

Mehmet Esat Belviranli

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Research Interests

- Diversely heterogeneous architectures, performance & resource modeling, constraint-aware computing for autonomous systems, machine learning acceleration, parallel programming paradigms, runtime systems, performance modeling for future compute systems.

Education

- **University of California, Riverside** Riverside, CA
Doctor of Philosophy in Computer Science and Engineering *Sep. 2009 - Sep. 2016*
Thesis: Efficient Execution of Scientific Applications on Heterogeneous Architectures
Advisor: Prof. Laxmi N. Bhuyan
- **Bilkent University** Ankara, Turkey
Master of Science in Computer Science and Engineering *Sep. 2006 - Aug. 2009*
Thesis: A Circular Layout Algorithm for Clustered Graphs
Advisor: Prof. Ugur Dogrusoz
- **Bilkent University** Ankara, Turkey
Bachelor of Science in Computer Science and Engineering *Sep. 2001 - May 2006*

Work Experience

- **Colorado School of Mines** Golden, CO
Assistant Professor, Computer Science Department *Aug. 2019 - Current*
- **Oak Ridge National Laboratory** Oak Ridge, TN
Computer Scientist, Computer Science and Mathematics Division *Dec. 2018 - Aug. 2019*
Supervisor: Dr. Jeffrey S. Vetter
- **Oak Ridge National Laboratory** Oak Ridge, TN
Postdoctoral Research Associate, Computer Science and Mathematics Division *Nov. 2016 - Nov. 2018*
Mentor: Dr. Jeffrey S. Vetter
- **University of California, Riverside** Riverside, CA
Research Assistant, Computer Science and Engineering Department *Sep. 2010 - Sep. 2016*
Advisor: Prof. Laxmi N. Bhuyan
- **Samsung Information Systems America** San Jose, CA
Processor Architect Intern, Advanced Processor Lab *Jun. 2013 - Sep. 2013*
Mentor: Dr. Sung-Soo Park
- **Tom Sawyer Software** Oakland, CA
Software Engineer *Aug. 2007 - Jul. 2008*
Manager: Dr. Brett Zane-Ulman

Peer-Reviewed Publications

Journals

- J1. Fareed Qararyah, Mohamed Wahib, Doğa Dikbayır, [Mehmet E. Belviranli](#), Didem Unat, “A computational-graph partitioning method for training memory-constrained DNNs,” *Parallel Computing (PARCO)*, 2021.
- J2. [Mehmet E. Belviranli](#), Laxmi N. Bhuyan, and Rajiv Gupta, “A Dynamic Self-Scheduling Scheme for Heterogeneous Multiprocessor Architectures,” *ACM Transactions on Architecture and Code Optimization (TACO)*, January 2013.
- J3. Ugur Dogrusoz, [Mehmet E. Belviranli](#), and Alptug Dilek, “CiSE: A Circular Spring Embedder Layout Algorithm,” *IEEE Transactions on Visualization and Computer Graphics*, June 2013.
- J4. Alptug Dilek, [Mehmet E. Belviranli](#), and Ugur Dogrusoz, “VISIBIOweb: Visualization and Layout Services for BioPAX Pathway Models,” *Nucleic Acids Research*, July 2010.

