ARYAN DESHWAL

aryandeshwal.github.io • aryan.deshwal@wsu.edu

EDUCATION

Ph.D. Student, Computer Science, 4.0 GPA   **2018–Present**
Washington State University   *Pullman, Washington*

MS, Computer Science   **2018–2020**
Washington State University   *Pullman, Washington*
Thesis: A Learning to Search Framework for Multi-Objective Optimization of Manycore Systems Design

Bachelor of Technology, Mathematics and Computing   **2013–2017**
Delhi Technological University   *New Delhi, India*

RESEARCH EXPERIENCE

Research Assistant   **August 2018–Present**
EECS Department, Washington State University   *Pullman, Washington*
Advisor: Prof. Jana Doppa

Undergraduate Research Intern   **June 2017–August 2017**
Department of Biotechnology, I.I.T. Roorkee   *Roorkee, India*

TEACHING EXPERIENCE

Teaching Assistant
EECS Department, Washington State University   *Pullman, Washington*

- CptS 570: Introduction to Machine Learning (Fall-2019)

INDUSTRIAL EXPERIENCE

Research Intern   **May 2021–August 2021**
Google Brain - Vizier Team

Research and Development Engineer   **October 2017–May 2018**
Works Applications   *Tokyo, Japan*

Software Engineering Intern   **June 2016–August 2016**
Samsung   *Bengaluru, India*

AWARDS AND HONORS

- Top Reviewer Award, International Conference on Machine Learning (ICML), 2021

- Outstanding Reviewer Award, International Conference on Learning Representations (ICLR), 2021

- Top Reviewer Award, International Conference on Machine Learning (ICML), 2020

- Outstanding Innovation in Technology Award (for my MS Dissertation), WSU, 2020

- GPSA Graduate Research Assistant Excellence Award, Washington State University, 2020

- Outstanding Teaching Assistant in Computer Science, College of Engineering, WSU, 2020

- Outstanding Teaching Assistant in Computer Science, School of EECS, WSU, 2020

- Mahmoud Dillsi Graduate Fellowship, 2020

- Alfred Suksdorf Fellowship, Washington State University, 2018-2020

PUBLICATIONS

Conference Papers

1. **Aryan Deshwal**, Janardhan Rao Doppa. Combining Latent Space and Structured Kernels for Bayesian Optimization over Combinatorial Spaces. *Thirty-Fifth Conference on Neural Information Processing Systems (NeurIPS)*, 2021.

2. **Aryan Deshwal**, Syrine Belakaria, Jana Doppa. Bayesian Optimization over Hybrid Spaces. *Proceedings of Thirty-eighth International Conference on Machine Learning (ICML), 2021.*

3. **Aryan Deshwal**, Syrine Belakaria, Ganapati Bhat, Janardhan Rao Doppa, and Partha Pratim Pande. Learning Pareto-Frontier Resource Management Policies for Heterogeneous SoCs: An Information-Theoretic Approach. To appear in *Proceedings of 58th IEEE/ACM Design Automation Conference (DAC), 2021.*

4. **Aryan Deshwal**, Syrine Belakaria, Jana Doppa. Mercer Features for Efficient Combinatorial Bayesian Optimization. *Proceedings of Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI), 2021.*

5. **Aryan Deshwal**, Syrine Belakaria, Janardhan Rao Doppa, and Alan Fern. Optimizing Discrete Spaces via Expensive Evaluations: A Learning to Search Framework. *Proceedings of Thirty-Fourth AAAI Conference on Artificial Intelligence (AAAI)*, 2020.

6. Syrine Belakaria, **Aryan Deshwal**, Nitthilan Kannappan Jayakodi, and Janardhan Rao Doppa. Uncertainty-Aware Search Framework for Multi-Objective Bayesian Optimization. *Proceedings of Thirty-Fourth AAAI Conference on Artificial Intelligence (AAAI)*, 2020.

7. Syrine Belakaria, **Aryan Deshwal**, and Janardhan Rao Doppa, Multi-Fidelity Multi-Objective Bayesian Optimization: An Output Space Entropy Search Approach. *Proceedings of Thirty-Fourth AAAI Conference on Artificial Intelligence (AAAI)*, 2020.

