


# Danish Rafiq

 morafiq.in  +91-729 825 3248  danishrafiq32@gmail.com  Danish Rafiq

 Danish Rafiq  Danish Rafiq

 Department of Electrical Engineering, Islamic University of Science & Technology, Awantipora, J&K, India 192122

## Research Interests

---

- Model reduction, sparse sensing, and high performance computing
- System-theoretic measures for parametric reduction
- Scientific machine learning for reduced modeling strategies

## Awards and Grants

---

- **DST INSPIRE Faculty Fellowship Grant (1.2 Crores)** **Mar 2024 - Mar 2029**  
Awarded by Department of Science & Technology, Ministry of Science & Technology, Govt. of India.  
*Project title: Equivalencing and Controlling of Low-Inertia Power Systems (ECLIPSE).*
- **Horizon Europe Seal of Excellence Award** **Apr 2023**  
Awarded by European Commission under the call for Marie Sklodowska-Curie Post Doctoral Fellowship 2022 with Imperial College London, UK.  
*Recognized a high-quality project proposal by international panel of experts and recommended for funding by other sources.*
- **National Post-Doctorate Fellowship (NPDF) Grant (25 Lakhs)** **Nov 2022 - Nov 2024**  
Awarded by the Science and Engineering Research Board (SERB) under the Department of Science & Technology (DST), Ministry of Science & Technology, New Delhi, Govt. of India.  
*Project title: Deep-learning based discoveries of reduced-order models in science and engineering*
- **Doctorate Fellowship** **Sep 2017 - Sep 2022**  
Fellowship grant by the Ministry of Education (MoE) , Government of India for pursuing Ph.D. at the Department of Electrical Engineering, National Institute of Technology Srinagar, India.
- **IEEE Control Systems Society Travel Grant** **2019 & 2020**  
For participation in the Indian Control Conference at IIT Delhi, India in January 2019 and at IIT Delhi, India in December 2019, at IIT Hyderabad in 2019, and at IIT Bombay in December 2021.

## Experience

---

- **Principal Investigator SERB-NPDF, IUST, J&K, India** **Nov 2022 - Present**  
Project: Deep learning based discoveries of reduced order modeling in Science and Engineering
- **Research Intern at DIC, IUST J&K, India** **Dec 2016 - July 2017**  
Project: Design and development of a sensory wristband made to attenuate the communication divide children with hearing disabilities and caregivers

- **Team leader, The Lalit Grand Palace, J&K India** **Aug 2016 - Oct 2016**  
Appointed as a member to lead the electrical team of several team members in the Department of Engineering for Power Distribution and Transformer maintenance
- **Industrial Experience** **Aug 2016 - Oct 2016**  
Upper Sindh Hydro Power Plant-II (103MW), Kangan, J&K, India.

## Education

---

- **Doctorate in Electrical Engineering** **Sep 2017 - Aug 2022**  
National Institute of Technology Srinagar, J&K, India Advisor: M. Abid Bazaz  
*Thesis: Advanced techniques for dimensionality reduction of nonlinear and parametric dynamical systems using system-theoretic measures*
- **Bachelor in Electrical Engineering (Honors)** **Aug 2012 - Aug 2016**  
Islamic University of Science & Technology, India (CGPA: 8.5/10) Advisor: S. Ahmad Nahvi  
*Thesis: Single-axis stabilization of a Quadcopter using lead compensation techniques*
- **Higher Secondary Part-II** **Mar 2010 - Nov 2011**  
Sri Pratap College, J&K, India (456/500)  
*Among top 1% in the state*
- **High Schooling** **Mar 2008 - Dec 2009**  
New Convent High School, J&K (463/500)  
*Among top 1% in the state*

## Journal Publications

---

(226 Google scholar citations; h-index 7; i10-index 6)

14. J. Farooq, **D. Rafiq**, P. R. Vlachas, and M. A. Bazaz  
RefreshNet: Learning Multiscale Dynamics through Hierarchical Refreshing  
*arXiv link: <https://arxiv.org/abs/2401.13282>.*
13. A. Hamid, **D. Rafiq**, S. A. Nahvi, and M. A. Bazaz  
Hierarchical deep learning based adaptive time-stepping of multiscale systems  
*Engineering applications of Artificial Intelligence*, 2024. [**IF: 8.00**]  
*arXiv link: <https://arxiv.org/abs/2311.05961>.*
12. A. Hamid, **D. Rafiq**, S. A. Nahvi, and M. A. Bazaz  
Enhancing Computational Efficiency in Multiscale Systems using Deep Learning of Coordinates and Flow Maps  
*Journal of Computational Science*, 2024. [**IF: 3.3**]
11. A. Hamid, **D. Rafiq**, S. A. Nahvi, and M. A. Bazaz  
Deep Learning assisted Surrogate Modeling of Large-Scale Power Grids  
*Sustainable Energy, Grids and Networks*, **34**: 101031, 2023. [**IF: 5.405**]

