Shahkar Ahmad Nahvi

Curriculum Vitae

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scholar.google.com/citations?user=bLFbrC0AAAAJ

Summary

Associate Professor with over 17 years of experience in teaching, research, and academic leadership in Electrical Engineering. Expertise in surrogate modeling, nonlinear dynamical systems, and data-driven control strategies. Actively involved in translational research and innovation, including low-cost frugal technologies and robotics. Founder and Coordinator of a Design Innovation Centre, with multiple government-funded projects and patents. Strong publication record, international collaboration experience, and doctoral/postdoctoral mentoring.

Education

2010–2013 **Ph.D. in Systems and Control**, *IIT Delhi, India*, CGPA: 9.25/10. Thesis: Reduced order modelling and fast simulation strategies for nonlinear dynamical systems.

2003–2005 **M.Tech (Honours) in Power Systems and Drives**, *Aligarh Muslim University, India*, Percentage: 79.78. Thesis: Microcomputer based Power Electronic Controller for AC and DC motor drives.

1999–2003 **B.Tech (Honours) in Electrical Engineering**, *Aligarh Muslim University, India*, CGPA: 8.98/10.

Employment History

2021–Present **Associate Professor**, *Islamic University of Science and Technology (IUST), J&K, India*

2008–2021 **Assistant Professor**, *Islamic University of Science and Technology (IUST), J&K, India*

2006–2008 **Lecturer**, *National Institute of Technology (NIT), Srinagar, India*

Teaching Record

Undergraduate Signals and Systems, Control Systems, Power Electronics, Electrical Machines, Linear Algebra, Design Thinking

Postgraduate Numerical Optimization, Nonlinear Systems, Large-scale Systems, Research Methodology

Interdisciplinary **Curriculum development and course design** as Program Coordinator of B.S. through *Design your own degree (DYoD)* mode at IUST.

Research Interests

Surrogate modeling using hybrid methods (data-driven and Physics based) with applications in Digital twins for electrical systems

Data-driven control, Koopman operator theory

Active Disturbance Rejection Control for robotics

Simulation acceleration in power electronic circuits

Frugal engineering and embedded system applications

Selected Publications

2024 Hamid, Rafiq, Nahvi et al., *Hierarchical deep learning-based adaptive time stepping scheme for multiscale simulations.*Applications of Artificial Intelligence

2023 Hamid, Rafiq, Nahvi et al., *Deep learning assisted surrogate modeling of large-scale power grids*, Sustainable Energy, Grids and Networks.

2022 Khan, Bazaz, Nahvi, *An Adaptive Framework for Efficient Simulation of Nonlinear Power Electronic Circuits*, IFAC-PapersOnLine.

2020 Khan, Bazaz, Nahvi, *Adaptive multi-resolution framework for fast simulation of power electronic circuits*, IET Circuits, Devices and Systems.

2019 Khan, Bazaz, Nahvi, *Singular perturbation-based model reduction of power electronic circuits*, IET Circuits, Devices and Systems.

2018 Khan, Bazaz, Nahvi, *Singular perturbation-based model reduction of power electronic circuits*, IFAC-PapersOnLine.

2013 Nahvi et al., *Piece-wise Quasi-linear Approximation for Nonlinear Model Reduction*, IEEE Transactions on CAD of Integrated circuits and systems.

2013 Nahvi et al., *Nonlinearity-aware sub-model combination in trajectory-based methods*, Mathematics and Computers in Simulation.

Research Grants

2024–Present Low-cost haptic feedback enabled robotic interface for teaching STEM concepts, JKSTIC, INR 700,000

2021–2024 Frugal Ventilator Design, JKSTIC, INR 770,000

2022–2024 Deep Learning for MOR, SERB NPDF, INR 2,700,000

2015–Present Design Innovation Centre, MHRD, INR 10,000,000

2018–2020 MOR for Power Electronics, INR 700,000, CPRI, GOI

International Collaboration

2018 Guest Researcher, Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany. Worked with Prof. Peter Benner on algorithmic macromodeling.