Conferences

- C1. Justin McGowen, Ismet Dagli, Neil Dantam [Mehmet E. Belviranli](#), “Scheduling for Cyber-Physical Systems with Heterogeneous Processing Units under Real-World Constraints,” *ACM International Conference on Supercomputing (ICS)*, June 2024.
- C2. Amid Morshedlou, Ismet Dagli, Jamal Rostami, Omid Moradian, [Mehmet E. Belviranli](#), “Enhancing Reliability and Safety in Rock Excavation Using A Machine Learning Approach Through Wear Condition Identification” 58th US Rock Mechanics/Geomechanics Symposium ARMA, June 2024
- C3. Amid Morshedlou, Ismet Dagli, Austin Olltmans, Andrew Petruska, Mehmet Belviranli, Jamal Rostami, “Enhancing Safety Using Energy-Efficient Machine Learning Algorithms Through Prediction of Rock Type and Cutter Wear” Society for Mining, Metallurgy & Exploration: Annual Conference & EXPO, SME Annual Conference - MINEXCHANGE, February 2024
- C4. Justin Davis, and [Mehmet E. Belviranli](#), “Context-aware Multi-Model Object Detection for Diversely Heterogeneous Compute Systems,” *IEEE Design, Automation & Test in Europe Conference & Exhibition (DATE)*, March 2024. [Outstanding Paper Award]
- C5. Ismet Dagli, [Mehmet E. Belviranli](#), “Shared Memory-contention-aware Concurrent DNN Execution for Diversely Heterogeneous SoCs,” *ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP)*, February 2024.
- C6. Jedidiah McClurg, Miles Claver, Jackson Garner, Jordan Schmerge, Jake Vossen and [Mehmet E. Belviranli](#), “Optimizing Regular Expressions via Rewrite-Guided Synthesis,” *31st International Conference on Parallel Architectures and Compilation Techniques (PACT)*, October 2022.
- C7. Ismet Dagli, Alexander Cieslewicz, Jedidiah McClurg [Mehmet E. Belviranli](#), “AxoNN: Energy-Aware Execution of Neural Network Inference on Multi-Accelerator Heterogeneous SoCs,” *Proceedings of 59th ACM/IEEE Design Automation Conference (DAC)*, July 2022.
- C8. Yuanchao Xu, [Mehmet E. Belviranli](#), Xipeng Shen, Jeffrey S. Vetter, “PCCS: Processor-Centric Contention-aware Slowdown Model for Heterogeneous System-on-Chips,” *Proceedings of the 54th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO)*, October 2021.
- C9. Mohammad Monil, [Mehmet E. Belviranli](#), Seyong Lee, Malony Allen, and Jeffrey S. Vetter, “MEPHESTO: Modeling Energy-Performance in Heterogeneous SoCs and Their Trade-Offs,” *2020 International Conference on Parallel Architectures and Compilation Techniques (PACT)*, September 2020.
- C10. [Mehmet E. Belviranli](#), and Jeffrey S. Vetter, “FLAME: Graph-based Hardware Representations for Rapid and Precise Performance Modeling,” *IEEE Design, Automation & Test in Europe Conference & Exhibition (DATE)*, March 2019.

- C11. Pak Markthub, [Mehmet E. Belviranli](#), Seyong Le, Jeffrey S. Vetter, and Satoshi Matsuoka, “DRAGON: Breaking GPU Memory Capacity Limits with Direct NVM Access,” *ACM/IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis (SC)*, November 2018.
- C12. [Mehmet E. Belviranli](#), Seyong Lee, and Jeffrey S. Vetter, “Designing Algorithms for the EMU Migrating-threads-based Architecture,” *IEEE High Performance Extreme Computing Conference (HPEC)*, September 2018. [[Best Paper Finalist](#)]
- C13. [Mehmet E. Belviranli](#), Seyong Lee, Jeffrey S. Vetter, and Laxmi N. Bhuyan, “Juggler: A Dependency-Aware Task Based Execution Framework for GPUs,” *ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP)*, February 2018.
- C14. Amir A. Abdolrashidi, Devashree Tripathy, [Mehmet E. Belviranli](#), Daniel Wong, and Laxmi N Bhuyan, “Wireframe: Supporting Data-dependent Parallelism through Dependency Graph Execution in GPUs.,” *IEEE/ACM International Symposium on Microarchitecture (MICRO)*, October 2017.
- C15. [Mehmet E. Belviranli](#), Farzad Khorasani, Laxmi N. Bhuyan, and Rajiv Gupta, “CuMAS: Data Transfer Aware Multi-Application Scheduling for Shared GPUs,” *ACM International Conference on Supercomputing (ICS)*, June 2016.
- C16. Farzad Khorasani, [Mehmet E. Belviranli](#), Rajiv Gupta, and Laxmi N. Bhuyan, “Stadium Hashing: Scalable and Flexible Hashing on GPUs,” *IEEE International Conference on Parallel Architectures and Compilation Techniques (PACT)*, October 2015.
- C17. [Mehmet E. Belviranli](#), Peng Deng, Laxmi N Bhuyan, Rajiv Gupta, and Qi Zhu, “PeerWave: Exploiting Wavefront Parallelism on GPUs with Peer-SM Synchronization,” *ACM International Conference on Supercomputing (ICS)*, June 2015.
- C18. Chih H. Chou, [Mehmet E. Belviranli](#), and Laxmi N. Bhuyan, “Thermal Prediction and Scheduling of Network Applications on Multicore Processors,” *ACM/IEEE Symposium on Architectures for Networking and Communications Systems (ANCS)*, October 2013.

