# Yifan Sun

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## Academic Appointments

**Assistant Professor** — Williamsburg, VA
Computer Science, William & Mary — Aug. 2020 - Present

## Education

**Northeastern University** — Boston, MA
Ph.D. in Computer Engineering — Sep. 2013 - Aug. 2020

**University at Buffalo** — Buffalo, NY
M.S. in Electrical Engineering — Sep. 2011 - Jun. 2013

**Huazhong University of Science and Technology** — Wuhan, China
B.Eng. in Electrical Engineering — Sep. 2007 - Jun. 2011

**Wuhan University** — Wuhan, China
Bachelor in Business Administration (Minor) — Sep. 2008 - Jun. 2011

## Industry Experience

**AMD, Software Engineer (Co-op)** — Boxborough, MA
Performance modeling and graphics simulator development for AMD Navi GPUs — Jul. 2018 - Dec.2018

**Dell EMC, Software Engineer (Co-op)** — Hopkinton, MA
Cloud-based GPU-as-a-service system design, development, and deployment — Jul. 2016 - Dec.2016

## Awards

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| 2019 | **Outstanding Graduate Student in Experiential Learning**, Northeastern University | Boston, MA |
| 2019 | **Teaching Award**, Northeastern University College of Engineering | Boston, MA |
| 2018 | **Best Paper Award**, ICPE | Berlin, Germany |
| 2016 | **Best Paper Candidate**, IISWC | Providence, RI |
| 2013 | **Best Student Paper Award**, WUWNET | Kaohsiung, Taiwan |

## Publications

### Peer-reviewed Conference Publications

1. Yifan Sun, Yixuan Zhang, Ali Mosallaei, Michael D. Shah, Cody Dunne, David Kaeli. 2021. **Daisen: A Framework for Visualizing Detailed GPU Execution**. The 23rd EG Conference on Visualization (EuroVis '21). [Acceptance Rate ≈ 26.0%]

2. Yixuan Zhang, Yifan Sun, Lace Padilla, Submit Barua, Enrico Bertini, Andrea G. Parker. 2021. **Mapping the Landscape of COVID-19 Crisis Visualizations**. The ACM conference on Human Factors in Computing Systems (CHI '21). ACM. [Acceptance rate ≈ 26.3%]

3. Trinayan Baruah, Kaustubh Shivdikar, Shi Dong, Yifan Sun, Saiful A. Mojumder, Kihoon Jung, José L. Abellán, Yash Ukidave, Ajay Joshi, John Kim, David Kaeli. 2021. **GNNMark: A Benchmark Suite to Characterize Graph Neural**

**Network Training on GPUs**. 2021 IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS '21). IEEE. [Acceptance rate ≈ 36.9%]

4. Trinayan Baruah, Yifan Sun, Saiful A. Mojumder, José L. Abellán, Yash Ukidave, Ajay Joshi, Norman Rubin, John Kim, David Kaeli. 2020. **Valkyrie: Leveraging Inter-TLB Locality to Enhance GPU Performance**. In Proceedings of the 29th International Conference on Parallel Architectures and Compilation Techniques (PACT '20). ACM. [Acceptance rate ≈ 25.9%]

5. **[Honorable Mention (<5%)]** Omid Mohaddesi, Yifan Sun, Rana Azghandi, Rozhin Doroudi, Sam Snodgrass, Ozlem Ergun, Jacqueline Griffin, David Kaeli, Stacy Marsella, Casper Harteveld. 2020. **Introducing Gamettes: A Playful Approach for Capturing Decision-Making for Informing Behavioral Models**. The ACM Conference on Human Factors in Computing Systems (CHI '20). ACM. Honolulu, HI, USA, 1-13. [Acceptance rate ≈ 24.3%]

