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, embedded and mobile system security.

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 Architure and Code Optimzation (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. Ismet Dagli, Justin Davis, Mehmet E. Belviranli, "HARNESS: Holistic Resource Management for Diversely Scaled Edge Cloud Systems," *ACM International Conference on Supercomputing (ICS)*, June 2025.

C2. Ismet Dagli, James Crea, Soner Seckiner, Yuanchao Xu, Selcuk Kose, Mehmet E. Belviranli, "MC3: Memory Contention based Covert Channel Communication on Shared DRAM System-on-Chips," *IEEE Design, Automation & Test in Europe Conference & Exhibition (DATE)*, March 2025.

C3. 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.

C4. 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

C5. 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

C6. 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 in Autonomous System Design]

C7. 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.

C8. 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.

C9. 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.

C10. 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.

C11. 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.

C12. 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.

C13. 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.

C14. 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]

C15. 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.

C16. 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.

C17. 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.

C18. 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.

C19. 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.

C20. 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

- **DoD - Microelectronics Commons:** SMILE: Semiconductor Manufacturing via Innovative Learning Experience. Role: Co-PI. Total amount: 200,000 USD. Duration: 1 year.
- **NSF Award:** Collaborative Research: SaTC: CORE: Small: Exploration of Shared Memory Related Security Challenges in Mobile Computing Platforms. Role: PI. Total amount: 600,000 USD
- **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:
  – International Conference on Supercomputing (ICS), 2025, Role: *Workshops and Tutorials Chair*
  – 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), 2023, 2024
  – IEEE International Parallel & Distributed Processing Symposium (IPDPS), 2023
  – Design Automation Conference (DAC'22, DAC'23)
  – 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
- 1^{st} 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:
  - 89^{th} over 1.5 million candidates, Turkey, 2001
- Abroad Undergraduate Education Fellowship by Turkish Government, Turkey, 2001