Supervision

PhD 3 awarded (NIT Srinagar/IUST), 1 ongoing (NIT Srinagar)

Postdoc 1 mentored under SERB NPDF (2022–2024)

Academic Leadership

2014–Present Head of Department (various terms), Electrical Engineering, IUST

2015–Present Founder and Coordinator, Design Innovation Centre (DIC), IUST

2023–Present Program Coordinator, BS Design Your Own Degree (DYoD) program

2018–2021 Nodal Officer Academics, World Bank Funded Technical Education Quality Improvement Program (TEQIP) - III

Innovation and Patents

As founder and coordinator, Design Innovation Centre (DIC), IUST, established lab with CAD, 3D printing, embedded systems, 10+ patents/designs on assistive and frugal technologies given below:

2024 Efficient Induction Based Heating Device for Room Comfort

2024 Smart Egg Incubator With Programmable Environmental Controls, Redundant Sensor System, and Scalable Insulated Design

2024 3 in 1 Interchangeable spring-loaded claw hammer, socket set and axe

2024 Secure Push-to-Lock Gate Latch for Livestock Fencing Systems

2023 Air Handling Unit for Potable Powered Air Purifying Respirator

2023 Air filter for air purifying respirator

2023 Air pump for Potable Powered air purifying respirator

2022 Automatic Book Page Flipper for disabled

2021 Face Splash Guard, Frugal Mechanical Ventilator with vertical actuation, Frugal Mechanical Ventilator with horizontal actuation, Applicants

2020 Negative Pressure Chamber

Public and Professional Service

Committee roles: Academic Council, TEQIP-III Board, Faculty Recruitment, Board of Studies, Board of Research Studies

Membership: IEEE

Reviewer: IEEE TCAD, ECC, ICC, ACODS

Honours and Awards

GATE-2004: 97.25 percentile; MHRD PG Scholarship

IDB Scholarship during B.Tech (4 years)

