Aditya Balu

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Education

Iowa State University — Ames, IA
Ph.D. in Mechanical & Computer Engineering (Co-major), GPA: 3.72/4.00 — *Aug 2016 – May 2020*
Title: Deep Learning & GPU algorithms for Computer Aided Engineering
Advisors: Prof. Adarsh Krishnamurthy & Prof. Soumik Sarkar

Birla Institute of Technology and Science, Pilani — Hyderabad, India
Bachelor of Engineering (Hons.) in Mechanical Engineering; GPA: 3.68/4.00 (9.02/10.0) — *Aug 2010 – Aug 2014*

Professional Experience

Mechanical Engineering, Iowa State University — Ames, IA
Associate Graduate Lecturer — *Aug 2023 – Present*

Translational AI Center (TrAC), Iowa State University — Ames, IA
Data Scientist — *Jan 2022 – Present*

Iowa State University — Ames, IA
Postdoctoral Research Associate — *May 2020 – Dec 2021*

Ansys Inc. — Pittsburgh, PA
Machine Learning Co-op — *July 2018 – Dec 2018*

FMC Technologies (now TechnipFMC) — Hyderabad, India
Design Engineer - I — *July 2014 – July 2016*

HBL Power Systems Limited — Hyderabad, India
Summer Intern — *May 2012 – July 2012*

Teaching Experience

Iowa State University — Ames, IA
Instructor — *Jan 2022 - Present*

- ME 170 – Engineering Graphics and Solidworks (Spring 2022)
- CPS 364X – Cyber-Physical Systems Applications (Spring 2023)

Iowa State University — Ames, IA
Teaching Assistant — *Aug 2016 - May 2020*

- ME 592X – Data Analytics and Machine Learning for Cyber-Physical Systems (Spring 2018 & Spring 2019)
- ME 570X – Solid Modeling and GPU Computing (Spring 2019)
- ME 324 – Manufacturing Processes (Fall 2016)

Awards and Recognitions

- Finalist, NSF NAMRC Bluesky Manufacturing Competition, "Beyond the blueprint: conversational AI as a game-changer in manufacturing" Rutgers University, NJ, 2023.
- NVIDIA Deep Learning Institute Ambassador, Iowa State University
- ACCESS-CI Campus Champion, Iowa State University
- Finalist, NSF NAMRC Bluesky Manufacturing Competition, "Physics-aware machine learning surrogates for real-time digital twins in additive manufacturing," St. Louis, MO, 2021.
- Research excellence award, Iowa State University, December 2019
- Travel grant award for Neural Information Processing Systems (NIPS), December 2017

Publications

Google Scholar Citations: 1422; H-Index 18, (Accessed Feb 6, 2024)
Google Scholar: https://scholar.google.com/citations?hl=en&user=GNuXi6oAAAAJ

Selected Publications

Book Chapters

2023	1	Ming-Chen Hsu, **Aditya Balu**. Direct flow simulation of objects represented by point clouds, *Frontiers in Computational Fluid-Structure Interaction and Flow Simulation: Research from Lead Investigators Under Forty-2023*, pages 119–153. Springer, 2023
2021	2	**Aditya Balu**, Sambit Ghadai, Gavin Young, Soumik Sarkar, Adarsh Krishnamurthy. A machine learning framework for decision support in design and manufacturing. John G. Michopoulos, Christiaan J. J. Paredis, David W. Rosen, Judy M. Vance, editors, *Advances in Computing and Information in Engineering (ACIER)*. volume 2, pages 479–498. ASME, 2021. URL: https://arxiv.org/abs/1703.01499v1. chapter 15

