Divyanshu Saxena

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Education

Ph.D., Computer Sciences | The University of Texas at Austin | GPA – 4/4 *2021–Present*

MS/Ph.D., Computer Sciences | University of Wisconsin-Madison | GPA – 3.875/4 *2020–2021*

B.Tech, Computer Science and Engineering | Indian Institute of Technology Delhi | GPA – 8.14/10 *2016–2020*

Research Experience

Interests: Serverless Platforms, Resource Disaggregation, 5G and Edge Networks, Large scale networked systems

Memory Deduplication in Serverless Platforms October 2020 - Present

UT Austin, UW-Madison | Supervisor: Prof. Aditya Akella

- Investigated the duplication in memory states of containers on serverless platforms, and exploited it for reducing cold starts.
- Designed an efficient deduplication mechanism over dis-aggregated memory - leading to reduced number of cold starts and reduced memory footprints.
- Demonstrated a 13-67% reduction in the number of cold starts leading to upto 4X improvements in end-to-end latencies. *Work under submission and review process.*

Designing adaptive consistency models for Distributed Edge Storage July 2020 - September 2020

Indian Institute of Science, Bangalore | Supervisor: Prof. Yogesh Simmhan

- Worked on a distributed data store over unreliable Edge devices, using a super peer overlay network of Fog Devices.
- Designed an efficient algorithm to find data items within two hops across the network, making use of Bloom Filters for indexing.
- Implemented various session and causal consistency models on top of the Edge data store, to support multiple clients.

Ghost Indexing in Graph Databases April 2019 - May 2020

Indian Institute of Technology, Delhi | Supervisor: Prof. Srikanta Bedathur

- Investigated the utility of adding in-graph indexes over Graph Databases, for the Janusgraph and Neo4J frameworks.
- Implemented the novel idea of *Ghost Vertices* to implement in-graph BPlus-Tree and B-Tree indexes in Graph Databases.
- Demonstrated 2-10X improvement in execution times for range search queries in JanusGraph by using the novel *Ghost Indexes*.

Network Design for a Modified Two Echelon Vehicle Routing Problem May 2018 - July 2018

National University of Singapore | Supervisor: Prof. Andrew Lim

- Designed and implemented a Neighborhood Search heuristic to route available vehicles, choosing the optimal location of carparks for the Two Echelon Vehicle Routing Problem, an NP-hard combinatorial optimization problem.
- Used clustering and local search to get the solution for the problem, making use of novel operators for defining neighborhood.

Work Experience

The University of Texas at Austin | Research Assistant with *Prof. Aditya Akella* August 2021 - Present

Research on serverless platforms; and systems for emerging networks

University of Wisconsin-Madison | Research Assistant with *Prof. Aditya Akella* January 2021 - July 2021

Research on memory deduplication in serverless platforms

Joint Seat Allocation Authority (JoSAA) | Software Intern February 2020 - October 2020

Developed software for the premier National Engineering Examination of India

IISc, Bangalore | Research Intern with *Prof. Yogesh Simmhan* July 2020 - September 2020

Designing adaptive consistency models for Distributed Edge Storage

Cohesity | Member of Technical Staff Intern May 2019 - July 2019

Adding Zero Copy Buffer Payloads over gRPC

National University of Singapore | Research Intern with *Prof. Andrew Lim* May 2018 - July 2018

Designing heuristics for a Two Echelon Vehicle Routing Problem

Selected Projects

Offloading TAS on BlueField SmartNIC | *Course Project under Prof. Simon Peter* *Fall 2021*

- Designed an efficient service to offload TAS, a TCP acceleration service, by running the fast and slow paths on the SmartNIC.
- Used RDMA for communication between Host and NIC memory for writing application payload buffers and waking up threads.

RecoverKV: Highly-available strongly-consistent KV-store | *Course Project under Prof. Mike Swift Spring 2021*

- Designed and implemented a highly-available distributed key-value store that can tolerate upto $n/2$ failures.
- Made use of a custom quorum protocol and replicated logs to develop a performant but strongly consistent store.

Combating Multi-Camera Interference using Carrier Sensing | *Supervisor: Prof. Suman Banerjee* *Fall 2020*

- Investigated the loopholes in the current interference mitigation mechanisms for multiple 3D camera environments.
- Drawing inspiration from the CSMA-CA protocol, designed a novel carrier sensing based mitigation mechanism for cameras.
- Demonstrated a 50% reduction in the power amplification needed to capture a 3D image, compared to the existing techniques.

Identifying Shared Accounts in Streaming Services | Course Project under *Prof. Srikanta Bedathur* *Fall 2019*

- Implemented Session-based Heterogeneous Embedding (Jiang et al *SIGIR'18*) to identify different users using the same account.
- Improved the performance of the model by the use of a novel formulation of loss function using KMeans++ Clustering.

Containerization over xv6 Operating System | Course Project under *Prof. Smruti R Sarangi* *Spring 2019*

- Implemented a user space implementation of containers over xv6, a UNIX-like educational Operating System.
- Implemented data structures and system calls in the kernel for maintaining resource and file isolation, and fair scheduling.
- Implemented virtual page tables and associated system calls to allow container processes to declare and use variables.

Person Counter and Display Device | *Supervisor: Prof. Subodh Kumar* *Summer 2017*

- Implemented real-time processing of images to count number of people in a room, using the Beaglebone microprocessor.
- Used multiple Haar cascade classifiers, applied on the same image, to counter the problem of occlusion.
- Conferred the *Design Innovation Summer Award* by the Ministry of Human Resource Development (Government of India).

Scholastic Achievements

- Awarded a **Departmental Scholarship** of USD3000 for the academic session 2020-21 at the UW-Madison.
- Secured **All India Rank 64** in Joint Entrance Exam Advanced - 2016 among 1.5 million applicants.
- Secured **All India Rank 61** in Kishore Vaigyanik Protasahan Yojana (KVPY) - 2015 conducted by IISc Bangalore.
- Secured **All India Rank 1** in FIITJEE Talent Reward Examination (FTRE) - 2014 conducted by FIITJEE Ltd.
- Conferred a nine-year scholarship on qualifying **National Talent Search Examination** (2012), conducted by NCERT.
- Qualified the **National Standard Examination** in Physics (NSEP) and Chemistry (NSEC) in 2016.

Teaching Experience

Teaching Assistant | Programming III, Department TA Position at UW-Madison *Fall 2020*

Teaching Assistant | Artificial Intelligence, offered by **Prof. Mausam** at IIT Delhi. *Fall 2019*

Relevant Courses

Systems

Operating Systems, Computer Networks, Relaxed Memory Concurrency, Special Module in High Speed Networks, Distributed Systems, Mobile and Wireless Networking, Datacenters

ML/AI

Artificial Intelligence, Machine Learning, Computer Vision, Information Retrieval, Reinforcement Learning

Positions of Responsibility

Class Convener | Elected among 104 students of 2016 Entry Computer Science Batch *April 2019 - July 2020*

Student Mentor | IIT Delhi *June 2018 - May 2019*

- Selected as Student Mentor to mentor six Computer Science Freshmen students. Also appointed as **Head Mentor**.