Mohsen (Clay) Bagheri

Latest Update: October, 2024

Stony Brook University
Department Computer Science
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EDUCATION

MS/Ph.D. in Computer Science (Spring semester 2025 I will switch to PhD program) — Stony Brook University
Advisor: — *Fall, 2024 − Present*
GPA: "will be posted very soon"

Ph.D. in Computer Science "Transfer to Stony Brook Univ" — University of Nebraska-Lincoln
Advisor: Prof. Witawas Srisa-an — *May, 2023 − May, 2024*
GPA: 4.0 0ut of 4.0

M.Sc. in Computer Engineering (Computer Architecture) — IAU University
Advisor: Distinguished Prof. Hamid Sarbazi-Azad, Prof. Sam Jabbehdari — *Sep, 2016 − Dec, 2019*
GPA: 3.80 0ut of 4.0

B.Sc. in Computer Engineering (Computer Hardware) — Allameh Dehkhoda University
Advisor: Asst Prof. Karim Khazaei — *Jan, 2011 − Dec, 2015*
GPA: 3.75 0ut of 4.0

A.Sc.in Computer Engineering (Computer Hardware) — Allameh Dehkhoda University
Advisor: Asst Prof. Karim Khazaei — *Sep, 2007 − Dec, 2010*
GPA: 3.71 0ut of 4.0

AWARDS AND HONORS

DAC Young Fellows at the Design Automation Conference 61 (DAC)
Selected for the program, includes full conference registration and participation in fellow activities — *April 2024*

SOC (University of Nebraska-Lincoln)
$33,240 towards Graduate Teaching Assistantships — *Aug 2023*

Jeffrey S. Raikes School of Computer Science and Management (University of Nebraska-Lincoln)
$10,000 towards Graduate Research Assistantships — *May 2023*

SoC Full Tuition Scholarship (University of Nebraska-Lincoln)
Awarded $87,000 towards tuition, stipend, and travel — *Jan 2022*

National Science Foundation (NSF)
Awarded $1,200 Graduate Student Conference Travel Grants — *May 2022*

Ranked 10st in National University Entrance Exam
More than 4,292 students participated in the entrance exam for the doctoral. — *Sep 2021*

Achieved the Excellent mark for the Master's Thesis
Recognized for exceptional research and writing skills. — *Dec, 2019*

PUBLICATIONS

- **Mohsen Bagheri,** Tooska Dargahi, Ahmad Khonsari "FL-BAFL: Federated Learning for Secure Fraud Detection in Bank Accounts," IEEE Communications Letters,. (under review)

- Ahmed Danladi Abdullahi, **Mohsen Bagheri,** Tooska Dargahi, Ahmad Khonsari "Car Data Monetisation: Challenges, Opportunities and the Road Ahead," IEEEAccess,. (under review)

- **Mohsen Bagheri,** M Saed, M Sadrosadati, S. Jabbehdari, H. Sarbazi-Azad, "Efficient Modeling and Performance Evaluation of SSDs with 3D XPoint Technology," International Symposium on High-Performance Computer Architecture (HPCA), 2019. (Withdrawn)

TECHNICAL SKILLS

Programming Languages: Visual Basic, Pascal, C/C++, C#, VHDL, Python, Java

Database Systems: Microsoft SQL Server, MySQL, Oracle, PostgreSQL

Operating Systems: Windows, Windows Server, Linux

Networking: CCNA, CCNP, MCITP, Network+, Designing NSS, Routing & Switching, Network Security, Infrastructure & Operations, Monitoring & System Administration, HPE ATP-Server Solution V3

Digital & Embedded System Design: Verilog, Max+plus, Altium Designer, Orcad, ModelSim, PSpice, HSpice, Arduino (Sparkfun Pro RF −LoRa)

Application & Scientific Tools: Active Directory, Microsoft Project, Visual Studio, DiskSim, LaTeX, Microsoft Office, SPSS, LLVM, MQsim, 3D XPoint-Base MQSim, DSSAT v4.8, CRAFT v3.4

RESEARCH EXPERIENCE

Multi-cloud Hybrid GPU Clusters for AI Workloads with SUNY/IBM
Aug 2024 − Present

Department of Computer Science, Stony Brook University

- Developed predictive models to estimate the performance of AI/ML workloads across heterogeneous GPU clusters, including NVIDIA RTX series, optimizing workload placement for resource efficiency.
- Enhanced IBM's Autopilot system by developing additional modules to track critical metrics (GPU, CPU, and I/O performance) and improving anomaly detection and recommendation systems for AI infrastructure.
- Led the infrastructure setup, including installing OKD.io and Autopilot on Stony Brook's GPU clusters and maintaining a robust backup system for long-term AI workload analysis.