Journal Publications

2024	3	Muhammad Arbab Arshad, Talukder Jubery, James Afful, Anushrut Jignasu, **Aditya Balu**, Baskar Ganapathysubramanian, Soumik Sarkar, Adarsh Krishnamurthy. Evaluating neural radiance fields (NeRFs) for 3D plant geometry reconstruction in field conditions. *Plant Phenonics*, 6(0235):1–17, 2024. URL: https://spj.science.org/doi/10.34133/plantphenomics.0235
	4	Ethan Herron, Jaydeep Rade, Anushrut Jignasu, Baskar Ganapathysubramanian, **Aditya Balu**, Soumik Sarkar, Adarsh Krishnamurthy. Latent diffusion models for structural component design. *Computer-Aided Design*, 171:103707, 2024. URL: https://www.sciencedirect.com/science/article/abs/pii/S0010448524000344
	5	Biswajit Khara, **Aditya Balu**, Ameya Joshi, Soumik Sarkar, Chinmay Hegde, Adarsh Krishnamurthy, Baskar Ganapathysubramanian. NeuFENet: Neural finite element solutions with theoretical bounds for parametric PDEs. *Engineering with Computers*:1–23, 2024. URL: https://link.springer.com/article/10.1007/s00366-024-01955-7
	6	Biswajit Khara, Ethan Herron, Zhanhong Jiang, **Aditya Balu**, Chih-Hsuan Yang, Kumar Saurabh, Anushrut Jignasu, Soumik Sarkar, Chinmay Hegde, Baskar Ganapathysubramanian, Adarsh Krishnamurthy. Neural PDE solvers for irregular domains. *Computer-Aided Design*, 172:103709, 2024. URL: https://www.sciencedirect.com/science/article/abs/pii/S0010448524000368
2023	7	Jaydeep Rade, Anushrut Jignasu, Ethan Herron, Ashton Corpuz, Baskar Ganapathysubramanian, Soumik Sarkar, **Aditya Balu**, Adarsh Krishnamurthy. Deep learning-based 3D multigrid topology optimization of manufacturable designs. *Engineering Applications of Artificial Intelligence*, 2023. Accepted

8 **Aditya Balu**, Manoj R. Rajanna, Joel Khristy, Fei Xu, Adarsh Krishnamurthy, Ming-Chen Hsu. Direct immersogeometric fluid flow and heat transfer analysis of objects represented by point clouds. *Computer Methods in Applied Mechanics and Engineering*, 404(115742), 2023. URL: https://www.sciencedirect.com/science/article/pii/S0045782522006971

9 Jiale Feng, Mojdeh Saadati, Talukder Jubery, Anushrut Jignasu, Aditya Balu, Yawei Li, Lakshmi Attigala, Patrick Schnable, Soumik Sarkar, Baskar Ganapathysubramanian, Adarsh Krishnamurthy. 3D reconstruction of plants using probabilistic voxel carving. *Computers and Electronics in Agriculture*, 213:108248, 2023. URL: https://www.sciencedirect.com/science/article/abs/pii/S0168169923006361

Refereed Conference Publications

2024 10 Nastaran Saadati, Minh Pham, Nasla Saleem, Joshua R Waite, Aditya Balu, Zhanong Jiang, Chinmay Hegde, Soumik Sarkar. DIMAT: decentralized iterative merging-and-training for deep learning models. *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 27517–27527, 2024

11 Anushrut Jignasu, Kelly Marshall, Ankush Mishra, Lucas Rillo, Baskar Ganapathysubramanian, Aditya Balu, Chinmay Hegde, Adarsh Krishnamurthy. Slice-100K: A multimodal dataset for extrusion-based 3D printing. *Neural Information Processing Systems (NeurIPS)*, 2024. URL: https://openreview.net/forum?id=gad19kaPzb#discussion. Datasets and Benchmarks Track

2022 12 Zhanhong Jiang, Xian Yeow Lee, Sin Yong Tan, Kai Liang Tan, **Aditya Balu**, Young M Lee, Chinmay Hegde, Soumik Sarkar. MDPGT: momentum-based decentralized policy gradient tracking. *Proceeding of AAAI Conference on Artificial Intelligence*, 2022

2021 13 Minsu Cho, **Aditya Balu**, Ameya Joshi, Anjana Deva Prasad, Biswajit Khara, Soumik Sarkar, Baskar Ganapathysubramanian, Adarsh Krishnamurthy, Chinmay Hegde. Differentiable spline approximations. *Proceedings of the Neural Information Processing Systems*, 2021. URL: https://proceedings.neurips.cc/paper/2021/hash/a952ddeda0b7e2c20744e52e728e5594-Abstract.html

14 Yasaman Esfandiari, Sin Yong Tan, Zhanhong Jiang, **Aditya Balu**, Ethan Herron, Chinmay Hegde, Soumik Sarkar. Cross-gradient aggregation for decentralized learning from Non-IID data. Marina Meila, Tong Zhang, editors, *Proceedings of the 38th International Conference on Machine Learning*, volume 139 of *Proceedings of Machine Learning Research*, pages 3036–3046. PMLR, July 2021. URL: https://proceedings.mlr.press/v139/esfandiari21a.html