Technical Skills

Programming MATLAB, Python, C/C++, Arduino, LaTeX

Simulation ANSYS, Simulink

References

Prof. Peter Benner, MPI Magdeburg, Germany benner@mpi-magdeburg.mpg.de

Prof. Bibudhananda Biswal, CIC, Delhi University, India bbiswal@ducic.ac.in

Prof. M.M.S. Beg, CS, AMU, India mmsbeg@cs.berkeley.edu

Prof. S. Janardhanan, EE, IIT Delhi, India janas@ee.iitd.ac.in

Prof. Mairajudin Mufti, EE, NIT Srinagar, India mdmufti@nitsri.ac.in

Full Publication list

Reverse chronological order

- **International Journals**

1. Majid H Koul, Tufail Ahmad, Haseeb Dar, Shahkar A Nahvi, "Fabrication and control of an in-house developed reaction wheel-based inverted pendulum for education and experimentation," Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control Engineering, Vol. 240(3), p. 388–400, 2026.
2. Asif Hamid, Danish Rafiq, Shahkar Ahmad Nahvi, Mohammad Abid Bazaz, "Hierarchical deep learning-based adaptive time stepping scheme for multiscale simulations," Engineering Applications of Artificial Intelligence, vol. 133, p. 108 430, 2024.
3. M. U. Munieeb, S. S. Sofi, F. Bashir, M. U. Hassan, and Shahkar Ahmad Nahvi, "Some contributions to lagrangian modelling of power converters," Franklin Open, vol. 8, p. 100 125, 2024, issn: 2773-1863.
4. Asif Hamid, Danish Rafiq, Shahkar Ahmad Nahvi, Mohammad Abid Bazaz, "Deep learning assisted surrogate modeling of large-scale power grids", Sustainable Energy, Grids and Networks, Volume 34, 2023, 101031.
5. Hadhiq Khan, Mohammad Abid Bazaz, Shahkar Ahmad Nahvi, "An Adaptive Framework for Efficient Simulation of Nonlinear Power Electronic Circuits", IFAC-PapersOnLine 55 (1), 854-859
6. Hadhiq Khan, Mohammad Abid Bazaz, Shahkar Ahmad Nahvi, "Adaptive Multi-Resolution Framework for Fast Simulation of Power Electronic Circuits", IET Circuits, Devices and Systems, 2020, DOI: 10.1049/iet-cds.2019.0320.
7. Satyavir Singh, Mohammad Abid Bazaz, Shahkar Ahmad Nahvi, "Simulating Swing Dynamics of a Power System Model Using Nonlinear Model Order Reduction", COMPEL - The international journal for computation and mathematics in electrical and electronic engineering, Vol. 38 No. 6, pp. 1918-1930, October 2019, https://doi.org/10.1108/COMPEL-08-2018-0331.
8. Hadhiq Khan, Mohammad Abid Bazaz, Shahkar Ahmad Nahvi, "Singular Perturbation based Model Reduction of Power Electronic Circuits", in IET Circuits, Devices and Systems, vol. 13, no. 4, pp. 471-478, July 2019. doi: 10.1049/iet-cds.2018.5234.
9. Satyavir Singh, Mohammad Abid Bazaz, Shahkar Ahmad Nahvi, "A scheme for comprehensive computational cost reduction in proper orthogonal decomposition", Journal of Electrical Engineering, Vol 69 (2018), No. 4, pages 279–285.
10. Hadhiq Khan, Mohammad Abid Bazaz, Shahkar Ahmad Nahvi, "Simulation Acceleration of High-Fidelity Nonlinear Power Electronic Circuits Using Model Order Reduction" ,IFAC-PapersOnLine, Volume 51, Issue 1, 2018.
11. Shahkar Ahmad Nahvi, Mohammad Abid Bazaz, Mashuq-un- Nabi, S Janardhanan, "Approximate Snapshot-ensemble Generation for Basis Extraction in Proper Orthogonal Decomposition", IFAC-PapersOnLine, Volume 47, Issue 1, 2014, Pages 917-921.
12. Shahkar Ahmad Nahvi, Mashuq-un-Nabi, S. Janardhanan, "Piece-wise Quasi-linear Approximation for Nonlinear Model Reduction", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, Volume 32, Issue 12, pp. 2009-2013, Dec. 2013.
13. S.A. Nahvi, M. Nabi, S. Janardhanan, "Nonlinearity-aware sub-model combination in trajectory based methods for nonlinear Mor", Mathematics and Computers in Simulation, Elsevier, Volume 94, pp. 127-144, August 2013.
14. Shahkar Ahmad Nahvi, Mashuq-un-Nabi, S. Janardhanan, "Trajectory Piece-wise quasi-linear approximation of large nonlinear dynamic systems", International Journal of Modeling, Identification and Control, Inderscience, Vol. 19, No. 4, pp. 369-377, Aug. 2013.
15. Shahkar Ahmad Nahvi, Mashuq-un-Nabi, S. Janardhanan, "AFAS - Adaptive Fast Approximate Simulation for nonlinear model reduction", International Journal of Modeling, Identification and Control, Inderscience, Vol. 19, No. 2, pp. 113-124, May 2013.

- **Book Chapters**

1. Singh S., Bazaz M.A., Nahvi S.A. (2020) Computationally Efficient Scheme for Simulation of Ring Oscillator Model. In: Hu YC., Tiwari S., Trivedi M., Mishra K. (eds) Ambient Communications and Computer Systems. Advances in Intelligent Systems and Computing, vol 1097. Springer, Singapore.
2. Singh S., Bazaz M.A., Nahvi S.A. (2020) Reduced-Order Modeling of Transient Power Grid Network with Improved Basis POD. In: Gao XZ., Tiwari S., Trivedi M., Mishra K. (eds) Advances in Computational Intelligence and Communication Technology. Advances in Intelligent Systems and Computing, vol 1086. Springer, Singapore