8. Syrine Belakaria[†], Zhiyuan Zhou[†], **Aryan Deshwal**, Janardhan Rao Doppa, Deuk Heo, and Partha Pratim Pande. Design of Multi-Output Switched-Capacitor Voltage Regulator via Machine Learning. *Proceedings of Twenty-Third IEEE/ACM Design, Automation and Test in Europe Conference (DATE)*, 2020. † denotes equal contribution.

9. Paul Bogdan, Fan Chen, **Aryan Deshwal**, Janardhan Rao Doppa, Biresh Kumar Joardar, Hai (Helen) Li, Shahin Nazarian, Linghao Song, Yao Xiao. Taming Extreme Heterogeneity via Machine Learning based Design of Autonomous Manycore Systems. *International Conference on Hardware/Software Codesign and System Synthesis Companion (CODES), pp 21:1-21:10*, 2019.

10. Syrine Belakaria, **Aryan Deshwal**, and Janardhan Rao Doppa.Max-value Entropy Search for Multi-Objective Bayesian Optimization. *Proceedings of Thirty-Third International Conference on Neural Information Processing Systems (NeurIPS), pp 7823-7833*, 2019.

11. **Aryan Deshwal**, Janardhan Rao Doppa, and Dan Roth. Learning and Inference for Structured Prediction: A Unifying Perspective. *Proceedings of Twenty-Eighth International Joint Conference on Artificial Intelligence (IJCAI), pp 6291-6299*, 2019.

12. Chao Ma, F A Rezaur Rahman Chowdhury, **Aryan Deshwal**, Md Rakibul Islam, Janardhan Rao Doppa, and Dan Roth. Randomized Greedy Search for Structured Prediction: Amortized Inference and Learning. *Proceedings of Twenty-Eighth International Joint Conference on Artificial Intelligence (IJCAI), pp 5130-5138*, 2019.

Journal Papers

1. **Aryan Deshwal**, Cory Simon, Jana Doppa. Bayesian Optimization of Nanoporous Materials. To appear in *Molecular Systems Design and Engineering Journal, Royal Society of Chemistry*, 2021.

2. Syrine Belakaria, **Aryan Deshwal**, Jana Doppa. Output Space Entropy Search Framework for Multi-Objective Bayesian Optimization. To appear in *Journal of Artificial Intelligence Research (JAIR)*, 2021.

3. Biresh Kumar Joardar, **Aryan Deshwal**, Janardhan Rao Doppa, Partha Pratim Pande, Krishnendu Chakrabarty. High-Throughput Training of Deep CNNs on ReRAM-based Heterogeneous Architectures via Optimized Normalization Layers. To appear in *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, 2021.

4. **Aryan Deshwal**, Nitthilan Kannappan Jayakodi, Biresh Joardar, Janardhan Rao Doppa, Partha Pratim Pande. MOOS: A Multi-Objective Design Space Exploration and Optimization Framework for NoC enabled Manycore Systems. *ACM Transactions on Embedded Computing Systems (TECS), 18(5s): 77:1-77:23*, 2019.

5. Nitthilan Kannappan Jayakodi, Syrine Belakaria, **Aryan Deshwal**, and Janardhan Rao Doppa. Design and Optimization Framework to Trade-off Energy and Accuracy of Inference on Mobile Platforms via Pretrained Neural Networks. *ACM Transactions on Embedded Computing Systems (TECS), 19(1): 4:1-4:24*, 2020.

Workshop Papers

1. **Aryan Deshwal**, Syrine Belakaria, Janardhan Rao Doppa. Scalable Combinatorial Bayesian Optimization with Tractable Statistical models, 2020. `https://arxiv.org/abs/2008.08177`. *Proceedings of NeurIPS Workshop on Engineering Modeling, Simulation, and Design, 2020*.

2. Syrine Belakaria, **Aryan Deshwal**, Janardhan Rao Doppa. Information-Theoretic Multi-Objective Bayesian Optimization with Continuous Approximations, 2020. `https://arxiv.org/abs/2009.05700`. *Proceedings of NeurIPS Workshop on Engineering Modeling, Simulation, and Design, 2020*.