FL-BAFL: Federated Learning for Secure Fraud Detection in Bank Accounts
Aug 2023 − Dec 2023

School of Computing, University of Nebraska-Lincoln

- Developed a Federated Learning approach for secure fraud detection in the financial industry, maintaining data privacy.
- Addressed the challenges of selecting machine learning algorithms and establishing secure network infrastructures.
- Aimed to create a high-performance fraud detection model with strict data confidentiality applicable to various privacy-sensitive industries.

Examining Transformer Models for Approximate Computations Acceleration
Aug 2023 − Dec 2023

School of Computing, University of Nebraska-Lincoln

- Investigated the integration of approximate computations in Transformer models to reduce computational demands.
- Conducted extensive literature reviews and algorithm development for balancing computation speed and accuracy.
- Contributed insights for optimizing large-scale Transformer models in NLP and machine learning.

Integrating DSSAT Software with Custom API and UI for Agricultural Support
May 2023 − Aug 2023

Jeffrey S. Raikes School, University of Nebraska-Lincoln

- Enhanced agricultural decision-making support by integrating DSSAT software with a custom API and user interface.
- Conducted extensive system testing and debugging for reliable functionality.
- Facilitated accessible platform for agricultural stakeholders to leverage DSSAT software capabilities.

Covert Channel for Power Manipulation on GPU
May 2022 − Dec 2022

IPM - Institute for Research in Fundamental Sciences

- Explored creating covert channels through power manipulation in GPUs.
- Developed a method to modulate data via power consumption, detectable by external monitoring.

Modeling and Evaluating 3D XPoint Technology
Sep 2018 − Dec 2019

IPM - Institute for Research in Fundamental Sciences

- Developed a simulation framework for 3D XPoint technology, addressing architectural innovations and optimizations.

Scalable Directory for Many-Core Processors
Sep 2017 − Aug 2018

IPM - Institute for Research in Fundamental Sciences

- Introduced a scalable architecture for directories in many-core processors, reducing area overhead.

PROFESSIONAL EXPERIENCE

Graduate Teaching Assistant Aug 2024 - Present
Department Computer Science, Stony Brook University

- Advisor: Prof. Kevin McDonnell

Graduate Research Assistant May 2023 - May 2024
School of Computing, University of Nebraska-Lincoln

- Advisor: Prof. Witawas Srisa-an

Graduate Research Assistant May 2023 - Aug 2023
Jeffrey S. Raikes School of Computer Science and Management, University of Nebraska-Lincoln

- Advisor: Prof. Stephen Cooper
- Integrated DSSAT software with a custom API and UI for improved agricultural decision-making.
- Conducted extensive testing and debugging for reliable functionality.
- Created an accessible platform for stakeholders to leverage DSSAT software capabilities.

HPC Admin & Development Associate Sep 2016 - Feb 2023
IPM - HPC Laboratory

- Supervisor: Prof. Hamid Sarbazi-Azad
- Managed and maintained high-performance computing infrastructure.
- Optimized system performance and providing user support and training.
- Engaged in research and development for advanced HPC technologies.

Graduate Research Assistant Sep 2016 - Dec 2020
IPM - Institute for Research in Fundamental Sciences

- Advisor: Prof. Hamid Sarbazi-Azad
- Focused on modeling and evaluating Solid-State Drive using 3D XPoint Technology.

TEACHING EXPERIENCE

CSE 220: Systems Fundamentals I Fall 2024
Graduate Teaching Assistant

- Department of Computer Science, Stony Brook University
- Responsibilities: Assisted with course design, delivered lectures, held office hours, answered email/newsgroup queries, and graded homework and exams.

