MANOJ P. SAHA

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SUMMARY

- Ph.D. candidate with experience in data indexing, flash storage devices, CXL-attached persistent memory, tiered-memory systems and machine learning (ML) systems.
- Research interests in computer systems, emerging memory and storage devices, and ML infrastructure.
- Dissertation Year Fellowship recipient possessing a blend of academic and industry research experience with a portfolio of publications and patent.

EDUCATION

Ph.D. in Computer Science Expected May, 2025
Florida International University, USA. CGPA: 4.0/4.0

M.S. in Computer Science
University of Texas at El Paso, USA. CGPA : 3.72/4.0

MBA (Marketing)
University of Dhaka, Bangladesh. CGPA: 3.56/4.0

B.S. in Electronic & Telecommunication Engineering
North South University, Bangladesh. CGPA: 3.53/4.0

PATENTS

- Manoj P. Saha, Janki Bhimani, "Systems and methods for optimizing data management within key value storage," U.S. Patent 11474699, Oct 2022.
- Manoj P. Saha, Somnath Roy, Benixon Arul Dhas, Harsh Roogi, "Efficient metadata management for large block volume," USPTO Application No. 63/702,803 (provisional), Oct 2024.

PUBLICATIONS

- Manoj P. Saha, Danlin Jia, Janki Bhimani, Ningfang Mi, "MoKE: Modular Key-value Emulator for Realistic Studies on Emerging Storage Devices," 2023 IEEE 16th International Conference on Cloud Computing, Chicago, USA (Hybrid), Jul 2023.
- Manoj P. Saha, Omkar Desai, Bryan S. Kim, Janki Bhimani, "Leveraging Keys In Key-Value SSD for Production Workloads," 32nd International Symposium on High-Performance Parallel and Distributed Computing, Orlando, USA, Jun 2023.
- Manoj P. Saha, Bryan Kim, Haryadi Gunawi, Janki Bhimani, "RHIK - Resizable Hash-based Indexing for KV-SSD," 32nd International Symposium on High-Performance Parallel and Distributed Computing, Orlando, USA, Jun 2023.
- Adnan Maruf, Daniel Carlson, Ashikee Ghosh, Manoj P. Saha, Raju Rangaswami, Janki Bhimani, "Allocation Policies Matter for Hybrid Memory Systems," 32nd International Symposium on High-Performance Parallel and Distributed Computing, Orlando, USA, Jun 2023.
- Manoj P. Saha, Adnan Maruf, Bryan S. Kim, Janki Bhimani, "KV-SSD: What is it Good For?," 58th Design Automation Conference, San Francisco, USA, Dec 2021.
- Janki Bhimani, Jingpei Yang, Ningfang Mi, Changho Choi, Manoj Saha, Adnan Maruf, "Fine-grained control of concurrency within KV-SSDs,", 14th ACM International Conference on Systems and Storage, Virtual, Jun 2021.
- Danlin Jia, Manoj P. Saha, Janki Bhimani, Ningfang Mi, "Performance and Consistency Analysis for Distributed Deep Learning Applications," 39th IEEE International Performance Computing and Communications Conference, Virtual, Nov 2020.
- MA Matin, MP Saha, HM Hasan, "Design of broadband patch antenna for WiMAX and WLAN," 2010 International Conference on Microwave and Millimeter Wave Technology, Chengdu, China, May 2010.

UPCOMING PUBLICATIONS AND PATENT

- Manoj P. Saha, Ashikee Ghosh, Raju Rangaswami, Janki Bhimani, Yanzhao Y, "Fragments: Do We Really Need Complete Model State for Fast Failure Recovery?," (writing on process)

- Manoj P. Saha, Ashikee Ghosh, Raju Rangaswami, Janki Bhimani, Yanzhao Yu, "Looking Beyond File I/O-based DNN Checkpointing," (writing on process).
- Manoj P. Saha, Christopher Kverne, Danlin Jia, Janki Bhimani, Ningfang Mi, "KVPack: Hybrid Indexing for KV-SSD," (writing on process).
- Manoj P. Saha, Omkar Desai, Janki Bhimani, Bryan S. Kim, "Key Prefix-based Indexing for KV-SSD," (patent discovery under process).
- Submission of 2 more papers related to CXL-attached persistent memory devices are also ongoing.