Workshops

- W1. H. Umut Suluhan, Serhan Gener, Alexander Fusco, Joshua Mack, Ismet Dagli, [Mehmet E. Belviranli](#), Cagatay Edemen, Ali Akoglu, “A Runtime Manager Integrated Emulation Environment for Heterogeneous SoC Design with RISC-V Cores,” *Heterogeneity in Computing Workshop (HCW)*, May 2024.
- W2. Ben Wagley, Pak Markthub, James Crea, Bo Wu, and [Mehmet E. Belviranli](#), “Exploring Page-based RDMA for Irregular GPU Workloads. A case study on NVMe-backed GNN Execution,” *The 16th Workshop on General Purpose Processing Using GPU (GPGPU, co-located with PPoPP)*, February 2024.
- W3. Ismet Dagli, Andrew Depke, Andrew Mueller, Md Sahil Hassan, Ali Akoglu, and [Mehmet E. Belviranli](#), “Exploring Page-based RDMA for Irregular GPU Workloads. A case study on NVMe-backed GNN Execution,” *Proceedings of the 3rd Workshop on Flexible Resource and Application Management on the Edge (FRAME)*, August 2023.
- W4. Justin McGowen, Ismet Dagli, [Mehmet E. Belviranli](#), Neil Dantam; “Representations for Scheduling of Heterogeneous Computation to Support Motion Planning”; Implicit Representations for Robotic Manipulation RSS Workshop 2022
- W5. Ismet Dagli, [Mehmet E. Belviranli](#), “Exploration of Multi-Accelerator Neural Network Inference in Diversely Heterogeneous Embedded Systems,” *Redefining Scalability for Diversely Heterogeneous Architectures (RSDHA, co-located with SC)*, November 2021.
- W6. [Mehmet E. Belviranli](#), Weize Yu, and Selcuk Kose, “Ultra-Fine Grain Power Management at Datapath-Level: Fact or Fiction,” *ACM International Conference on Architectural Support for Programming Languages and Operating Systems - Wild and Crazy Ideas Session (ASPLOS - WACI)*, January 2015.
- W7. [Mehmet E. Belviranli](#), Chih Hsun Chou, Laxmi N. Bhuyan, and Rajiv Gupta, “A Paradigm Shift in GP-GPU Computing: Task Based Execution of Applications with Dynamic Data Dependencies,” *Sixth International Workshop on Data Intensive Distributed Computing (DIDC, co-located with HPDC)*, January 2014.

Posters

- P1. Justin McGowen, Ismet Dagli, Neil Dantam Mehmet E. Belviranli, “Constraint-aware Resource Management for Cyber-physical Systems,” *IEEE Design, Automation & Test in Europe Conference & Exhibition (DATE)*, March 2024.
- P2. Ismet Dagli, Mehmet E. Belviranli, “H-EYE: Holistic Performance Modeling for Diversely Scaled Systems,” *ACM Student Research Competition (SRC) at International Symposium on Code Generation and Optimization (CGO)*, March 2024. [Finalist, 3rd place]
- P3. Ismet Dagli, Mehmet E. Belviranli, “HaX-CoNN : Heterogeneity-aware Execution of Concurrent Deep Neural Networks,” *ACM Student Research Competition (SRC) at IEEE/ACM International Symposium on Microarchitecture (MICRO)*, October 2022. [Finalist, 3rd place]
- P4. Guilherme Prado Alves, Marco Minutoli, Mehmet E. Belviranli, Antonino Tumeo, “Breadth-First Search on Xilinx Versal,” *ACM/IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis (SC)*, November 2021.
- P5. Mehmet E. Belviranli, Seyong Lee, and Jeffrey S. Vetter, “Programming the EMU Architecture: Algorithm Design Considerations for Migratory-Threads-Based Systems,” *ACM/IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis (SC)*, November 2018.
- P6. Pak Markthub, Mehmet E. Belviranli, Seyong Le, Jeffrey S. Vetter, and Satoshi Matsuoka, “Efficiently Extending GPU Addressable Memory with NVM,” *NVIDIA GPU Technology Conference (GTC)*, March 2018.
- P7. Cagri Aksay, Fatma Arik, Esra Ataer, Asli Ayaz, Ozgun Babur, Mehmet E. Belviranli, Ahmet Cetintas, Emek Demir, and Ugur Dogrusoz, “PATIKAweb: A Web Service for Querying, Visualizing, and Analyzing a Graph Based Pathway Database,” *Intelligent Systems for Molecular Biology (ISMB)*, June 2005.