- **International Conferences**

1. P. S. Hamid, S. Shafi, S. A. Nahvi, M. H. Koul and M. A. Bazaz, "Effect of Observer Gain Values on Active Disturbance Rejection Control: A Practical Study in Mechatronics Applications," International Conference on Intelligent Systems (AICERA: ICIS 2023), Kerala, India, 2023. **Best Paper Award**
2. A. Hamid, D. Rafiq, S. A. Nahvi and M. A. Bazaz, "Neural network-based time stepping scheme for multiscale partial differential equations," IEEE Sponsored 7^{th} International Conference on Computer Applications in Electrical Engineering - Recent Advances (CERA-2023), Roorkee, India, 2023.
3. S. Shafi, P. S. Hamid, S. A. Nahvi, M. H. Koul and M. A. Bazaz, "Experimental Investigation of the Effectiveness and Robustness of Active Disturbance Rejection Control using a DC Motor-Driven Piston," IEEE Sponsored 7^{th} International Conference on Computer Applications in Electrical Engineering - Recent Advances (CERA-2023), Roorkee, India, 2023. **Best Paper Award**
4. S. Shafi, P. S. Hamid, S. A. Nahvi, M. H. Koul and M. A. Bazaz, "Active Disturbance Rejection Control of angular position of a DC servo motor," 2023 International Conference on Power, Instrumentation, Energy and Control (PIECON), Aligarh, India, 2023, pp. 1-5.
5. S. Shafi, P. S. Hamid, S. A. Nahvi, M. H. Koul and M. A. Bazaz, "Observer based state feedback controller design of a DC servo motor using identified motor model: an experimental study," 2023 International Conference on Power, Instrumentation, Energy and Control (PIECON), Aligarh, India, 2023, pp. 1-6
6. A. Hamid, D. Rafiq, S. A. Nahvi and M. Abid Bazaz, "Discovering low-rank representations of large-scale power-grid models using Koopman theory," 2022 Trends in Electrical, Electronics, Computer Engineering Conference (TEECCON), 2022, pp. 108-112, doi: 10.1109/TEECCON54414.2022.9854835.
7. A. Hamid, D. Rafiq, S. A. Nahvi and M. A. Bazaz, "Power Grid parameter estimation using Sparse Identification of Nonlinear Dynamics," 2022 International Conference on Intelligent Controller and Computing for Smart Power (ICICCSP), 2022, pp. 1-6, doi: 10.1109/ICICCSP53532.2022.9862464.
8. H. Khan, M. A. Bazaz and S. A. Nahvi, "A Framework for Fast Simulation of Power Electronic Circuits," 2019 International Aegean Conference on Electrical Machines and Power Electronics (ACEMP) and 2019 International Conference on Optimization of Electrical and Electronic Equipment (OPTIM), Istanbul, Turkey, 2019, pp. 310-314.
9. Hadhiq Khan, Mohammad Abid Bazaz, and Shahkar Ahmad Nahvi, "Accelerated Simulation Across Multiple Resolutions for Power Electronic Circuits", Indian Control Conference 2019, IIT Delhi, Delhi, January 2019.
10. Satyavir Singh, Mohammad Abid Bazaz and Shahkar Ahmad Nahvi, "Reduced Order Modelling of Ring Oscillator System with POD-DEIM", presented in IEEE 4th International Conference (ICCCA-2018),New Delhi, December 14-15, 2018.
11. Satyavir Singh, Mohammad Abid Bazaz and Shahkar Ahmad Nahvi, "Model Order Reduction of Two Area Electric Power Systems", presented in IEEE 4th International Conference (ICCCA-2018),New Delhi, December 14-15, 2018.
12. Adil Showkat, Danish Rafiq, Suhail Majeed, Vakar Ahmed, Majid Hamid Koul and Shahkar Ahmad Nahvi, "Disturbance Rejection of a Single-Axis of a Quadcopter using Lead Compensation", presented in the Third IFAC International Conference on Advances in Control and Optimization of Dynamical Systems, (ACODS 2018), DRDO Hyderabad, India, Feb. 2018.