RESEARCH EXPERIENCE

Software Engineer, Intern May. 2024 - Aug. 2024
Samsung Semiconductor Inc.
- Designed a library to enhance CXL-attached persistent memory I/O performance and reduce contention in multi-threaded environments.
- Investigated and analyzed CXL-attached persistent memory I/O performance data to identify future research challenges.
- Proposed a novel indexing scheme to manage large logical volumes by leveraging CXL-attached persistent memory devices.

Graduate Assistant Aug. 2019 - present
Florida International University
- Project: Efficient checkpointing and versioning for ML workloads
  - Phase 1: Proposed a low latency, direct persistence checkpointing and versioning library for ML workloads by leveraging persistent memory devices (submitted to FAST 2024).
  - Phase 2: Designed a new checkpointing scheme for ML workloads to eliminate training stalls by leveraging how different layers learn (paper writing in progress).
- Project: Hybrid memory systems for Large Language Model (LLM) training
  - Explored optimization opportunities of Large Language Model (LLM) training and inference workloads using hybrid memory systems.
  - Evaluated performance of different allocation policies for hybrid memory systems using LLM workloads with various offload mechanisms of DeepSpeed Zero optimizer.
- Project: KV-SSD Emulator for in-storage indexing research
  - Phase 1: Designed a QEMU-based KV emulator with NVMe KV interface and data placement and garbage collection delay emulation. (IEEE CLOUD 2023).
  - Phase 2: Extended the KV emulator with support for in-storage index emulation to enable realistic studies on the emerging Key-Value storage devices (paper writing in-progress).
- Project: In-storage indexing for KV-SSD
  - Phase 1: Proposed a new resizable hash-based index for emerging Key-Value SSD devices (patented).
  - Phase 2: Designed a new scheme for improving I/O request handling performance by leveraging data hierarchy for Key-Value and Object storage devices (HPDC 2023).
- Project: SSD performance characterization
  - Collected and analyzed KV-SSD performance data to understand I/O behavior of emerging Key-Value Stack under a wide variety of workloads (DAC 2021).
  - Analyzed SSD performance under different temperature and humidity settings in the operating environment (FIU SCIS Tech Summit 2019).
- Project: Performance analysis of distributed deep learning training methods
  - Investigated the impact of different distributed deep neural network (DNN) training methods using parameter servers architecture.
  - Studied trade-off between accuracy and training time for different parameter distribution strategy and provided guidelines for deploying applications under different parameter server architectures (IPCCC 2020).

Research Assistant Sep. 2016 - Aug. 2018
University of Texas at El Paso
- Project: Dynamic word embeddings for different application domains
  - Developed unsupervised machine learning models to capture temporal information evolution.

- Built machine learning models to analyze the evolution of software security threats.
- Created corpus of news articles for natural language processing tasks.

ADDITIONAL EXPERIENCE

Teaching Assistant Aug. 2019 - April 2021
Florida International University
- Worked as a teaching assistant for different courses including Systems Programming and Programming I.
- Implemented semi-automatic grading infrastructure for programming assignments.

Teaching Assistant Sep. 2017 - May 2019
University of Texas at El Paso
- Graded coding assignments and assisted faculty in setting test questionnaire for different Computer Science courses including Computer Architecture and Data Structures.
- Taught multiple classes as substitute instructor in Data Structures and Automata courses.

** Also worked in different engineering and leadership roles in the telecommunications and digital marketing industry.

TECHNICAL SKILLS

General purpose programming: C/C++, Python, Java, JavaScript, PHP
Numerical programming: Darknet, TensorFlow, Keras, NumPy, Pandas, Matlab
Statistical programming: R, SAS
Database: SQL, RocksDB, Aerospike, MinIO
Misc. : Bash, Assembly, Git, LaTeX, MS Azure

OPEN-SOURCE PROJECTS

- **Google Play app crawler and dataset**
  Implemented web crawlers for large-scale data collection and built machine learning models to analyze sentiment in app reviews [1 citation]. github.com/manojps

COURSES

- **Computer Systems:** Data Storage Systems, Operating Systems
- **Artificial Intelligence:** Artificial Intelligence I, Data Mining, Deep Learning, Statistical Programming, Quantitative Analysis

AWARDS

- Dissertation Year Fellowship, Florida International University (2024)
- Anita Mochen Loya Graduate Engineering Fellowship, University of Texas at El Paso (2016)