

# Shahkar Ahmad Nahvi

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## Summary

I received my PhD in Control and Computation from the Department of Electrical Engineering, **IIT-Delhi** in 2013. My research interests are in Model order reduction (MOR) techniques, which aim at finding low-dimensional approximations of Large-scale systems and in optimisation and control design using dimensionally reduced models. I also have interests in data driven dynamics, especially application of modern data driven techniques to complex systems and robotics.

I spent the month of September 2018 at the Max Planck Institute(MPI) for Dynamics of Complex Technical Systems, Magdeburg, Germany where I was invited as a guest researcher by Professor Peter Benner, who heads the *Computational methods in systems and control* research group at MPI Magdeburg.

I am also interested in Design and Innovation to solve real world problems. For the last four years, I am working as Coordinator of the Design Innovation Centre at my University where I have been instrumental in setting up a state-of-the-art Laboratory, facilitating student driven innovation and fostering a spirit of creative thinking amongst the student community.

I have been actively involved in teaching, curriculum design and student mentoring and guidance for the last ten years. Currently, I am working as Assistant Professor at the Electrical Engineering Department, Islamic University of Science and Technology, Awantipora.

## Education

- **PhD (Control and Computation)** **2010 – 2013**  
Electrical Engineering Department, IIT Delhi *Delhi, India*
  - Thesis: Reduced order modelling and fast simulation strategies for nonlinear dynamical systems.
  - CGPA: 9.25 on a scale of 10.
- **M. Tech (Honors)(Power System and Drives)** **2003 – 2005**  
Electrical Engineering Department, Aligarh Muslim University *Aligarh, India*
  - Dissertation: Microcomputer based Power Electronic Controller for AC and DC motor drives.
  - Percentage: 79.78
- **B. Tech (Honors)(Electrical Engineering)** **1999 – 2003**  
Electrical Engineering Department, Aligarh Muslim University *Aligarh, India*
  - CGPA: 8.98 on a scale of 10.

## Academic and Research experience

- **Guest Researcher** **03/09/2018 – 03/10/2018**  
*Max Planck Institute* *Magdeburg, Germany*
  - I worked with Prof. Peter Benner in his research group, Computational methods in systems and control on the project *Algorithmic Macromodelling for Power Electronics*.
- **Assistant Professor** **September' 2008 – present**  
*Electrical Engineering Department, Islamic University of Science and Technology* *J& K, India*

Islamic University of Science and Technology is a public university in the state of J& K, covered under articles 2f and 12b of the University Grants Commission, Govt. of India, and was established in the year 2006. The School of Technology was initiated in 2007.

  - I have been teaching courses related to Dynamics, Control and Computation including Numerical Optimisation, Dynamics of Systems, Advanced Control Systems, et.c. in addition to basic courses in Electrical Engineering like Network Analysis, Power Electronics and Power systems. I have been intensively involved in setting up experimental and computational set-up for these courses.
  - I have also handled administrative responsibilities. I have served as Incharge Head of Department (HOD) from June 2014 to January 2018 and from October 2020 till date. My responsibilities as Incharge-HOD include planning, infrastructural development and general administration.

- **Coordinator** **April' 2015 – present**

*Design Innovation Centre, Islamic University of Science and Technology*

*J&K, India*

In 2015, I was given the responsibility of establishing a Design Innovation Centre (DIC) at my University under a nation-wide initiative of the Govt. of India for setting up of Design Innovation Centres across the country. Since its establishment, DIC has acted as innovation facilitator, an educational resource as well as a focal point for design and innovation activities on campus. A brief of our work is given on the website <https://dic-iust.webnode.com/>.

- **Teaching Assistant during PhD** **July' 2010 – November' 2012**  
*IIT Delhi* *Delhi, India*

– Assistance in the examination and evaluation of M. Tech (Masters in Technology) Control and Automation course.

- **Lecturer (on contract)** **August' 2006 – September' 2008**  
*Electrical Engineering Department, National Institute of Technology Srinagar.* *J&K, India.*

My primary work at NIT Sinagar consisted of teaching courses at the undergraduate level in Electrical Engineering (Control Systems, Power Electronics, Network Analysis, Microprocessors), development of experiments for laboratory assignments and supervision of undergraduate student projects related to Electrical Engineering with focus on Power Electronics and Control of Electrical Drives.