13. Hadhiq Khan, Mohammad Abid Bazaz and Shahkar Ahmad Nahvi, "Accelerated Simulation of a High-Fidelity DC-DC Buck-Boost Converter Using Model Order Reduction", presented in Indian Control Conference, IIT Kanpur, January 4-6, 2018.
14. Hadhiq Khan, Mohammad Abid Bazaz and Shahkar Ahmad Nahvi, "Model Order Reduction of Power Electronic Circuits", in 6th International Conference On Computer applications in Electrical Engineering-Recent Advances, October 2017, IIT Roorkee, Roorkee, India.
15. Shahkar Ahmad Nahvi, M.A. Bazaz, "Model Order Reduction for Power Electronics: Issues and Perspectives", IEEE International Conference on Computing, Communication and Automation, Delhi, India, April-2017.
16. Mohammad Abid Bazaz, Shahkar Ahmad Nahvi, Mashuq-un- Nabi, S Janardhanan, "Adaptive Parameter Space Sampling in Matrix Interpolatory pMOR", IEEE-RDCAPE, Noida, U.P. , India, March 2015.
17. Shahkar Ahmad Nahvi, Mohammad Abid Bazaz, Mashuq-un- Nabi, S Janardhanan, "Fast Simulation of Nonlinear Dynamical Systems for Application in Reduced Order Modelling ", Proc. of the European control conference (ECC-2014), Strasbourgh, France, July 2014.
18. S. A. Nahvi, M. Nabi and S. Janardhanan, "Adaptive sampling of nonlinear system trajectory for Model Order Reduction", Proc. International Conference on Modelling, Identification and Control, Wuhan, China, June 2012, pp. 1249-1255.
19. S. A. Nahvi, M. Nabi and S. Janardhanan, "A Quasi-linearisation approach to trajectory based methods for nonlinear MOR", Proc. International Conference on Modelling, Identification and Control, Wuhan, China, June 2012, pp. 217-222.
20. Shahkar Ahmad Nahvi, Mashuq-un-Nabi, S. Janardhanan, "Trajectory based methods for nonlinear MOR: Review and Perspectives", Proc. of the 2012 IEEE International Conference on Signal Processing, Computing and Control, Shimla, India, March 2012, pp. 1-6.
21. S.A. Nahvi, Mashuq-un-Nabi, "Optimal control of a heat conduction problem using its low order approximation," Proceedings of IEEE International Conference on Power, Signals, Controls and Computation, Thrissur, India, Jan. 2012, pp.1-6.
22. P. Guha, S. A. Nahvi & M. Nabi, "Optimal Control of Temperature Profile for a Distributed Parameter Heat Conduction Problem with Generic Nontrivial geometry using Krylov Projection based Model Order Reduction", Proc. of 3rd International Conference on Control and Optimization with Industrial Applications, Ankara, Turkey, August 2011.
23. Haroon Ashfaq, S.A. Nahvi, M.S. Jamil Asghar, "A Personal-Computer based Controller for Performance Improvement of Grid-Connected Wound-Rotor Induction Generators," Proceedings of IEEE International Power and Energy Conference, Putra Jaya, Indonesia, Nov. 2006, pp.432-436.

- **National Conferences**

1. S. A. Nahvi, H. Ashfaq, M. S. J. Asghar, M. M. S. Beg, "Development of a Personal-Computer based Power-Electronic Controller for Induction Motors", National Conference on Power Electronics and Drives, March 7-9, 2006, Karaikudi, India, pp. 146-149.
2. M. Mohibullah, Imdadullah and Shahkar Ahmad Nahvi, "Analysis and Experimental Demonstration of Two-Fluid Model LMMHD Conversion Technology", National Conference on Advances in Heat Transfer and Fluid Dynamics, September 16-17, 2006, Aligarh Muslim University, Aligarh, India, pp. 413-418.