6. Trinayan Baruah, Yifan Sun, Ali Tolga Dinçer, Saiful A. Mojumder, José Luis Abellán, Yash Ukidave, Ajay Joshi, Norman Rubin, John Kim, David Kaeli. 2020. **Griffin: Hardware-Software Support for Efficient Page Migration in Multi-GPU Systems**. In Proceedings of the 26th IEEE International Symposium on High-Performance Computer Architecture (HPCA '20). IEEE. San Diego, CA, USA, 596-609. [Acceptance rate ≈ 19.4%]

7. Yifan Sun, Trinayan Baruah, Saiful A. Mojumder, Shi Dong, Xiang Gong, Shane Treadway, Yuhui Bao, Spencer Hance, Carter McCardwell, Vincent Zhao, Harrison Barclay, Amir Kavyan Ziabari, Zhongliang Chen, Rafael Ubal, José L. Abellán, John Kim, Ajay Joshi, and David Kaeli. 2019. **MGPUSim: Enabling Multi-GPU Performance Modeling and Optimization**. In Proceedings of the 46th International Symposium on Computer Architecture (ISCA '19). ACM, New York, NY, USA, 197-209. [Acceptance rate ≈ 17.0%]

8. Mohammad Khavari Tavana, Yifan Sun, Nicolas Bohm Agostini, and David Kaeli. 2019. **Exploiting Adaptive Data Compression to Improve Performance and Energy-Efficiency of Compute Workloads in Multi-GPU Systems**. In Proceedings of the 33rd IEEE International Parallel and Distributed Processing Symposium (IPDPS '19). IEEE, Rio de Janeiro, Brazil, 664-674 [Acceptance rate ≈ 27.7%]

9. Saiful A Mojumder, Marcia S Louis, Yifan Sun, Amir Kavyan Ziabari, José L Abellán, John Kim, David Kaeli, and Ajay Joshi. 2018. **Profiling DNN Workloads ona Volta-based DGX-1 System**. In Proceedings of the 2018 IEEE International Symposium on Workload Characterization (IISWC '18). IEEE, Raleigh, North Carolina, USA, 122-133. [Acceptance rate ≈ 36.2%]

10. Rozhin Doroudi, Rana Azghandi, Zlatan Feric, Omic Mohaddesi, Yifan Sun, Jacqueline Griffin, Ozlem Ergun, David Kaeli, Pedro Sequeira, Stacy Marsella, and Casper Harteveld. 2018. **An Integrated Simulation Framework for Examining Resiliency in Pharmaceutical Supply Chains Considering Human Behavior**. In Proceedings of the 2018 Winter Simulation Conference (WSC '18). ACM, Gothenburg, Sweden, 88-99. [Acceptance rate ≈ 70.4%]

11. Yifan Sun, Saoni Mukherjee, Trinayan Baruah, Shi Dong, Julian Gutierrez, Prannoy Mohan, and David Kaeli. 2018. **Evaluating Performance Tradeoffs on the Radeon Open Compute Platform**. In Proceedings of the 2018 IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS '18). IEEE, Belfast, Northern Ireland, United Kingdom, 209-218. [Acceptance rate ≈ 31.3%]

12. **[Best Paper Award]** Shi Dong, Gong Xiang, Yifan Sun, Trinayan Baruah, and David Kaeli. 2018. **Characterizing the Microarchitectural Implications of a Convolutional Neural Network (CNN) on GPUs**. In Proceedings of the 2018 ACM International Conference on Performance Engineering (ICPE '18). ACM, Berlin, Germany, 96-106. [Acceptance rate = 24.0%]

13. Trinayan Baruah, Yifan Sun, Shi Dong, David Kaeli, and Norm Rubin. 2018. **Airavat : Improving Energy Efficiency of Heterogeneous Applications**. In Proceedings of the 2018 Design, Automation & Test in Europe Conference & Exhibition (DATE '18). IEEE, Dresden, Germany, 731-736. [Acceptance rate ≈ 24.2%]

14. Leiming Yu, Xun Gong, Yifan Sun, Qianqian Fang, Norm Rubin, and David Kaeli. 2017. **Moka: Model-based Concurrent Kernel Analysis**. In Proceedings of the 2017 IEEE International Symposium on Workload Characterization (IISWC '17). IEEE, Seattle, Washington, USA, 197-206. [Acceptance rate ≈ 27.7%]