10. **D. Rafiq**, and M. A. Bazaz  
A collection of large-scale benchmark models for nonlinear model order reduction  
*Archives of Computational Methods in Engineering*, **30**: 69–83, 2023. [IF: 8.171]
9. **D. Rafiq**, J. Farooq, and M. A. Bazaz  
Synergistic use of intrusive and non-intrusive model order reduction techniques for dynamical power grids  
*International Journal of Electrical Power and Energy Systems*, **138**: 107908, 2022. [IF: 5.65]
8. **D. Rafiq**, and M. A. Bazaz  
Model order reduction via moment-matching: A state-of-the-art review  
*Archives of Computational Methods in Engineering*, **29**: 1463-1483, 2022. [IF: 8.171]
7. **D. Rafiq**, and M. A. Bazaz  
Adaptive parametric sampling scheme for nonlinear model order reduction  
*Nonlinear Dynamics*, **107**: 813-828, 2021. [IF: 5.741]
6. **D. Rafiq**, and M. A. Bazaz  
Nonlinear Model Order Reduction via Nonlinear Moment Matching with Dynamic Mode Decomposition  
*International Journal of Nonlinear Mechanics*, **128**:103625, 2021. [IF: 3.33]
5. **D. Rafiq**, and M. A. Bazaz  
Efficient computation of 1D and 2D nonlinear viscous Burgers' equation  
*International Journal of Dynamics & Control*, **9**:1523-1535, 2021. [IF: 2.5]
4. **D. Rafiq**, and M. A. Bazaz  
A framework for parametric reduction in large-scale nonlinear dynamical systems  
*Nonlinear Dynamics*, **102**:1897-1908, 2020. [IF: 5.741]
3. **D. Rafiq**, and M. A. Bazaz  
A comprehensive scheme for reduction of nonlinear dynamical systems  
*International Journal of Dynamics & Control* , **8**:361-369, 2020. [IF: 2.5]
2. **D. Rafiq**, A. Batool, and M. A. Bazaz  
Three months of COVID-19: A systematic review and meta-analysis  
*Reviews in Medical Virology*, **30**:e2113, 2020. [IF: 11.043]
1. **D. Rafiq**, S. A. Suhail, and M. A. Bazaz  
Evaluation and prediction of COVID-19 in India: A case study of worst hit states  
*Chaos, Solitons & Fractals*, **139**:110014, 2020. [IF: 9.922]

## Conference Papers (Referred)

---

8. A. Hamid, **D. Rafiq**, S. A. Nahvi, and M. A. Bazaz  
Neural network-based time stepping scheme for multiscale partial differential equations  
*7th International Conference on Computer Applications in Electrical Engineering-Recent Advances (CERA), October 27 - 29, in IIT Roorkee, India, 2023.*
7. J. Farooq, **D. Rafiq**, and M. A. Bazaz  
Multiscale Autoencoder-RNN architecture for mitigating error accumulation in long-term forecasting  
*International Conference on Emerging Techniques in Computational Intelligence (ICETCI), 2023.*

6. Khan A., **D. Rafiq**, and A. Bazaz  
A library-based dimensionality reduction scheme using nonlinear moment-matching  
*IEEE 2022 International Conference on Intelligent Vision and Computing [Best paper award]*,  
Nov 2022.
5. A. Hamid, **D. Rafiq**, S. A. Nahvi, and M. A. Bazaz  
Power Grid parameter estimation using sparse Identification of nonlinear dynamics  
*International Conference on Intelligent Controller and Computing Smart Power*, 2022.
4. A. Hamid, **D. Rafiq**, S. A. Nahvi, and M. A. Bazaz  
Discovering low-rank representations of large-scale power-grid models using Koopman theory  
*IEEE 2022 Trends in Electrical, Electronics, Computer Engineering Conference (TEECCON)*, 2022
3. **D. Rafiq**, and M. A. Bazaz  
Structure preserving nonlinear reduced order modeling technique for power systems  
*Seventh Indian Control Conference (ICC)*, 2021.
2. **D. Rafiq**, and M. A. Bazaz  
A comprehensive scheme for fast simulation of Burgers' equation  
*Sixth Indian Control Conference (ICC)*, IEEE 397-402, 2019.
1. **D. Rafiq**, and M. A. Bazaz  
Model order reduction of non-linear transmission lines using non-linear moment matching  
*2019 International Conference on Computing, Power and Communication Technologies (GUCON)*,  
394-399, 2019.

## Patents Published

---

1. **D. Rafiq**, A. Showkat, S. Yousuf, V. Ahmad, P. Shouib, M. Koul, and S. A. Nahvi  
*Situational awareness and alarming system for the hearing impaired*,  
No. 201911019834, Office of the Controller General of Patents & Trademarks, Ministry of Commerce  
& Industry, India, 2022.

