

# Mayank Parasar

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## CARRIER OBJECTIVE

I work in the field of **Computer Architecture** and my research focus is to come-up with breakthrough solutions in the field of **Interconnection Networks**, **Memory System** and system software/application layer co-design. I like coding, my favorite language is C++ (then python). I have worked on open source simulators like gem5. I am passionate about designing cycle-accurate system simulators. I am looking for full time opportunities starting in summer.

## EDUCATION

**Georgia Institute of Technology**, Atlanta, Georgia, USA

- Ph.D. in Electrical and Computer Engineering Aug 2015 – Present
  - Thesis: Novel and Efficient Techniques for Guaranteeing Routing and Protocol Level Deadlock Freedom in Interconnection Networks
  - Adviser: Prof. Tushar Krishna
  - Focus: Interconnection Networks, On-Chip Network, Performance, Deadlock, Cache Coherence, Memory System.
  - Cumulative GPA: 4.0/4.0
- Minor in Computer Science Aug 2016 – May 2017
  - Cumulative GPA: 4.0/4.0
- M.S. in Electrical and Computer Engineering May 2015 – Aug 2017
  - Cumulative GPA: 4.0/ 4.0

**Indian Institute of Technology, Kharagpur (IIT Kharagpur)**, Kharagpur, West Bengal, India

- B.Tech(Hons.) in Electrical Engineering Department Aug 2009 – May 2013
  - Cumulative GPA: 8.41 / 10

## WORK EXPERIENCE

**Graduate Research Assistant**, Synergy Lab, Georgia Institute of Technology, Atlanta, GA, USA.

- May 2016 – Present
  - Formulating meaningful research optimizations both at micro-architectural level as well as at system software level.

**Co-Op Engineer at AMD Research**, Advanced Micro Devices, Inc. (“AMD”), Austin, TX, USA.

- Aug 2017 – Dec 2017
  - Worked on optimizing micro-architectural support for virtual address translation in heterogeneous system architecture involving accelerators. Work involved adding support in gem5 simulator.

**Graduate Teaching Assistant**, Georgia Institute of Technology, Atlanta, GA, USA.

- Aug 2015 – May 2016
  - Teaching assistant in course ECE-3056: Architecture, Concurrency, and Energy in Computation under late professor Sudhakar Yalamanchili.
  - Designed and implementing programming assignment for the students
  - Provided student assistance during office hours

**CPU Validation Engineer**, NVIDIA Corporation, Bangalore, India.

- Jul 2013 – Jun 2015
  - Involved in Implementing big.LITTLE architecture functionality in simulator for ARM Cortex-A53 and ARM Cortex-A57 processors
  - Implemented ARMv8.1 extensions, including 16 bit ASID and VMID size along with new instructions for atomically accessing memory, in architectural simulator

## SKILLS

**Computer Architecture Simulators**

- gem5, Garnet2.0, USIMM, Cacti

**Programming Languages**

- C, C++, R, Python, Bash, tcsh, Matlab/Octave, Verilog, HTML

## PROJECTS

**Convolutional neural network for number recognition (CUDA C)**,

Georgia Institute of Technology

Feb 2018 – Apr 2018

- Implemented the computation graph of a convolutional neural network to perform image recognition on a gray-scale image.

- Optimized kernel execution times using shared memory, constant memory and memory coalescing for NVIDIA GPUs.

#### **Implemented distributed server [Client:Store:Vendor] using gRPC framework,**

Advanced Operating System, Georgia Institute of Technology Oct 2016 – Nov 2016

- Implemented Client:Store:Vendor communication, with specifications provided in proto file using gRPC.
- Implemented Master for managing mapper and reducer threads. Implemented ‘Mapper’ and ‘Reducer’

#### **Devised C++ kernel to analyze underlying memory system,**

#### **High performance cache replacement policies: RRIP, DRRIP, SHiP and EAF**

#### **DRAM Page closure policies and Memory Scheduling policies**

Advanced Memory System, Georgia Institute of Technology Jan 2016 – Mar 2016

- Used infrastructure from Cache Replacement championship-ISCA2010.
- USIMM is used for implementing DRAM Page Closure: Open-Page, Close-Page, Open-Page-for-Read-Close-Page-for-Write; Memory Scheduling Policies(MCP): FCFS, FR-FCFS-CapN, Fair Scheduling Policy

#### **The Distributed Two-Dimensional Discrete Fourier Transform,**

#### **The Multi-Threaded Two-Dimensional Discrete Fourier Transform,**

Advanced Programming Techniques, Georgia Institute of Technology Aug 2015 – Oct 2015

- Used MPI (Message Passing Interface) to implement 2-D DFT in C++.
- Used pthreads to implemented Danielson-Lanczos Algorithm (aka Cooley-Tukey FFT Algorithm) to compute 2-D DFT

#### **Dependency Tracking and Forwarding for 5-stage Superscalar Pipeline with Branch Prediction, Out of Order Pipeline with In-Order Commit,**

#### **Chip Multiprocessor (CMP) Memory System Design,**

Advanced Computer Architecture, Georgia Institute of Technology Aug 2015 – Nov 2015

- Implemented G-Share Branch predictor
- Implemented Tomasulo’s algorithm to implement Out of Order Execution, using Reorder Buffer (ROB) and Register Alias Table (RAT) in Super Scalar machine
- Implemented Static Way Partitioning and Utility based Cache Partitioning for shared L2 Cache

## **PUBLICATIONS**

## **CONFERENCES**

- [1] M. Parasar, H. Farrokhbakht, N. Enright Jerger, P. Gratz, T. Krishna, and J. San Miguel, “DRAIN: Deadlock Removal for Arbitrary Irregular Networks,” in *The 26th IEEE International Symposium on High-Performance Computer Architecture (HPCA)*, San Diego, California, USA, Feb 2020.
- [2] M. Parasar, N. Enright Jerger, P. Gratz, J. San Miguel, and T. Krishna, “SWAP: Synchronized Weaving of Adjacent Packets for Network Deadlock Prevention,” in *Proceedings of International Symposium on Microarchitecture (MICRO)*, Columbus, Ohio, USA, Oct 2019.
- [3] M. Parasar and T. Krishna, “BINDU: Deadlock-freedom with one bubble in the network,” in *Proceedings of International Symposium on Networks-on-Chip (NOCS)*, New York, USA, Oct 2019.
- [4] M. Parasar, A. Sinha, and T. Krishna, “Brownian Bubble Router: Enabling deadlock freedom via guaranteed forward progress,” in *Proceedings of International Symposium on Networks-on-Chip (NOCS)*, Torino, Italy, Oct 2018.
- [5] M. Parasar, A. Bhattacharjee, and T. Krishna, “SEESAW: Using superpages to improve VIPT caches,” in *Proceedings of International Symposium on Computer Architecture (ISCA)*, Los Angeles, California, USA, Jun 2018.
- [6] M. Parasar, and T. Krishna, “Lightweight emulation of virtual channels using swaps,” in *Proceedings of the 10th International Workshop on Network on Chip Architectures (NoCArc)*, Boston, USA, Oct 2017.

## **AWARDS & SCHOLARSHIPS**

- AMD Student Ambassador at Georgia Tech 2018 – 2019
- Otto & Jenny Krauss Fellow 2015 – 2016

## **LANGUAGES**

- Hindi: Native language.
- English: Proficient (speaking, reading, writing).