## Administrative experience

A list of significant administrative responsibilities that I have been involved in during my current employment at IUST:

1. **Incharge Head of the Department:** Served as Incharge Head of Department, Electrical Engineering, IUST for a period of seven semesters between 2014 to 2018. Currently serving as Incharge HOD from October 2020 till date.
2. Involvement as member in University level Academic Committees:

Assignment	No. of sem.
University level committee for preparing blueprint of Choice based credit system (CBCS) for University Polytechnic	1
University level committee for preparing draft PhD statutes for all departments	1
Member, Entrepreneurship Development Cell, IUST	6
<b>Nodal Officer Academics, TEQIP-III</b>	6
Member, Board of management, TEQIP-III	4
<b>Member, Board of Governors TEQIP-III</b>	4
Member, Research Committee, Dept. of Mechanical Engineering	1

3. Involvement as in University level Special Committees.

Assignment	No. of sem
Chairman, Enquiry Committee (2014)	1
<b>Member Secretary, University level Committee for Scrutinizing application forms for Assistant Professors</b>	1
<b>Chairman, Project Purchase Committee, Design Innovation Centre, IUST</b>	7
<b>Member, Central Disciplinary Committee</b>	8
Member, Selection committee for Asst. Prof 2015 (Contractual)	1
<b>Chairman, Selection committee for Design Fellow - 2015</b>	1
<b>Chairman, University level committee for preparing seniority list of teaching and non-teaching employees</b>	1
Member, University level committee for revisiting recruitment rules of non-teaching staff of University	1
Member, Selection committee for Asst. Prof (Contractual) 2017	1
Member, Selection committee for Junior Engineer (Elect)	1
Member of committee for looking into installation of 3-phase 20 KVA UPS	1
Member, Electrical verification sub-committee	1
Member, Screening committee for the post of Design Fellow, Design Innovation Centre	1
<b>Member Secretary, Selection Committee for the post of Design Fellow, Design Innovation Centre - 2019</b>	1

4. Involvement in Departmental activities identified by Head of the Department. Given below in tabular form.

Assignment	No. of sem.
Chief coordinator examinations (EE)	1
Chairman, Departmental Internal quality assurance cell	2
Expert, Curriculum development, Mechanical Engineering Department, IUST	1

## PhD and Masters Supervision

- Successfully guided two PhD students (at EE dept., NIT Srinagar) from 2016-2020 as co-supervisor jointly with a faculty member at NIT Srinagar. Currently supervising one student at IUST since August 2020.
- Regularly acted as an external evaluator of M.Tech (Masters in Technology) dissertations of students in the the NIT Srinagar.

## Sponsored Projects

- I am the **Coordinator** of the **Ministry of Human Resources and Development (MHRD), Govt. of India's** funded project for the establishment of a Design Innovation Centre (DIC) at my University. This Project is in it's fifth year and is worth INR 1 Crore.
- I was the Co-Principal Investigator of the Central Power Research Institute (CPRI) sponsored project on *Model Order Reduction for Simulation Acceleration in Power Electronics*. The project was of 1.5 years duration with a sanctioned budget of INR 7 lakhs and has been successfully completed.

## Short-term courses/workshops organised

- **Modelling and Simulation of Large Scale Systems** jointly organised by Department of Electrical Engineering, NIT Srinagar and Department of Electrical Engineering, IUST, and held from April 13 to 17, 2015 at NIT Srinagar.
- **Innovation Frontiers-I**, one day workshop organised by Design Innovation Centre (DIC), IUST, and held on April 28, 2016 at DIC, IUST.
- **Design Thinking**, one day workshop organised by Design Innovation Centre (DIC), IUST, and held on July 26, 2017 at DIC, IUST.
- **Innovation Frontiers-III**, Workshop on 3D Printing, held on 04-07-2018, at DIC, IUST.
- **Innovation Frontiers-IV**, two day workshop organised by Design Innovation Centre (DIC), IUST, and held on Dec 11-12, 2018, at DIC, IUST.
- **Innovation Frontiers-V**, two day workshop organised by Design Innovation Centre (DIC), IUST, and held on March 23-24, 2021, at DIC, IUST.