## Software developed

---

7. **Adaptive-HiTS**: Adaptive time-stepping based on hierarchical deep learning of multi-scale systems,  
2023. [<https://github.com/DanishRaf32/Adaptive-HiTs>]
6. **Deep-Grid**: Obtain data-driven deep learning-based reduced order model of large power systems,  
2023. [<https://github.com/DanishRaf32/Deep-Grid>]
5. **NL-Bench**: Benchmark models for nonlinear model order reduction, Jan 2022.  
DOI: 10.5281/zenodo.5905826 [[link](#)]
4. **NLMM-DMD**: MATLAB code for Nonlinear Moment-Matching with Dynamic Mode Decomposi-  
tion, Feb 2022.  
DOI: 10.5281/zenodo.6059812 [[link](#)]
3. **MORPS**: Model order reduction of power systems, June 2021.  
DOI: 10.5281/zenodo.4954937 [[link](#)]
2. **SONLMM-DEIM**: MATLAB implementation of Second-Order Nonlinear-Moment Matching Al-  
gorithm with Discrete Empirical Interpolation Method, Mar 2021.

1. **APSM**: Adaptive parameter sampling method for parametric nonlinear systems, Jan 2021.

## Talks

---

- Feb 2023 “*Integrating Renewable Energy: Challenges and Solutions*”, at the One-day workshop on Energy Conservation & Renewable Energy, Islamic University of Science & Technology, India.
- Dec 2021 “*Structure preserving nonlinear reduced order modeling technique for power systems*”, at the Seventh Indian Control Conference at IIT Bombay, India. [\[link\]](#)
- Dec 2019 “*A comprehensive scheme for fast simulation of Burgers’ equation*”, at the Sixth Indian Control Conference at IIT Hyderabad, India. [\[link\]](#)
- Dec 2019 “*Model order reduction of non-linear transmission lines using non-linear moment matching*” at Galgotias University, Noida, New Delhi, India.

## Mentoring and advising

---

### Current (2 Ph.D.)

#### Student Thesis co-supervised:

8. S. Lateef, A. Nazir, S. Shahzaib, S. Reshi, V. Yousuf, **D. Rafiq**  
*Design of 3DOF testbench for attitude control of a Quadcopter*, (Bachelor thesis, IUST, Spring 2023)
7. A. Khan, **D. Rafiq**, and M. A. Bazaz  
*System-theoretic methods for efficient reduction of dynamic power system models*, (Master Thesis, NIT Srinagar, Spring 2022).
6. A. Mushtaq, **D. Rafiq**, and M. A. Bazaz  
*High-fidelity simulation of power electronic circuits with nonlinear effects*, (Master Thesis, NIT Srinagar, Spring 2022).
5. R. Kumar, **D. Rafiq**, and M. A. Bazaz  
*Transient analysis of power systems using nonlinear model order reduction technique*. (Master Thesis, NIT Srinagar, Spring 2020).
4. M. Das, **D. Rafiq**, and M. A. Bazaz  
*Improved Algorithms for fast simulation of power electronic converters*. (Master Thesis, NIT Srinagar, Spring 2020).
3. B. Nath, **D. Rafiq**, and M. A. Bazaz  
*Design and control of a two-axis reaction robot using PID controller* (Bachelor Thesis, NIT Srinagar, Spring 2019).
2. P. Sharma, R. Kumar, R. Jarangal, S. Shekhar, **D. Rafiq**, and M. A. Bazaz  
Attitudecontrol of quadcopter (Bachelor Thesis, NIT Srinagar, Spring 2019).
1. T. Akshay, A. Sood, **D. Rafiq**, and M. A. Bazaz  
Single-axis stabilization of a quadcopter (Bachelor Thesis, NIT Srinagar, Spring 2017).

#### Teaching Assistance

1. **ELE401G - Optimization for Engineering Design**, IUST, Fall 2023 & 2024.
2. **ELE503P - Control Systems & Virtual Instrumentation Lab**, Fall 2021, NIT Srinagar [\[link\]](#)

3. **ELE503 - Control Systems Design**, Fall 2021, NIT Srinagar.
4. **EEM123 - Linear Systems Theory**, Spring 2021, NIT Srinagar.
5. **ELE402 - Control Systems Principles (ELE-402)**, Spring 2019, NIT Srinagar.
6. **ELE3/E - Selected Topics in Advanced Control**, Spring 2019, NIT Srinagar.
7. **ELE606P - Microprocessor Lab**, Fall 2018, NIT Srinagar.

## ★ Competences

---

<b>Operating Systems</b>	Linux, Mac OS X, Microsoft Windows
<b>Numerical Softwares</b>	Python, MATLAB, COMSOL Multiphysics, ANSYS, PROTUES, GMESH, SIMULINK, PSCAD
<b>Typesetting</b>	L <sup>A</sup> T <sub>E</sub> X, OpenOffice
<b>Tools</b>	PSCAD, Visio, AutoCAD,
<b>Languages</b>	Kashmiri (Mother Tongue), English (ETS TOEFL iBT 96/120), Urdu

## 👤 References

---

**Prof. Mohammad Abid Bazaz**  
Head, Department of Electrical Engineering  
NIT Srinagar, J &K, India, 190006  
@ abid@nitsri.ac.in  
☎ +91 600 510 3740

**Dr. Shahkar Ahmad Nahvi**  
Head, Department of Electrical Engineering  
IUST Awantipora, J &K, India, 192122  
@ shahkar.nahvi@islamicuniversity.edu.in  
☎ +91 979 783 6555

Last update: April 14, 2024