15. **[Best Paper Candidate]** Yifan Sun, Xiang Gong, Amir Kavyan Ziabari, Leiming Yu, Xiangyu Li, Saoni Mukherjee, Carter McCardwell, Alejandro Villegas, and David Kaeli. 2016. **Hetero-Mark, a Benchmark Suite for CPU-GPU Collaborative Computing**. In Proceedings of the 2016 IEEE International Symposium on Workload Characterization (IISWC '16). IEEE, Providence, Rhode Island, USA, 1-10. [Acceptance rate $\approx$ 30.4%]

16. Yifan Sun, Chisheng Liang, Steven Sutherland, Casper Harteveld, and David Kaeli. 2016. **Modeling Player Decisions in a Supply Chain Game**. In Proceedings of the 2016 IEEE Conference on Computational Intelligence and Games (CIG '16). IEEE, Santorini, Greece, 1-8. [Acceptance rate unknown]

17. Saoni Mukherjee, Yifan Sun, Paul Blinzer, Amir Kavyan Ziabari, and David Kaeli. 2016. **A Comprehensive Performance Analysis of HSA and OpenCL 2.0**. In Proceedings of the 2016 IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS '16). IEEE, Uppsala, Sweden, 183-193. [Acceptance rate $\approx$ 35.1%]

18. Jithin Jagannath, Anu Saji, Hovannes Kulhandjian, Yifan Sun, Emrecan Demirors, and Tommaso Melodia. 2013. **A Hybrid MAC Protocol with Channel-Dependent Optimized Scheduling for Clustered Underwater Acoustic Sensor Networks**. In Proceedings of the 8th ACM International Conference on Underwater Networks and Systems (WUWNET). ACM, Kaohsiung, Taiwan, Article 3, 8 pages. [Acceptance rate $=$ 20.0%]

19. **[Best Student Paper Award]** Yifan Sun, and Tommaso Melodia. **The internet underwater: An IP-compatible Protocol Stack for Commercial Undersea Modems**. In Proceedings of the 8th ACM International Conference on Underwater Networks and Systems (WUWNET). ACM, Kaohsiung, Taiwan, Article 37, 8 pages. [Acceptance rate $=$ 20.0%]

## Journal Publications

1. Shi Dong, Yifan Sun, Nicolas Bohm Agostini, Elmira Karimi, Daniel Lowell, Jing Zhou, José Cano, José L. Abellán, David Kaeli. 2021. **Spartan: A Sparsity-Adaptive Framework to AccelerateDeep Neural Network Training on GPUs**. TPDS, (March 2021).

2. Rozhin Doroudi, Pedro Sequeira, Stacy Marsala, Ozlem Ergun, Rana Azghandi, David Kaeli, Yifan Sun, Jacqueline Griffin. 2019. **Effects of Trust-Based Decision Making in Disrupted Supply Chains**. PLOS One, (January 2020).

3. Chen Li, Yifan Sun, Lingling Jin, Lingjie Xu, Zheng Cao, Pengfei Fan, David Kaeli, Sheng Ma, Yang Guo, and Jun Yang. 2019. **Priority-Based PCIe Scheduling for Multi-Tenant Multi-GPU System**. IEEE Computer Architecture Letters (CAL) 18, 2 (July-Dec. 1 2019), 157-160.

4. Amir Kavyan Ziabari, Yifan Sun, Yenai Ma, Dana Schaa, José L. Abellán, Rafael Ubal, John Kim, Ajay Joshi, and David Kaeli. 2016. **UMH: A Hardware-based Unified Memory Hierarchy for Systems with Multiple Discrete GPUs**. ACM Transactions on Architecture and Code Optimization (TACO) 13, 4 Article 35 (December 2016), 25 pages.