## Talks

- ‘Modelling, simulation and control of switched electronic systems’, One week workshop on Design in Power Electronics, Dept. of Electrical Engineering, SoET, BGSB University, 9<sup>th</sup> Feb 2020.
- ‘Scientific documentation using Latex’, One week workshop on research methodology in Sciences for Research Scholars’, at University of Kashmir, 23<sup>rd</sup> June 2019.
- ‘Bibliography management using BibTeX’, during a Workshop on L<sup>A</sup>T<sub>E</sub>X, at Department of Electrical Engineering, N.I.T. Srinagar, 3-4 June, 2016.
- ‘Mathematical preliminaries for MOR’, in Workshop on Modelling and Simulation of Large Scale Systems, April 13 to 17, 2015 at NIT Srinagar.
- ‘MOR for Nonlinear dynamical systems’, in Workshop on Modelling and Simulation of Large Scale Systems, April 13 to 17, 2015 at NIT Srinagar.
- ‘Some open problems and potential applications in MOR’, in Workshop on Modelling and Simulation of Large Scale Systems, April 13 to 17, 2015 at NIT Srinagar.
- ‘Model order reduction for simulation and control’, Electrical Engineering Department, Indian Institute of Technology Hyderabad, 6<sup>th</sup> June 2014.
- ‘Technical and Scientific documentation using L<sup>A</sup>T<sub>E</sub>X’, in Workshop on ‘Research Methodologies’, School of Business Studies, Islamic University of Science and Technology, Awantipora, November 2013.
- ‘Power Quality Problems caused by Conventional AC-DC converters’, in Workshop on ‘Power Quality Problems and their Solutions’, Department of Electrical Engineering, N.I.T. Srinagar, July 2008.

## Review work

I have reviewed papers for Indian Control Conference (ICC), IEEE Transactions on CAD of Integrated Circuits and Systems, IEEE Transactions on Emerging Topics in Computational Intelligence, European Control Conference (ECC), Advances in Control and Optimisation of Dynamical Systems (ACODS).

## Publications

Reverse chronological order

### • International Journals

- 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.
- 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>.
- 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.
- 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.
- 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.
- [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.
- [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.

- 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.
- 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.
- 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

- 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.
- 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

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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)*, Strasbourg, France, July 2014.
- 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.
- 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.

- [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.
- [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.
- 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.
- 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

- [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.
- 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.

### Awards

- Qualified In Graduate Aptitude Test for Engineers (GATE-04) conducted by the Indian Institutes of Technology with a percentile of 97.25 and an All-India-Rank of 520. For the same, was awarded Postgraduate Scholarship by Ministry of Human Resources and Development (Govt. of India) during M.Tech.
- Awarded Scholarship by Islamic Development Bank, Jeddah, Kingdom of Saudi Arabia for a period of four years during B.Tech.
- Awards at the Intra-University and Inter-School level for creative writing in English.

### Short-term courses/workshops attended

- Participated in GIAN course on Advanced Sliding Mode Control and Estimation for Real Complex Systems of the 21st Century, held at IIT Roorkee, between 24 to 27 October 2017
- ‘Nanotechnology: Present and Future Horizons’, Department of Chemistry, N.I.T. Srinagar, 8<sup>th</sup> September, 2008.
- ‘Power Quality Problems and their Solutions’, Department of Electrical Engineering, N.I.T. Srinagar, 7<sup>th</sup> – 10<sup>th</sup> September, 2008.
- ‘Computer aided design of Electrical Machines with Power Electronics Applications’, FITT, IIT Delhi, 28<sup>th</sup> – 30<sup>th</sup> January, 2010.
- ‘62<sup>nd</sup> General Orientation Course’, UGC-Academic Staff College, University of Kashmir, 10<sup>th</sup> June - 8<sup>th</sup> July, 2013.
- ‘ISTE workshop on Computer Programming’, IIT Bombay, 20<sup>th</sup> May - 21<sup>st</sup> June, 2014.

### Teaching Interests

#### • Graduate-level Courses and Labs

- Large-scale systems and dimension reduction methods, Numerical Optimisation, Linear system theory, Nonlinear systems, Optimal control, Discrete-time systems, Random Processes in Control and Estimation.

#### • Undergraduate-level Courses and Labs

- Signal and Systems, Linear Algebra, Circuits, Dynamical System Analysis, Power Systems, Power Conversion, Electrical Machines, Numerical Simulation, MATLAB/SCILAB.

## Current Research Interests

- MOR for Large scale nonlinear dynamical systems.
- Modelling and Simulation of Power Converters.
- Data driven dynamics and control.

## Software Skills

**Languages:** C, C++ Assembly Language programming, L<sup>A</sup>T<sub>E</sub>X.

**Softwares:** MATLAB, SCILAB.

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## References

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