CSCE-235: Discrete Mathematics Spring 2024
Graduate Teaching Assistant

- School of Computing, University of Nebraska-Lincoln
- Responsibilities: Assisted with course design, delivered lectures, held office hours, answered email/newsgroup queries, and graded homework and exams.

CSCE-438/838: Internet of Things (IoT) Fall 2023
Graduate Teaching Assistant

- School of Computing, University of Nebraska-Lincoln
- Same responsibilities as other courses, with a focus on IoT systems and applications.

CSCE-462/862: Communication Networks Fall 2023
Graduate Teaching Assistant

- School of Computing, University of Nebraska-Lincoln
- Responsibilities: Assisted with course materials, held office hours, and graded exams and assignments.

CSCE-322: Programming Language Fall 2023
Graduate Teaching Assistant

- School of Computing, University of Nebraska-Lincoln
- Responsibilities: Assisted with lectures and assignments, conducted office hours, and responded to student queries.

ECE-9801: Parallel Processing
Fall 2018
Graduate Teaching Assistant
- School of Electrical and Computer Engineering, IAU University
- Responsibilities: Assisted with course design, delivered lectures, held office hours, and evaluated homework and exams.

ECE-9701: Architecture of Data Storage Systems
Fall 2018
Graduate Teaching Assistant
- School of Electrical and Computer Engineering, IAU University
- Responsibilities: Provided support in course design, lecturing, and grading; assisted students during office hours.

ECE-9601: Advanced Computer Architecture
Fall 2017
Graduate Teaching Assistant
- School of Electrical and Computer Engineering, IAU University
- Responsibilities: Assisted with course material development, delivered lectures, and handled student assessments.

ACADEMIC PROJECTS

Implementation of a Modified Paxos Consensus Protocol for Distributed Banking System
Oct 2024
Department of Computer Science, Stony Brook University
- Designed and implemented a distributed banking application using a group of servers, ensuring fault tolerance through a modified Paxos consensus protocol.
- Developed leader election and consensus mechanisms to synchronize transactions across multiple servers, ensuring consistency and reliability even with concurrent failures.
- Enhanced performance by optimizing the Paxos protocol to reduce latency and improve transaction throughput under conditions of server failure or resource contention.

Exploratory Data Analysis of New York Stock Exchange Data
Sep 2024
Department of Computer Science, Stony Brook University
- Analyzed daily stock prices and company fundamentals from the Kaggle NYSE dataset using time series analysis and correlation matrices for pairs trading.
- Developed regression models to predict earnings per share (EPS) and optimized model performance through data normalization and parameter tuning.
- Applied exploratory data analysis techniques to uncover trends and insights, improving the understanding of stock market movements.

Design and Implementation of a Virtual Memory Manager
May 2024
School of Computing, University of Nebraska-Lincoln
- Designed and implemented a virtual memory manager using a simulated 65,536-byte address space, managing translations with a TLB and implementing FIFO and LRU page replacement algorithms to optimize memory utilization.
- Configured memory management unit to handle logical-to-physical address translations, integrating efficient page fault handling mechanisms by simulating a backing store with dynamic data retrieval.
- Developed performance metrics for memory operations, tracking TLB hit rates and page fault frequencies to enhance memory operation efficiency.

Implementation of a Time-Sharing Scheduler Using Signals
Apr 2024
School of Computing, University of Nebraska-Lincoln
- Developed a round-robin scheduler to manage multiple threads in a simulated time-sharing system using POSIX signals, interval timers, and a scheduling algorithm.
- Engineered signal handling for thread suspension, resumption, and termination, ensuring efficient context switching and responsiveness.
- Integrated a custom timer mechanism to dispatch SIGALRM for managing time quanta and implemented robust signal handling strategies for efficient thread lifecycle management.

Implementation of Synchronization Constructs for Thread Management
Mar 2024
School of Computing, University of Nebraska-Lincoln
- Developed and optimized a multi-threaded producer-consumer model using POSIX semaphores to manage concurrency, ensuring deadlock-free and race condition-free operations.
- Implemented a monitor-based synchronization mechanism to facilitate safe and efficient inter-thread communication, enhancing system reliability.

- Utilized advanced synchronization constructs, including mutexes, semaphores, and monitors, to effectively manage critical sections and thread lifecycles.

