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 — 08/2016–02/2022
Advisor: David E. Irwin
Committee: Prashant Shenoy, Jay Taneja, and Fatima M. Anwar
Dissertation: *Improving the Programmability of Networked Energy Systems*

National University of Science and Technology (NUST), Pakistan — 09/2013–03/2016
MS in Energy Systems Engineering
Dissertation: *Using Stressed Grids as a Storage Medium for Renewable Energy*

University of Engineering and Technology Lahore, Pakistan — 09/2009–05/2013
BS in Electrical Engineering

Academic Experience

University of Massachusetts Amherst
Postdoctoral Research Associate, College of Information and Computer Sciences, — 02/2022–present
Graduate Research Associate, Department of Electrical and Computer Engineering, — 08/2016–02/2022

Lahore University of Management Sciences, Pakistan
Research Associate, Department of Electrical Engineering, — 06/2015–06/2016

National University of Computer & Emerging Sciences, Pakistan
Research Engineer, Department of Computer Science, — 09/2013–05/2015

Industry Experience

VMware Research Group
Sustainability Research Intern, Advisors: Victor Firoiu, Ben Pfaff — 05/2021–08/2021

Google Research
Research Intern, Advisors: Nan Deng, Krzysztof Rzadca — 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/. To provide a context for my publications, I am quoting my Ph.D. advisor on the nature of publications in the broader domain of computer science.

"By convention, in my field, student authors are listed first in order of contribution, followed by senior authors in order of contribution. Note that, in computer systems research, the top conferences are generally considered more important than the top journals. Top conferences use a rigorous review process in which multiple (3-7) program committee members evaluate each submitted paper. The top conferences also often "shepherd" accepted papers, where the program committee member supervises revisions for accepted papers according to the reviewers' comments. Regarding acceptance rates, top conferences in computer systems typically accept <30% of submitted papers. Some conferences also follow a hybrid journal model with multiple deadlines each year and an opportunity for revisions and resubmission. The Association for Computing Machinery (ACM), the primary professional organization for computer systems research, provides specific guidelines for hybrid conferences/journals at https://www.acm.org/publications/pacm/introducing-pacm."

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] 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.

[5] **Noman Bashir**, Yasra Chandio, David Irwin, Fatima M. Anwar, Jeremy Gummeson, 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.

[6] 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.

[7] 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.

[8] 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.

[9] Qianlin Liang, **Noman Bashir**, Walid A. Hanafy, Ahmed Ali-Eldin, David Irwin, and Prashant Shenoy. *Dělen: 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 Rzadca, 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 Community-level 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.

Posters/demos (peer-reviewed)

[44] Santiago Correa, **Noman Bashir**, Jesus Omana Iglesias, Candace Saffery, Jay Taneja. *EXTEND: A Framework for Increasing Energy Access in Communities with Solar Home Systems*, ACM SIGCAS Conference on Computing and Sustainable Societies (COMPASS), 2019.

[45] **Noman Bashir**, Dong Chen, David Irwin, Prashant Shenoy. *Solar-TK: Solar Performance Modeling and Forecasting Toolkit*, ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (BuildSys), 2019.

[46] Zohaib Sharani, **Noman Bashir**, Khushboo Qayyum, and Affan A. Syed. *Enabling Practical Demand Response in Highly-Stressed Grids using Aashiyana*, The International Conference on Future Energy Systems (e-Energy), 2015.

[47] Zohaib Sharani, Khushboo Qayyum, **Noman Bashir**, and Affan A. Syed. *SoftUPS: Eliminating the Need and Cost of Battery Backups*, The International Conference on Future Energy Systems (e-Energy), 2014.

Book chapters

[48] **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

[49] **Noman Bashir**. *Improving the Programmability of Networked Energy Systems*, PhD thesis, University of Massachusetts Amherst, 2022.

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

Service to the profession

Co-chair ACM SIGEnergy Workshop on Societal Decarbonization (SoDec'23), formerly WeCan'22.
PhD Sympsium 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 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.