5. Abdulla K. Al-Ali, Yifan Sun, Marco Di Felice, Jarkko Paavola, and Kaushik R. Chowdhury. 2015. **Accessing Spectrum Databases using Interference Alignment in Vehicular Cognitive Radio Networks**. IEEE Transactions on Vehicular Technology 64, 1 (2014), 263-272

6. Yifan Sun, and Kaushik R. Chowdhury. 2015. **Enabling Emergency Communication through a Cognitive Radio Vehicular Network**. IEEE Communications Magazine 52, 10 (2014), 68-75.

## Book Chapters

1. Shih-Hao Hung, Thomas B. Jablin, Yifan Sun, Rafael Ubal, and David Kaeli. 2015. **HSA Simulators**. A book chapter in Heterogeneous System Architecture: Practical Applications for Industry, 1st edition, Elsevier Nov. 2015.

## Patents

1. Junping Zhao, Yifan Sun. Layne Peng, Jie Bao, Kun Wang. (Jan. 2021). **Intelligent data coordination for accelerated computing in cloud environment**. Patent No. US 10,891,156, Filed Apr 26, 2017, Issued Jan 12, 2021.

2. Yifan Sun, Layne Peng, Robert A. Lincourt JR., John Cardente, and Junping Zhao. (Jun. 2019). **Managing access to a resource pool of graphics processing units under fine grain control**. Patent No. US 10,262,390, Filed Apr 14, 2017, Issued Jun 27, 2019.

3. Junping Zhao, Layne Peng, Jie Bao, Kun Wang, and Yifan Sun. (Apr. 2019). **Checkpointing for GPU-as-a-Service in Cloud Computing Environment**, Patent No. US 10,275,851, Filed Apr 25, 2017, Issued Apr 30, 2019.

4. Yifan Sun, Layne Peng, Robert A. Lincourt JR., John Cardente, John S Harwood. (Oct. 2018). **Queue-based GPU Virtualization and Management System**. Patent No. US 10,109,030, Filed Dec 27, 2016, Issued Oct 23, 2018.

### Workshop Publications

1. Yixuan Zhang, Yifan Sun, Sumit Barua, Enrico Bertini, and Andrea Grimes Parker. 2020. **Mapping the Landscape of COVID-19 Crisis Visualizations**. Visualization for Communication (VisComm).

2. Yifan Sun, Trinayan Baruah, Shi Dong, and David Kaeli. 2019. **MGSim: A Flexible High-Performance Simulator for Multi-GPU Systems**. International Workshop on OpenCL (IWOCL).

### Preprints

1. Saiful A. Mojumder, Yifan Sun, Leila Delshadtehrani, Yenai Ma, Trinayan Baruah, José L. Abellán, John Kim, David Kaeli, Ajay Joshi. 2020. **MGPU-TSM: A Multi-GPU System with Truly Shared Memory**. arXiv preprint arXiv:2008.02300.

2. Saiful A. Mojumder, Yifan Sun, Leila Delshadtehrani, Yenai Ma, Trinayan Baruah, José L. Abellán, John Kim, David Kaeli, Ajay Joshi. 2020. **HALCONE : A Hardware-Level Timestamp-Based Cache Coherence Scheme for Multi-GPU Systems**. arXiv preprint arXiv:2007.04292.

3. Yifan Sun, Nicolas Bohm Agostini, Shi Dong, and David Kaeli. 2019. **Summarizing CPU and GPU Design Trends with Product Data**. arXiv preprint arXiv:1911.11313.

4. Yifan Sun, Trinayan Baruah, Saiful A Mojumder, Shi Dong, Rafael Ubal, Xiang Gong, Shane Treadway, Yuhui Bao, Vincent Zhao, José Luis Abellán, John Kim, Ajay Joshi, and David Kaeli. 2019. **MGSim+MGMark: A Framework for Multi-GPU System Research**. arXiv preprint arXiv:1811.02884.