Unix Shell Interface Development with Advanced IPC Mechanisms   Feb 2024
School of Computing, University of Nebraska-Lincoln

- Engineered a Unix shell in C/C++ with process forking (fork()), program execution (exec()), and process synchronization (wait()), handling command execution in isolated processes.
- Extended shell functionality to include interprocess communication via pipes (pipe()), enabling complex command chaining similar to Unix shell operations.
- Developed comprehensive error handling for malformed command inputs and implemented a batch command testing framework to verify shell behavior.

DISSERTATION

"Modeling and Evaluation of Solid-State Drive using 3D XPoint Technology"   Fall 2019
Master of Science Dissertation, IAU University

PROFESSIONAL SERVICE

Artifact Evaluation Committee, EuroSys'25   Jul 2024 - Present
20th European Conference on Computer Systems (EuroSys)

Vice Chair of the Nebraska IEEE Computer Section   Jan 2024 - May 2024
Institute of Electrical and Electronics Engineers (IEEE)

Teaching Assistant Grad Committee Representative   Sep 2023 - May 2024
School of Computing, University of Nebraska-Lincoln

Artifact Evaluation Committee, ASPLOS'24   Jul 2023 - May 2024
ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)

Computing Student Advisory Board (cSAB)   Feb 2023 - May 2024
School of Computing, University of Nebraska-Lincoln

Organizing Committee, IPM Third National Informatics Conference   13-14 Jan 2022
School of Computer Science, IPM

Organizing Committee, 9th IPM International Conference on Fundamentals of Software Engineering   19-21 May 2021
School of Computer Science, IPM

Organizing Committee, IPM Second National Informatics Conference   23-24 Dec 2020
School of Computer Science, IPM

Organizing Committee, IPM First National Informatics Conference   15-16 Dec 2019
School of Computer Science, IPM

Organizing Committee, IPM ThNov 30vanced School on Computing: Computer Architecture   24-28 Aug 2019
School of Computer Science, IPM

Organizing Committee, 8th IPM International Conference on Fundamentals of Software Engineering   1-3 May 2019
School of Computer Science, IPM

IEEE Student Branch Committee Representative   Sep 2018 Sep 2020
IAU University

Organizing Committee, IPM Advanced Data Science Summer School   18-23 Aug 2018
School of Computer Science, IPM

Organizing Committee, IPM Elementary Data Science Summer School   30 Jun - 5 Jul 2018
School of Computer Science, IPM

Organizing Committee, 7th IPM-HPC Workshop on Multi-core Systems and GPU in HPC   14-15 Feb 2018
School of Computer Science, IPM

Organizing Committee, IPM Data Science Day   Nov 30 2017
School of Computer Science, IPM

Organizing Committee, 7th IPM International Conference on Fundamentals of Software Engineering   26-28 Apr 2017
School of Computer Science, IPM

Organizing Committee, Multi-Core Programming and Big Data   23-24 Feb 2017
School of Computer Science, IPM

PROFESSIONAL AFFILIATIONS

Member of the Institute of Electrical and Electronics Engineers (IEEE) Since 2018

- Membership Number: 94946331
- IEEE Region R4 Central USA - Active
- IEEE Young Professionals - Active
- IEEE Computer Society Membership - Active
- Active Participant in Hardware Technology Conferences and Workshops.

Member of the Association for Computing Machinery (ACM) Since 2023

- Membership Number: 8677713
- SIGARCH Online Membership Group on Computer Architecture - Active
- Active participant in hardware technology conferences and workshops.

CERTIFICATIONS

Certificate of Appreciation - ASPLOS'24 April, 2024
For excellent service in all three cycles of ASPLOS'24 Artifact Evaluation

Certified in Risk Management Aug 7, 2019
Industrial Management Institute

Certified in Project Management Jul 4, 2019
Industrial Management Institute

Cisco Certified Network Professional (CCNP) May 15, 2018
Cisco Systems (Industrial Management Institute)

Cisco Certified Network Associate (CCNA) Apr 12, 2017
Cisco Systems (Industrial Management Institute)

Microsoft Certified IT Professional (MCITP) Jun 20, 2016
Microsoft (Industrial Management Institute)

CompTIA Network+ Mar 11, 2015
CompTIA (Industrial Management Institute)

