

# Yongjeong Kim

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Personal Page: <https://cseyj.github.io/about-me/>

## EDUCATION

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| <b>Brown University</b>                                                                                                                                                                                                                                  | <b>Providence, Rhode Island</b>                 |
| <ul style="list-style-type: none"><li>• <i>Sc.M in Computer Science</i></li><li>• Pathway: Systems</li><li>• Advisor: Professor Theophilus Benson</li><li>• Research Project/Thesis: P4GPP: A GPU-Accelerated P4 Packet Processing</li></ul>             | <i>May 2022</i><br>GPA: 4.0/4.0 (Self-Reported) |
| <b>The Ohio State University</b>                                                                                                                                                                                                                         | <b>Columbus, Ohio</b>                           |
| <ul style="list-style-type: none"><li>• <i>B.S. in Computer and Information Science</i></li><li>• Sub-Plan: Networking</li><li>• Research Supervisor: Professor David Ogle</li><li>• Research Project: Enabling Internet Access in Rural Areas</li></ul> | <i>May 2020</i>                                 |

## WORK EXPERIENCE

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| <b>NVIDIA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Santa Clara, California</b>    |
| <i>Compiler DPU Engineer</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <i>June 2022 – present</i>        |
| <ul style="list-style-type: none"><li>- Part of the Networking Compiler Project Team working on enabling programmability for NVIDIA Data Processing Units (DPUs).</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |
| <b>IBM Research</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Yorktown Heights, New York</b> |
| <i>Research Intern mentored by Dr. Ali Sydney and Dr. Bengi Karacali</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <i>May 2021 – August 2021</i>     |
| <ul style="list-style-type: none"><li>- Worked with the cloud infrastructure research group for software-defined networking and traffic engineering research that focuses on the next generation of cloud infrastructure.</li><li>- Researched SDN solutions and reviewed relevant literature for cloud scalability and reliability with distributed SDN controllers.</li><li>- Implemented ONOS controller application and P4 program for SR-MPLS for quality of service.</li><li>- Created test cases and benchmarked the solutions for SR-MPLS, distributed ONOS controllers and P4 programs at the target environment.</li></ul> |                                   |

## RESEARCH EXPERIENCE

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| <b>Systems@Brown Research Group at Brown University</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Providence, Rhode Island</b> |
| <i>Graduate Research advised by Professor Theophilus Benson</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <i>June 2020 – May 2022</i>     |
| <ul style="list-style-type: none"><li>- Researched the best abstraction for network functionalities within programmable network devices.</li><li>- Analyzed a best practice for appropriate network functionality offloads at data centers.</li><li>- Researched heterogeneous system architectures for accelerators such as FPGA, CPU and GPU.</li><li>- Researched the network observability for the distributed systems.</li><li>- The latest research projects include<ol style="list-style-type: none"><li>1. The P4 packet processing framework with GPU accelerator, enabling concurrent executions of both packets and multiple P4 programs.</li><li>2. The eBPF network monitoring tool for the observability of the microservices in the service mesh at the numerous networking stack (analyzing the network overheads at the kernel for service containers for different services).</li></ol></li></ul> |                                 |
| <b>Department of Computer Science and Engineering at The Ohio State University</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Columbus, Ohio</b>           |
| <i>Undergraduate Research supervised by Professor David Ogle</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <i>August 2019 – April 2020</i> |
| <ul style="list-style-type: none"><li>- Researched the best practice for an application to deal with discontinuous networks in developing regions.</li><li>- Created an internal layer between the application and transport layers to support internal custody transfer.</li><li>- Worked on a socket library development for custody transfer with performance analysis.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                 |

## SELECTED PROJECTS

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|---------------------------------------------------------|----------------------------------|
| <b>Systems@Brown Research Group at Brown University</b> | <b>Providence, Rhode Island</b>  |
| <i>P4GPP: A GPU-Accelerated P4 Packet Processing</i>    | <i>September 2020 – May 2022</i> |

- Developed the P4 packet processing framework with GPU accelerator, enabling concurrent executions of both packets and multiple P4 programs with the dynamic parallelism.
- Implemented a P4-CUDA compiler in Python:
  1. It takes the JSON output of the P4 compiler and parse the relevant source code information to reduce the branch blocking and source code overheads by merging the shared blocks.
  2. It selects the best-optimized path for the dynamic parallelism by analyzing program dependencies and producing a set of possible execution paths, taking the synchronization and execution overheads.
  3. It generates the C/C++ code that are compatible with NVIDIA CUDA framework given the optimized execution path, including but not limited to the CUDA function for the table lookup that are stored at the GPU device memory for the local lookup.
  4. It applies existing state-of-art CPU-GPU heterogeneous optimizations such as zero-copying and batching to overlap the pipeline.
- Currently achieved close to 70-80% source code reduction and improved execution time by a few microseconds.