3. Syrine Belakaria, **Aryan Deshwal**, Janardhan Rao Doppa. Max-value Entropy Search for Multi-Objective Bayesian Optimization with Constraints, 2020. `https://arxiv.org/abs/2009.01721`. *Proceedings of NeurIPS Workshop on Machine Learning and the Physical Sciences, 2020*.

4. **Aryan Deshwal**, Syrine Belakaria, Janardhan Rao Doppa, and Alan Fern. Optimizing Discrete Spaces via Expensive Evaluations: A Learning to Search Framework. *ICML Workshop on Real World Experiment Design and Active Learning*, 2020.

5. Syrine Belakaria, **Aryan Deshwal**, and Janardhan Rao Doppa. Max-value Entropy Search for Multi-Objective Bayesian Optimization. *ICML Workshop on Real World Experiment Design and Active Learning*, 2020.

6. Syrine Belakaria, **Aryan Deshwal**, and Janardhan Rao Doppa. Uncertainty aware Search framework for Multi-Objective Bayesian Optimization with Constraints. *ICML Workshop on Automated Machine Learning (AutoML)*, 2020.

GRANT PROPOSALS

- Jana Doppa (PI) and Partha Pratim Pande. *Collaborative Research: Medium: Exploiting Synergies Between Machine-Learning Algorithms and Hardware Heterogeneity for High-Performance and Reliable Manycore Computing.* National Science Foundation (NSF), Core Program. $600K (5/2020–5/2023). Funded.

- My research work on machine learning for combinatorial design optimization by combining domain knowledge and data from cycle-accurate simulations was a central part of this proposal.

CONFERENCE TALKS

- Learning and Inference for Structured Prediction: A Unifying Perspective @ IJCAI Conference, 2019.

- Randomized Greedy Search for Structured Prediction: Amortized Inference and Learning @ IJCAI Conference, 2019.

- MOOS: A Multi-Objective Design Space Exploration and Optimization Frame-work for NoC enabled Manycore Systems @ Embedded Systems Week Conference, 2019.

- Optimizing Discrete Spaces via Expensive Evaluations: A Learning to Search Framework @ AAAI Conference, 2020.

- Mercer Features for Efficient Combinatorial Bayesian Optimization @ AAAI Conference, 2021.

- Bayesian Optimization over Hybrid Spaces @ ICML Conference, 2021.

PROFESSIONAL AND OUTREACH ACTIVITIES

Workshop and Tutorial Organization

- Lead organizer of *1st Annual AAAI Workshop on AI to Accelerate Science and Engineering (AI for Chemistry Theme)* at AAAI-2022.

- Lead organizer of *AAAI Tutorial on Bayesian Optimization: From Foundations to Advanced Topics* at AAAI-2022.

Program Committee Member

- Thirty-fifth Conference on Neural Information Processing Systems (NeurIPS), 2021

- Thirty-eighth International Conference on Machine Learning (ICML), 2021

- Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI), 2021

- International Conference on Learning Representations (ICLR), 2021

- Thirty-Fourth Conference on Neural Information Processing Systems (NeurIPS), 2020

- Thirty-Seventh International Conference on Machine Learning (ICML), 2020

- Twenty-Ninth International Joint Conference on Artificial Intelligence (IJCAI), 2020

Conference and Journal Reviewer

- Reviewer for NeurIPS-2019, UAI-2019, IJCAI-2019, KDD-2019, AISTATS-2019, ESWEEK-2019, AAAI-2020, AISTATS-2020, UAI-2020, KDD-2020, UAI-2021

- Journal of Artificial Intelligence Research (JAIR), 2019, 2021

- IEEE Journal of Selected Topics in Signal Processing, 2019

SKILLS

- **Programming Languages.** Python, Bash, C/C++, HTML/CSS, LaTeX, Java, MATLAB

- **Tools/Packages.** Git, SQL, PyTorch, TensorFlow, Python data science tools