




NOMAN BASHIR

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RESEARCH INTEREST	Improving the energy efficiency and sustainability of large-scale computing systems, e.g., edge, cloud, datacenters, and cyber-physical systems, e.g., electric grid.	
EDUCATION	University of Massachusetts Amherst , PhD in Computer Engineering Advisor: David E. Irwin Committee: Prashant Shenoy, Jay Taneja, and Fatima M. Anwar Dissertation: <i>Improving the Programmability of Networked Energy Systems</i>	08/2016–02/2022
	National University of Science and Technology (NUST) , Pakistan MS in Energy Systems Engineering Dissertation: <i>Using Stressed Grids as a Storage Medium for Renewable Energy</i>	09/2013–03/2016
	University of Engineering and Technology Lahore , Pakistan BS in Electrical Engineering	09/2009–05/2013
ACADEMIC EXPERIENCE	University of Massachusetts Amherst <i>Postdoctoral Research Associate</i> , College of Information and Computer Sciences, <i>Graduate Research Associate</i> , Department of Electrical and Computer Engineering,	02/2022–present 08/2016–02/2022
	Lahore University of Management Sciences , Pakistan <i>Research Associate</i> , Department of Electrical Engineering,	06/2015–06/2016
	National University of Computer & Emerging Sciences , Pakistan <i>Research Engineer</i> , Department of Computer Science,	09/2013–05/2015
INDUSTRY EXPERIENCE	VMware Research Group <i>Sustainability Research Intern</i> , Advisors: Victor Firoiu, Ben Pfaff	05/2021–08/2021
	Google Research <i>Research Intern</i> , Advisors: Nan Deng, Krzysztof Rzadca Salient Achievement: Our work on resource overcommitment in datacenters, published in EuroSys’21, is the default overcommit strategy across all Google datacenters.	05/2020–11/2020
HONORS & AWARDS	e-Energy’23 , selected as one of the top three reviewers (top 3 out of 84 PC members) New Energy Summer Summit 2023 , selected as a part of cohort at Dartmouth College (1 of 19 members). ACM SIGEnergy Doctoral Dissertation Award 2023 nomination. UMass ECE Doctoral Dissertation Award 2023 nomination. ICPE’23 paper selected as Best Paper Award finalist (3 out of 46 submissions) EuroSys’21 paper awarded Artifact Available, Artifacts Functional, and Results Reproduced Badge Supercomputing’20 paper selected as Best Paper Award finalist (7 out of 380 submissions) Supercomputing’20 paper selected as Best Student Paper Award finalist (7 out of 380 submissions) BuildSys’17 Grid fairness paper nominated for Best Paper Award (top 5 out of 96 submissions)	

PUBLICATIONS

All papers are available at <https://noman-bashir.github.io/publications/>.

Position papers

- [1] **Noman Bashir**, David Irwin, Prashant Shenoy. *On the Promise and Pitfalls of Optimizing Embodied Carbon*, The 2nd Workshop on Sustainable Computer Systems (**HotCarbon**), 2023.
- [2] **Noman Bashir**, David Irwin, Prashant Shenoy, Abel Souza. *Sustainable Computing - Without the Hot Air*, The Inaugural Workshop on Sustainable Computer Systems Design and Implementation (**HotCarbon**), 2022.
- [3] **Noman Bashir**, Tian Guo, Mohammad Hajiesmaili, David Irwin, Prashant Shenoy, Ramesh Sitaraman, Abel Souza, Adam Wierman. *Enabling Sustainable Clouds: The Case for Virtualizing the Energy System*, ACM Symposium on Cloud Computing (**SoCC**), 2021.

Conference papers

- [4] Abel Souza, **Noman Bashir**, Jorge Murillo, Walid Hanafy, Qianlin Liang, David Irwin, Prashant Shenoy. *Ecovisor: A Virtual Energy System for Carbon-Efficient Applications*, The International Conference on Architectural Support for Programming Languages and Operating Systems (**ASPLOS**), 2023.