15 **Aditya Balu**, Sergio Botelho, Biswajit Khara, Vinay Rao, Soumik Sarkar, Chinmay Hegde, Adarsh Krishnamurthy, Santi Adavani, Baskar Ganapathysubramanian. *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, pages 1–14, 2021

Professional Service

- **Invited Talks:**
  1. "Enhancing AI with Domain Knowledge: Lessons from Some Anecdotal Science and Engineering Applications", INSOFE Hyderabad Campus
  2. "Communication Efficient Decentralized Deep Learning for Agricultural Applications", Iowa State University, Translational AI Center Weekly Seminar Series
  3. "Enhancing Deep Learning Models with Geometry and Physics Priors", University of Missouri, St. Louis, CS Department Colloquium Series, Nov 2022
  4. "AI in Mechanical Engineering", University of Wyoming, Mechanical Engineering Undergrad Class
- **Associate Editor:** Journal of Intelligent Manufacturing
- **Journal Reviewer:** IEEE Transactions on Pattern Analysis and Machine Intelligence, Applied Computing and Informatics, Advances in Mechanical Engineering, Engineering Optimization, Journal of Intelligent Manufacturing, Scientific Reports, Computer-aided Design, Journal of Mechanical Design, Engineering Applications of Artificial Intelligence, Computers & Graphics, Engineering with Computers,

IEEE Transactions on Neural Networks and Learning Systems, Ultrasonics, Expert Systems with Applications, Intelligent Automation & Soft Computing, Advances in Engineering Software, Applied Engineering in Agriculture

- **Conference Reviewer/Subreviewer:** Machine Learning for Cyber-Agricultural Systems (MLCAS 2019), Symposium on Solid and Physical Modeling (2019), Symposium on Solid and Physical Modeling, 2022, International Conference on Machine Learning (ICML) 2023, Neural Information Processing Systems (Neurips) 2023
- **Organizing Committee:**
  1. Federated Learning and Analytics in Practice: Algorithms, Systems, Applications, and Opportunities Workshop at ICML 2023 (Program Committee member)
  2. AAAI 2023 workshop on AI-for Agriculture and Food Systems
  3. Minisymposium on "MS424 - Scientific Machine Learning for Computational Mechanics (SciML4CM)" in USNCCM 17
  4. Machine Learning for Cyber-Agricultural Systems (MLCAS 2022)
  5. TrAC Workshop on Scientific Machine Learning (April 2022)
  6. CVPR 2020 workshop on Deep Learning for Geometric Shape Understanding
  7. ICCV 2021 workshop on Deep Learning for Geometric Computing
  8. AAAI 2022 workshop on AI-based Design and Manufacturing
- **Tutorials organized:**
  1. A TrAC Tutorial on "*Demystifying trending AI techniques*", Ames, IA, April 2023
  2. "*A Deep Dive into Deep Learning: Architectures and Algorithms*" tutorial at Midwest Big Data Summer School, Ames, IA, May 2022
  3. A TrAC, CyVerse and Jetstream2 Tutorial on "*Intro to cloud-based Deep Learning*", virtual, April 2022
  4. SC 21 Tutorial on *"Scientific Machine Learning Using HPC Servers on the Cloud"*
  5. CVPR 2021 Tutorial on *"Distributed Deep Learning on HPC servers for Large Scale Computer Vision Applications"*
  6. An *"Hands on session for Implementing Deep Learning for Computer Vision applications"* tutorial at Midwest Big Data Summer School, Ames, IA , May 2021
  7. An *"Intro to Deep Learning"* course at Air Force Research Lab, Dayton, OH, Dec 2020
  8. An *"Intro to Deep Learning"* tutorial at Midwest Big Data Summer School, Ames, IA, May 2017

FUNDING

1	**Role:**	**Co-PI**
	Investigators:	Juan Ren, Adarsh Krishnamurthy, Soumik Sarkar, Aditya Balu
	Agency:	**NSF**
	Title:	CPS: Medium: Artificial-intelligence-enabled Atomic Force Microscopy
	Dates:	Jul 2024–Jun 2027
	Amount:	$$1,000,000
2	**Role:**	**Co-PI**
	Investigators:	Adarsh Krishnamurthy, Chinmay Hegde, Aditya Balu, Baskar Ganapathysubramanian
	Agency:	**NSF**
	Title:	Collaborative Research: EAGER: An LLM-Powered Framework for G-Code Comprehension and Retrieval
	Dates:	Feb 2024–Jan 2026
	Amount:	$$200,000