of the Kaya OS project to the new  $\mu$ ARM emulator. Wrote the student guide and the canonical implementation of Jae OS.

### Kaya OS

Wrote a complete operating system from scratch. The final product, in addition to support a multitude of peripheral devices, successfully ran eight concurrent processes, each running in their own virtual address space.

### Parallel GIS Raster Calculator

Developed a tool combining CPU based parallelism and NVIDIA's CUDA technology for GPU calculation for performing GIS raster calculations. Achieved 2 - 5 times performance increase over traditional analysis tools due to GPU performance.

### Eagle Scout Project

Installed commemorative plaques on veterans' graves at local cemetery. Led a group of 15 scouts to plan and accomplish this project.

## COURSE WORK

---

- |                                   |  |
|-----------------------------------|--|
| • Engineering Cloud Computing     | • Engineering Operating System                       |
| • Engineering Distributed Systems | • Simulating Nanoscale Systems                       |
| • Graph Analytics                 | • High Performance Computing                         |
| • Deep Learning Systems           | • Computational Modeling Methods for Virtual Tissues |
| • Engineering Compilers           |  |

## SKILLS

---

<i>Languages</i>	Rust, Python, C, C++, Bash, PowerShell, Java, Scheme, C#, SQL, L <sup>A</sup> T <sub>E</sub> X
<i>Programming</i>	Debugging, Problem Solving, Code Optimization, Git, Agile
<i>Infrastructure</i>	Kubernetes, Docker, Octopus Deploy, Ansible, OpenWhisk
<i>Technologies</i>	Linux, KVM, GDB, OpenMP, MPI, Tensorflow, SQL Server

## AWARDS

---

<i>Reserve Champion, Baked Goods Division</i>	Monroe County Fair 2023
<i>HPDC Travel Grant</i>	Travel grant to HPDC 2023
<i>ACM Travel Grant</i>	Travel grant to ASPLOS 2022
<i>Boy Scouts of America</i>	Eagle Scout
<i>National Honors Society</i>	
<i>National Technical Honors Society</i>	
<i>Xavier University</i>	John F. Niehaus Scholarship
<i>Xavier University</i>	John F. Niehaus Award

## ACTIVITIES

---

<i>Young Adult Ministry, St. Paul's Catholic Center</i>	Member, 2022-2023
	Vice Chair, 2023-2024
<i>Computer Science Club, Xavier University</i>	Treasurer, 2015-2017
	Vice President, 2016-2017
<i>Dean's Advisory Council, Xavier University</i>	Member, 2015 – 2017