- [5] Xiaoding Guan, **Noman Bashir**, David Irwin, Prashant Shenoy. *WattScope: Non-intrusive Application-level Power Disaggregation in Datacenters*, The International Symposium on Computer Performance, Modeling, Measurements and Evaluation (**Performance**), 2023.
- [6] **Noman Bashir**, Yasra Chandio, David Irwin, Fatima M. Anwar, Jeremy Gummesson, Prashant Shenoy. *Jointly Managing Electrical and Thermal Energy in Solar- and Battery-powered Computer Systems*, ACM International Conference on Future Energy Systems (**e-Energy**), 2023.
- [7] Adam Lechowicz, **Noman Bashir**, Mohammad Hajiesmaili, Prashant Shenoy. *Equitable Network-Aware Decarbonization of Residential Heating at City Scale*, ACM International Conference on Future Energy Systems (**e-Energy**), 2023.
- [8] Priyanka Mary Mammen, **Noman Bashir**, Ramachandra Kolluri, Eun Kung Lee, Prashant Shenoy. *CUFF: A Configurable Uncertainty-driven Forecasting Framework for Green AI Clusters*, ACM International Conference on Future Energy Systems (**e-Energy**), 2023.
- [9] Qianlin Liang, **Noman Bashir**, Walid A. Hanafy, Ahmed Ali-Eldin, David Irwin, and Prashant Shenoy. *Dēlen: Enabling Flexible and Adaptive Model-serving for Multi-tenant Edge AI*, IEEE/ACM Eighth International Conference on Internet-of-Things Design and Implementation (**IoTDI**), 2023.
- [10] Talha Mehboob, **Noman Bashir**, Michael Zink, and David E. Irwin. *Is Sharing Caring? Analyzing the Incentives for Shared Cloud Clusters*, IEEE/SPEC International Conference on Performance Engineering (**ICPE**), 2023. **Nominated for the Best Paper.**
- [11] John Wamburu, **Noman Bashir**, Emma Grazier, David Irwin, Christine Crago, Prashant Shenoy. *Equity-aware Decarbonization of Residential Heating Systems*, SIGEnergy Energy Informatics Review (**EIR**), 2023.
- [12] John Wamburu, **Noman Bashir**, David Irwin, Prashant Shenoy. *Data-driven Decarbonization of Residential Heating Systems*, ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (**BuildSys**), 2022.
- [13] Pradeep Ambati, **Noman Bashir**, David Irwin, Prashant Shenoy. *Good Things Come to Those Who Wait: Optimizing Job Waiting in the Cloud*, ACM Symposium on Cloud Computing (**SoCC**), 2021.
- [14] **Noman Bashir**, Nan Deng, Krzysztof Rządca, David Irwin, Sree Kodak, Rohit Jnagal. *Take it to the Limit: Prediction-Driven Resource Overcommitment in Datacenters*, ACM European Conference on Computer Systems (**EuroSys**), 2021, **Artifact Badges: Available, Functional, and Results Reproduced.**
- [15] Pradeep Ambati, **Noman Bashir**, David Irwin, Prashant Shenoy. *Waiting Game: Optimally Provisioning Fixed Resources for Cloud-enabled Schedulers*, Supercomputing (**SC**) 2020, **Best Paper Award Finalist and Best Student Paper Award Finalist.**
- [16] **Noman Bashir**, David Irwin, Prashant Shenoy. *DeepSnow: Modeling the Impact of Snow on Solar Generation*, ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (**BuildSys**), 2020.
- [17] **Noman Bashir**, David Irwin, Prashant Shenoy. *A Probabilistic Approach to Committing Solar Energy in Day-ahead Electricity Markets*, International Green and Sustainable Computing Conference (**IGSC**), 2020.
- [18] Santiago Correa, **Noman Bashir**, Andrew Tran, David Irwin, Jay Taneja. *Extend: A Framework for Increasing Energy Access by Interconnecting Solar Home Systems*, ACM SIGCAS Conference on Computing and Sustainable Societies (**COMPASS**), 2020.
- [19] Menghong Feng, **Noman Bashir**, Prashant Shenoy, David Irwin, Dragoljub Kosanovic. *SunDown: Model-driven Per-Panel Solar Anomaly Detection for Residential Arrays*, ACM SIGCAS Conference on Computing and Sustainable Societies (**COMPASS**), 2020.
- [20] Pradeep Ambati, **Noman Bashir**, Mohammad Hajiesmaili, David Irwin, Prashant Shenoy. *Hedge Your Bets: Optimizing Long-term Cloud Costs by Mixing VM Purchasing Options*, IEEE International Conference on Cloud Engineering (**IC2E**), 2020.
- [21] **Noman Bashir**, Dong Chen, David Irwin, Prashant Shenoy. *Solar-TK: A Data-driven Toolkit for Solar PV Performance Modeling and Forecasting*, IEEE International Conference on Mobile Ad-Hoc and Smart Systems (**MASS**), 2019.
- [22] Santiago Correa, **Noman Bashir**, Jesus Omana Iglesias, Candace Saffery, Jay Taneja. *Like a Good Neighbor, Solar is There*, The International Conference on Future Energy Systems (**e-Energy**), 2019.
- [23] **Noman Bashir**, David Irwin, Prashant Shenoy. *Helios: A Programmable Software-defined Solar Module*, ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (**BuildSys**), 2018.
- [24] **Noman Bashir**, David Irwin, Prashant Shenoy, Jay Taneja. *Enforcing Fair Grid Energy Access for Controllable Distributed Solar Capacity*, ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (**BuildSys**), 2017. **Nominated for the Best Paper.**