Hewlett Packard Enterprise Accredited Technical Professional - Server Solution V3 (HPE ATP-Server Solution V3) Feb 9, 2014
Hewlett Packard Enterprise

Oracle Certified Professional/MySQL Database Administrator Oct 22, 2013
Oracle Corporation/MySQL AB (Industrial Management Institute)

Microsoft Certified: SQL Server [specific certification] Aug 18, 2012
Microsoft (Industrial Management Institute)

Microsoft Certified Solutions Expert (MCSE): [specific track] Sep 10, 2011
Microsoft (Industrial Management Institute)

Linux Professional Institute Certification (LPIC) Nov 5, 2010
Linux Professional Institute (Industrial Management Institute)

Certified in Information Technology Infrastructure Library (ITIL) Dec 5, 2009
AXELOS Limited (Industrial Management Institute)

LANGUAGES

Persian: Native Proficiency
English: TOEFL iBT Overall Score: 110 out of 120

- Reading: 30
- Listening: 30
- Speaking: 20
- Writing: 30

GRE: Overall Score: 339 out of 340

- Verbal Reasoning: 169 (99th percentile)
- Quantitative Reasoning: 170 (94th percentile)
- Analytical Writing: 5.0 (94th percentile)

REFERENCES

References are available upon request.

Statement of Purpose

I am applying to pursue a Ph.D. in Computer Science at Columbia University because of my passion for advancing academic knowledge and my commitment to using technology as a force for social good. Columbia's distinguished faculty and groundbreaking research align with my career goals of becoming a university professor and making meaningful contributions to the field of computer science.

My journey in computer science began during my undergraduate studies at Allameh Dehkhoda University, where I became captivated by the complexity of designing efficient computing systems. This early fascination soon developed into a passion for solving practical problems, particularly in the areas of AI and IoT. My technical interests have grown through my academic career, and my master's work at IAU University, under the supervision of Distinguished Professors Hamid Sarbazi-Azad and Sam Jabbehdari, focused on the simulation and refinement of Intel's 3D XPoint technology. These experiences strengthened my desire to continue pushing the boundaries of computing, and I am eager to explore system optimizations further through Columbia's Ph.D. program.

Growing up in a multicultural community, I experienced firsthand the disparities in access to technology and education, which deeply influenced my desire to create inclusive technological solutions. My family, despite facing economic constraints, instilled in me a strong belief in the power of education. This upbringing, combined with my personal experiences, has shaped my commitment to making higher education accessible to underrepresented groups. I see technology as a tool to bridge gaps, and I want to apply my skills to empower marginalized communities.

Throughout my academic journey, I've had the opportunity to apply my knowledge through various research roles and projects. Currently, as a Graduate Assistant at Stony Brook University, I am engaged in research on multi-cloud hybrid GPU clusters for AI workloads in collaboration with SUNY/IBM. My work involves developing predictive models for optimizing workload placement and enhancing IBM's Autopilot system, which has deepened my research abilities and prepared me for the rigorous challenges of a doctoral program. Prior to this, I contributed to several research projects at the University of Nebraska-Lincoln, including developing federated learning models for secure fraud detection and exploring approximate computations in Transformer models.

Teaching has also played a significant role in my development as both a student and a future educator. My teaching assistant roles at Stony Brook University and the University of Nebraska-Lincoln have given me the opportunity to mentor students in courses ranging from Systems Fundamentals I to

Discrete Mathematics, Communication Networks, Programming Language, and IoT systems. Mentoring students and contributing to the academic community has reinforced my commitment to pursuing a career in academia, where I can continue to guide and inspire future technologists.

What excites me most about Columbia's Ph.D. program is its strong focus on interdisciplinary collaboration and access to cutting-edge research in areas like Computer architecture, AI, machine learning, and systems optimization. I am particularly interested in the work being done by faculty members who are pioneers in these areas, and I look forward to contributing to this vibrant research environment.

Upon completing my Ph.D., I aim to continue my work in academia as a professor, where I can both innovate and mentor the next generation of computer scientists. My ultimate goal is to drive technological advancements that have a lasting impact on society while ensuring that education in this field remains accessible to all.

Thank you for considering my application. I am excited about the opportunity to contribute to and grow within Columbia's esteemed academic community.

Sincerely,
Mohsen "Clay" Bagheri