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
Nonlinear Dynamics, 2024. [**IF: 5.741**]
Paper link: https://rdcu.be/dKs7A.

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 Decomposition, 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 Algorithm 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

Operating Systems	Linux, Mac OS X, Microsoft Windows
Numerical Softwares	Python, MATLAB, COMSOL Multiphysics, ANSYS, PROTUES, GMESH, SIMULINK, PSCAD
Typesetting	LaTeX, OpenOffice
Tools	PSCAD, Visio, AutoCAD,
Languages	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