- [25] **Noman Bashir**, Hira Shahzad Sardar, Mashood Nasir, Naveed Ul Hassan, Hassan A. Khan. *Lifetime Maximization of Lead-acid Batteries in Small Scale UPS and Distributed Generation Systems*, IEEE **PowerTech**, 2017.
- [26] Aneeq Ur Rehman, **Noman Bashir**, Naveed Ul Hassan, Chau Yuen. *Impact of Home Appliances on the Performance of Narrow-band Power Line Communications for Smart Grid Applications*, IEEE Region Ten International Conference (**TenCon**), 2016.
- [27] **Noman Bashir**, Zohaib Sharani, Khushboo Qayyum, and Affan A. Syed. *Delivering Smart Load-shedding for Highly-stressed Grids*, IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (**SmartGridComm**), 2015.

Journal articles

- [28] Pradeep Ambati, **Noman Bashir**, David Irwin, Prashant Shenoy. *Modeling and Analyzing Waiting Policies for Cloud-Enabled Schedulers*, IEEE Transactions on Parallel and Distributed Systems (**TPDS**), 2021.
- [29] Menghong Feng, **Noman Bashir**, Prashant Shenoy, David Irwin, Dragoljub Kosanovic. *Model-driven Per-Panel Solar Anomaly Detection for Residential Arrays*, ACM Transactions on Cyber-Physical Systems (**TCPS**), 2021.
- [30] **Noman Bashir**, David Irwin, Prashant Shenoy, Jay Taneja. *Mechanisms and Policies for Controlling Distributed Solar Capacity*, The ACM Transactions on Sensor Networks (**TOSN**), 2018.

Under-review

- [31] Walid Hanafy, Qianlin Liang, **Noman Bashir**, David Irwin, Prashant Shenoy. *CarbonScaler: Leveraging Cloud Workload Elasticity for Optimizing Carbon-Efficiency*, under review at ACM Special Interest Group on Measurement and Evaluation (**SIGMETRICS**), 2024.
- [32] Adam Lechowicz, Nicolas Christianson, Jinhang Zuo, **Noman Bashir**, Mohammad Hajiesmaili, Adam Wierman, Prashant Shenoy. *The Online Pause and Resume Problem: Optimal Algorithms and An Application to Carbon-Aware Load Shifting*, under review at ACM Special Interest Group on Measurement and Evaluation (**SIGMETRICS**), 2024.
- [33] Thanathorn Sukprasert, Abel Souza, **Noman Bashir**, and David Irwin, Prashant Shenoy. *Quantifying the Benefits of Carbon-Aware Temporal and Spatial Workload Shifting in the Cloud*, under review at The ACM Internet Measurement Conference (**IMC**), 2023.
- [34] Jorge Murillo, **Noman Bashir**, David Irwin, Ramesh K. Sitarama, Prashant Shenoy. *Carbon-aware Spatial Load Balancing for Content Delivery Networks*, IEEE Conference on Computer Communications (**INFOCOM**), 2024.
- [35] John Thiede, **Noman Bashir**, David Irwin, Prashant Shenoy. *Carbon Containers: A System-level Facility for Managing Application-level Carbon Emissions*, ACM Symposium on Cloud Computing (**SoCC**), 2023.
- [36] Walid Hanafy, Qianlin Liang, **Noman Bashir**, Abel Souza, David Irwin, Prashant Shenoy. *GAIA: A Cost- and Carbon-Aware Scheduler for Batch Processing in the Cloud*, ACM Symposium on Cloud Computing (**SoCC**), 2023.
- [37] Walid Hanafy, Qianlin Liang, **Noman Bashir**, David Irwin, Prashant Shenoy. *Energy Time Fairness: Balancing Fair Allocation of Energy and Time for GPU Workloads*, under review at ACM/IEEE Symposium on Edge Computing (**SEC**), 2023.
- [38] Diptyaroop Maji, **Noman Bashir**, David Irwin, Prashant Shenoy, Ramesh K. Sitaraman. *Untangling Carbon-free Energy Attribution and Carbon Intensity Estimation for Carbon-aware Computing*, under review at ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (**BuildSys**), 2023.
- [39] Phuthipong Bovornkeeratiroj, **Noman Bashir**, Vivek Deulkar, Bharathan Balaji, David Irwin, Prashant Shenoy, Mohammad Hajiesmaili. *Quantifying the Decarbonization Potential of Flexible Loads*, under review at ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (**BuildSys**), 2023.
- [40] Anupama Sitaraman, **Noman Bashir**, David Irwin, Prashant Shenoy. *Leveraging Solar PV and Storage for Deep Decarbonization of Residential Heating Systems*, under review at The International Green and Sustainable Computing (**IGSC**), 2023.
- [41] Yasra Chandio, **Noman Bashir**, Fatima Anwar. *Exploring Stealthy Multi-modal Attacks in Mixed Reality*, under review at IEEE International Symposium on Mixed and Augmented Reality (**ISMAR**), 2023.
- [42] Yasra Chandio, **Noman Bashir**, Fatima Anwar, Victoria Interrante. *Investigating the Correlation Between Presence and Reaction Time in Mixed Reality*, undergoing a major revision at IEEE Transactions on Visualization and Computer Graphics (**TVCG**), 2023.