## Open-Source Software

**MGPUSim (https://gitlab.com/akita/gcn3)**
Multi-GPU system simulator based on AMD GCN3 GPUs

**Akita (https://gitlab.com/akita/akita)**
High-flexibility, high-performance, parallel computer architecture simulation framework

**Hetero-Mark (https://github.com/NUCAR-DEV/Hetero-Mark)**
Benchmark suite for CPU-GPU collaborative computing

**Drug Supply Chain Simulator (https://gitlab.com/syifan/crisp)**
Human-in-the-loop logistics simulator for the U.S. drug supply chain

**VistaLights (https://github.com/syifan/VistaLights)**
Strategic game for maritime traffic management and disaster relieving

## Talks and Tutorials

1. **MGPUSim: A One-Stop Solution for GPU Architecture Simulation**
The 2020 International Conference on High Performance Computing & Simulation (HPCS '20). Jan 2021.

2. **MGPUSim: A High-Flexibility, High-Performance, Multi-GPU Simulator**
Alibaba. July 2020.

3. **Exploring Multi-GPU Simulation and Visual Profiling with MGPUSim**
With José L. Abellán, Trinayan Baruah, and David Kaeli. Tutorial at ISCA 2020. May 2020.

4. **Collaborative Heterogeneous Computing**
William & Mary. March 2020.

University of California, Santa Cruz. March 2020.
University of Pittsburgh. March 2020.
University of Central Florida. March 2020.

5. **Tutorial on the Akita Simulator Framework and MGPUSim**
   With Trinayan Baruah, Shi Dong, and David Kaeli. Tutorial at HPCA 2020. February 2020.
6. **Research in the NUCAR Laboratory at Northeastern University**
   FutureWei. With David Kaeli. July 2019.
7. **MGPUSim: a Flexible High-Performance Simulator for Multi-GPU Systems**
   International Workshop on OpenCL (IWOCL). May 2019.
8. **AKITA: A Go-Based Computer Architecture Simulator Framework**
   Google. May 2019.
9. **Enabling Multi-GPU High Performance Computing with Memory System Design**
   Lighting talk at Boston University Red Hat Collaboratory. February 2019.
10. **Benchmarking the New Unified Memory of CUDA 8**
    With Frank Zhao. GTC 2017 San Jose. August 2017.
11. **Multi2Sim 5.0**
    Tutorial at IISWC 2016. September 2016.

# Teaching

## William & Mary, Williamsburg, VA

**Topics in Computer Architecture** — Spring 2021
Instructor
Ph.D.-level Course

**Computational Problem Solving** — Fall 2020
Instructor
Undergraduate's First Python Programming Course (1st - 2nd year)

## Northeastern University, Boston, MA

**Fundamental Digital Design and Computer Organization** — Fall 2019
Co-instructor. With Dr. Pereira da Silva Aloizio
Intermediate-level Undergraduate Course (3rd year)

**Fundamentals of Engineering Algorithms** — Spring 2018
Instructor
Intermediate-level Undergraduate Course (3rd year)
Redesigned the course ("I have learned a lot in this course": 4.7 out of 5)
Instructor Effectiveness 4.4 out of 5

**Embedded Design Enabling Robotics** — Fall 2017
Instructor
Intermediate-level Undergraduate Course (2nd year)
Instructor Effectiveness 4.6 out of 5

# Selected Media Coverage

| | |
|---|---|
| **HiPEAC info 58** | MGPUSim announced at ISCA 2019 |
| **News@Northeastern College of Engineering** | Yifan Sun and NUCAR Research Lab featured in HiPEAC News |
| **News@Northeastern** | A Student Went off to Do a Co-op at a Major Tech Firm. He Came Back With a Patent. |
| **WIRED** | Finally, the Underwater We've All Been Waiting For |
| **NBC News** | Deep-sea Internet to Detect Tsunamis, Spy on Smugglers, and Discover Oil |

## Service

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| **Program Committee** | The 38th IEEE International Conference on Computer Design | 2020 |
| **Program Committee** | 13th Workshop on General Purpose Processing Using GPU (GPGPU) | 2019 |
| **Web Chair** | 9th Workshop on General Purpose Processing Using GPU (GPGPU) | 2016 |