#### **Systems@Brown Research Group at Brown University**

*Network Diagnosis With eBPF*

**Providence, Rhode Island**

*September 2021 – May 2022*

- Designed and implemented an eBPF monitoring tool for the kernel network processing observability tool for the service mesh containers.
- Implemented eBPF tracepoint functions in C to intercept the packet processing each layer (i.e., application, transport, network, and ethernet layers) entry functions at both receiving and sending directions.
- Implemented Python script to collect the service and Envoy proxy container configuration and iptables information from Istio service mesh at run-time.
- Implemented the web workload generator container that runs wrk2 and sample web service containers then deployed to Istio service mesh framework and Kubernetes at the server.
- Analyzed the packet header modification and process ID mapping behaviors from the collected logs.

#### **Department of Computer Science at Brown University**

*μGDPR: Privacy Conscious Microservices*

**Providence, Rhode Island**

*September 2021 – December 2021*

- Designed and implemented the μGDPR framework that utilizes the logging approach to realize the GDPR requirement from the microservice perspective with open source technologies.
- Implemented the framework in Python that collects the service logs from the Envoy sidecar at the request-id and time range granularity to generate the service dependency map in real-time. These metrics identify a list of services dependent on the affected services/requests during the breach incident time range.
- Benchmarked the CPU utilization and the log memory overheads of the framework with the wrk2 workload generator on the microservices deployed to the local Istio and Envoy test environment.

#### **Department of Computer Science and Engineering at The Ohio State University**

*Metropolis Capstone Project*

**Columbus, Ohio**

*January – April 2020*

As a group of 5 people, we worked on web user interface development and android application for a smart city salesforce project.

- Collaborated with a whole class and held team/sponsor meetings with weekly presentations.
- Contributed to the web user interface design at the Salesforce platform and the android application development.
- Adopted Forcedroid to the android application for Salesforce authentication and data extraction.
- Implemented events, cases, tasks, reports, and offline functionalities for the android application.

#### **Department of Computer Science and Engineering at The Ohio State University**

*Secured File Storage Android Application Research Project*

**Columbus, Ohio**

*August– December 2019*

As a group of 4 people, we developed a secured file storage android application for a network security research project.

- Participated in developing a flexible application protocol that supports reliability, authentication, and data integrity.
- Implemented RSA encrypted session key sharing, AES payload encryption, and fragmentation for performance.
- Developed multiple features including logging in, signing up, viewing files, deleting, uploading, and downloading.

**Department of Computer Science and Engineering at The Ohio State University****Columbus, Ohio***Internet of Medical Things Network Design Project**January – April 2019*

As a group of 9 people, we designed a secure, reliable, and fast hospital network with a cheap cost.

- Adopted a wired-mesh network structure and VLAN to secure private information.
- Adopted an IPv4 with NAT router structure with a characteristic of mesh network to avoid overhead and secure privacy of devices on the network.

**TEACHING ASSISTANSHIP**

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**CSCI 1680: Computer Networks****Brown University***Head Teaching Assistant**Spring 2022***CSE 2421: Introduction to Low-Level Programming and Computer Organization****The Ohio State University***Student Instructional Assistant 1**Spring 2020***CSE 2421: Introduction to Low-Level Programming and Computer Organization****The Ohio State University***Student Instructional Assistant 3**Autumn 2019***CSE 2421: Introduction to Low-Level Programming and Computer Organization****The Ohio State University***Student Instructional Assistant 3**Spring 2019***AWARDS AND DISTINCTIONS**

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**Cum Laude****The Ohio State University****Dean's List for Autumn 2019****The Ohio State University****Dean's List for Spring 2019****The Ohio State University****Dean's List for Autumn 2018****The Ohio State University****Dean's List for Autumn 2017****The Ohio State University****TECHNICAL SKILLS**

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- **Languages:** C, C#, Go, Java, JavaScript, P4, Python, Ruby, Scheme, x86 assembly language
- **Web Technologies & Databases:** Ruby on Rails, Node.js, Express.js .NET, HTML, CSS, MySQL, MongoDB
- **Networking Tools:** Wireshark, Tcpdump, tethereal, Mininet, Bmv2, pcap
- **Others:** ONOS, Docker, Istio, Envoy, CUDA, eBPF, multithreading, Shell, Unity, Android, Salesforce, Git, Heroku, Google Cloud Platform
- **Selected Coursework & Projects:** microservices management, privacy-conscious computer systems, raw socket programming, programmable data plane, multicast load-balancing, web-application development, wireless networking, network security, blockchain, deep learning, artificial intelligence, compiler development