Workshop papers

- [43] Yasra Chandio, **Noman Bashir**, Fatima Anwar. *HoloSet - A Dataset for Visual Inertial Odometry in Extended Reality*, The Data: Acquisition To Analysis (**DATA**), 2022.

Book chapters

- [44] **Noman Bashir**, Naveed Ul Hassan, Chau Yuen, Wayes Tushar. *Smart-grid Communications and Standard*, in *IET Communication, Control and Security Challenges for the Smart Grid*, 2017.

Thesis

- [45] **Noman Bashir**. *Improving the Programmability of Networked Energy Systems*, PhD thesis, University of Massachusetts Amherst, 2022.
- [46] **Noman Bashir**. *Using Stressed Grids as a Storage Medium for Renewable Energy*, MSc thesis, National University of Science and Technology, Islamabad, 2016.

Academic honors

2023	Nominated for SIGEnergy Doctoral Dissertation Award.
2023	Best paper finalist at ACM/SPEC ICPE.
2020	Best student paper and best paper finalist at ACM/IEEE Supercomputing (SC).
2017	Best paper nomination at ACM BuildSys.

Invited talks

07/2023	Climate Change AI, <i>Decarbonizing AI: The Good, the Bad, and the Ugly</i> .
03/2023	IBM Research, <i>Ecovisor: A Virtual Energy System for Carbon-Efficient Applications</i> .
02/2023	Workshop on NetZero Carbon Computing (NetZero), co-located with HPCA, <i>Benefits and Limitations of Carbon Accounting Paradigms</i> .
11/2022	Low Carbon and Sustainable Computing (LOCOS) seminar at University of Glasgow <i>Enabling Sustainable Clouds: The Case for Virtualizing the Energy System</i> .
11/2022	Tracing Summit at Google UK, <i>Take it to the Limit: Peak Prediction-driven Resource Overcommitment in datacenters</i> .
04/2021	Information Technology University (ITU), Pakistan, (virtual), <i>Leveraging Machine Learning to Design Energy Efficient and Sustainable Systems</i> .
11/2020	Energy Data Analytics Symposium, Duke University, <i>Solar-TK: A Data-driven Toolkit for Solar PV Performance Modeling and Forecasting</i> .

Service to the profession

Publicity chair at ACM e-Energy'24.
Co-chair ACM SIGEnergy Workshop on Societal Decarbonization (SoDec'23), formerly WeCan'22.
Ph.D. Symposium Chair at ACM BuildSys'23, IEEE IC2E'23.
PC member at ACM e-Energy'23, ACM BuildSys'23, ACM SoCC'23, and DATA'23.
PC member at ACM SoCC'22, ACM ENSYS'22.
Reviewer for Climate Change AI Innovation Grants Program (2023)
Reviewer for Journal of Systems Research, Serverless Systems Track (2023)
PC member at Workshop on Tackling Climate Change with Machine Learning at ICLR23, NeurIPS'22.
Co-organizer SIGEnergy Graduate Student Talk Series (starting 2022).
Organizer ACM e-Energy Hybrid Hub at UMass Amherst 2022.
Co-organizer of UMass Summer Turing Program (2022, 2023).
Shadow PC member at ACM EuroSys 2022 and ACM SenSys 2022.
Reviewer for IEEE Transactions on Parallel and Distributed Systems (TPDS), Elsevier Sustainable Computing (SUSCOM), and Elsevier Applied Energy journals.