Grants and Fellowships

- **DoE Award:** Modeling the Memory-Compute Gap in Large-scale Superconductive Systems (Role: Co-PI. Total amount: 400,000 USD)
- **NSF Award:** Atomically Precise Graphene Nanoribbon-based Transistors: Materials, Devices, Circuits, and Systems. Role: Co-PI. Total amount: 366,000 USD
- **SRC Award:** Smarter Nanoelectronics with Atomically Precise Graphene Nanoribbons . Role: Co-PI. Total amount: 391,000 USD
- **NSF Award:** FMitF: Track I: Robust Enforcement of Customizable Resource Constraints in Heterogeneous Embedded Systems. Role: PI. Total amount: 750,000 USD
- U.S. Air Force Research Lab Summer Faculty Fellowship Award for Summer 2022
- U.S. Air Force Research Lab Summer Faculty Fellowship Award for Summer 2021

Teaching and Mentoring Experience

- **Teaching** Colorado School of Mines
CSCI-582 Computing beyond CPUs, CSCI-442 Operating Systems Fall’19 - Present
- **Mentoring** Oak Ridge National Laboratory
Mentored five Ph.D. students via ORNL/ORISE-ASTRO internship program Spring’17, Summer’17, Spring’18, Summer’18
- **Co-Lecturer & Teaching Assistant** University of California, Riverside
Parallel Processing Architectures Spring’14, Spring’15, > 30 students
Advanced Computer Architecture Fall’13, > 30 students
Design and Architecture of Computer Systems Spring’15, > 30 students
- **Teaching Assistant** Bilkent University, Ankara, Turkey
Object Oriented Software Engineering Spring’09, > 100 students
Algorithms and Programming Fall’08, > 100 students

Professional Activities and Service

- Organizing committee:
 - Redefining Scalability for Diversely Heterogeneous Architectures (RSDHA), 2021, 2022, 2023 Collocated with SC, Role: *Organizer*
 - IEEE International Symposium on Smart Electronic Systems (ISES), 2021, Role: *Co-chair for Hardware/Software for Vehicular Intelligent Systems track*
 - Principles and Practice of Parallel Programming (PPoPP), 2020, Role: *Local PC-meeting co-chair*
 - International Conference on Supercomputing (ICS), 2015, Role: *Publications and web chair*
- Program committee member
 - The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC'23, SC'24)
 - IEEE International Parallel & Distributed Processing Symposium (IPDPS), 2023
 - Design Automation Conference (DAC), 2023
 - Design Automation Conference (DAC), 2022
 - ISC High Performance (ISC), 2022
 - International Conference on Parallel Processing (ICPP), 2022
 - IEEE International Parallel & Distributed Processing Symposium (IPDS), 2022
 - ACM/IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis (SC), 2021 — Grad student poster and BoF
 - International Conference on Parallel Processing (ICPP), 2021
 - IEEE International Parallel & Distributed Processing Symposium (IPDS), 2021
 - International Conference on Parallel Processing (ICPP), 2020
 - Principles and Practice of Parallel Programming (PPoPP), 2020
 - ACM/IEEE System Level Interconnect Prediction Workshop (SLIP), 2019
 - IEEE Computer Society Annual Symposium on VLSI (ISVLSI) Student Research Competition, 2019
 - ISC High Performance (ISC), 2019
 - Principles and Practice of Parallel Programming (PPoPP) Artifact Evaluation, 2018
- External reviewer
 - International Conference on Parallel Architectures and Compilation Techniques (PACT), 2019
- External reviewer
 - Journals: TPDS, TACO, JPDC, PARCO, JETCS, CCPE
 - Conferences: ASPLOS, ISCA, MICRO, IPDPS, EURO-PAR
- Served at 4 NSF Panels (2022-2024).
- Lab-level point of contact and reviewer for DoE- Exascale Computing Project (ECP) Pathforward Program, 2017-2019
- Served as mentor in SC Mentor-Protege program, 2018, 2019, 2020
- Mentored 5 Ph.D. students under Oak Ridge Institute for Science and Education program, 2016-current
- Professional societies
 - Member, IEEE
 - Member, ACM

Awards

- Outstanding paper award at the DATE'24 Autonomous Systems Design (ASD) initiative, 2024.
- Ph.D. student, Ismet Dagli, placed in top 3 at the CGO Student Research Competition (SRC), 2024
- Ph.D. student, Ismet Dagli, placed in top 3 at the MICRO Student Research Competition (SRC), 2022
- Best research poster award at Computing-Mines Affiliates Partnership Program (C-MAPP), 2022
- Best research poster runner-up award at Computing-Mines Affiliates Partnership Program (C-MAPP), 2022

- Colorado School of Mines tech fee proposal award for heterogeneous computing class, 2020
- Xilinx equipment and license donation, 2020
- Oak Ridge National Laboratory (ORNL) Significant Event Award, 2019
- Best Paper Finalist in IEEE High Performance Extreme Computing Conference, 2018
- 1st year graduate fellowship awarded by University of California, Riverside, 2009
- Full scholarship and stipend awarded by Bilkent University, Ankara, Turkey, 2001-2006
- Outstanding success in national university entrance exam:
 - 89th over 1.5 million candidates, Turkey, 2001
- Abroad Undergraduate Education Fellowship by Turkish Government, Turkey, 2001