Rihab Abdul Razak

Data Science
Machine Learning
Control Systems

02 June 1984
Bengaluru, India
+91 9869837508
tarihab.github.io
tarihab
tarihab@gmail.com
tarihab

Skills

- Data Analysis
- Machine Learning
- Mathematical Modelling
- Deep Learning
- Deep Reinforcement Learning
- Feedback Control Systems
- System Identification
- Time Series Analysis
- Parallel Computing

Software

- Matlab
- Python - numpy, scipy, scikit-learn, statstools, pytorch, networkx etc.
- C/C++
- Experience with ROS (Robot Operating System)
- Experience with MPI, OpenMP, CUDA and other HPC platforms
- Experience with NI LabVIEW
- Microsoft Windows, Linux

Languages

English

Hindi

Malayalam

Experience

since 2019 — Data Science Researcher — Shell Technology Centre Bangalore

Experience in Data Science R&D related to process modelling and optimization:

- Kalman filters and variants for parameter estimation and sensor bias estimation.
- Maximum likelihood estimation of unknown parameters in processes.
- Graph-based clustering algorithms.
- Data-driven dynamical model development using Linear regression, Ridge regression, Dynamic Mode Decomposition (DMD), Gaussian Process Regression (GPR), Neural Networks etc.
- Model Predictive Control (MPC) with data-driven models.
- Statistical modelling of Key Performance Indicators (KPI) using multivariate techniques such as PCA (Principal Component Analysis), PLS (Partial Least Squares) etc.
- Wavelet transform and frequency domain methods for monitoring.
- Data pre-processing: smoothing, outlier removal etc.

2012-2014 — System Engineer/Researcher R&D — Tata Consultancy Services Pvt Ltd.

Experience in software development for High Performance Computing Systems:

- Used tools such as OpenMP, MPI, CUDA etc. to develop optimized computing code for supercomputing platforms.
- Hardware-aware software for optimal performance on Nvidia GPUs and Intel architectures including the Xeon Phi computing platform.
- Parallelization and Optimization of applications such as Financial option pricing using Montecarlo methods, Grid search algorithm for parameter estimation in PK-PD modelling, CFD applications etc.

2009-2012 — Research Assistant — IIT Bombay

Research Assistant for a project titled Fault Detection and Diagnosis of Self Powered Neutron Detectors (SPNDs) sponsored by the Board of Research for Nuclear Sciences, India:

- Developed automated methods for Detection/Identification of faults in SPNDs.
- Employed Data Reconciliation techniques, PCA based modelling and Gross error detection techniques for Fault Detection and Identification (FDI).

2007-2009 — Engineer (Design) — Hindustan Aeronautics Ltd.

Involved in design/development of test-bed for a Gearbox assembly:

- Development of PLC programs and LabView based interfaces for controlling a motor drive and various other equipments/devices in the testbed.
- Attended one semester training course at IIT Kanpur on Aeronautical engineering- training included basics of aerodynamics, flight mechanics, avionics, propulsion systems, aero structures and manufacturing technology.

2006-2007 — Software Engineer — Accenture Services Pvt Ltd.

Manual testing of banking software.

Other Activities

Reviewer

IEEE Transactions on Control of Networked Systems
International Journal of Robust & Nonlinear Control
International Journal of Adaptive Control & Signal Processing
Journal of Intelligent & Robotic Systems
IEEE Conf. on Decision & Control
American Control Conference

Rihab Abdul Razak

Data Science
Machine Learning
Control Systems

Training

- Udacity Nanodegree: Intro. to Machine Learning
- Udacity Nanodegree: Deep Learning
- Udacity Nanodegree: Deep Reinforcement Learning
- Eigenvector University Europe: Chemometrics training
- EECI Graduate School on Control 2019: Practical Adaptive Control

Awards

- **Best Student Paper Award:** Indian Control Conf., Hyderabad, 2019.

References

References will be provided on request.

Education

2015 - 2020 **Ph.D. in Systems & Control Engg.** IITB-Monash Research Academy

Thesis: Distributed Adaptive Control of Mobile Sensor Networks: Coverage and Estimation Algorithms.

Advisors: Dr. Srikant Sukumar (IIT Bombay), Dr. Hoam Chung (Monash University)

The thesis deals with decentralized and adaptive control strategies for multi-agent systems with application to coverage control and estimation of scalar fields over compact sets of Euclidean space.

Courses: Systems Theory, Probability and Random Processes, Modelling and Identification, Control of Nonlinear Systems, Adaptive Control, Advanced Mobile Robotics, Optimal Control Systems, Real Analysis, Geometric and Analytic Dynamics.

2009-2012 **M.Tech. in Control & Computing** Indian Institute of Technology Bombay

Thesis: Data based Techniques for Fault Diagnosis of Self Powered Neutron Detectors.

Advisors: Dr. Mani Bhushan (IIT Bombay), Dr. Madhu Belur (IIT Bombay)

Courses: Applied Linear Algebra, Multivariable Control Systems, Matrix Computations, Nonlinear Dynamical Systems, Optimal Control, Behavioral Systems Theory, Process Modelling and Identification, State Estimation.

2002-2006 **B.Tech. in Electrical & Electronics Engg.** University of Calicut

Publications & Presentations

1. R Abdul Razak, A Ravi, R Suresh, K de Leeuw, J M Gonzalez, Adaptive Data-driven Modelling and Forecasting of Effluent Treatment Plants, Proc. 34th European Symp. Computer Aided Process Engg./15th International Symp. Process Systems Engg. (ESCAPE34/PSE24), Jun. 2024.
2. S N Potu, R Abdul Razak, S K Vadivelu, A State Estimation, Kalman Filter Autotuning and Uncertainty Quantification Framework with application to Industrial Storage Tank-farms, Proc. 4th National Conf. on Multidisciplinary Analysis and Optimization (NCMDAO), Oct. 2021.
3. R Abdul Razak, S Srikant, H Chung, Scalar Field Estimation with Mobile Sensor Networks, Int J Robust Nonlinear Control, 31: 4287-4305, 2021. preprint arXiv:1907.01309, 2019.
4. R Abdul Razak, S Srikant, H Chung, Estimating Scalar Fields with Mobile Sensor Networks, Proc. 6th Indian Control Conf. (ICC), Dec. 2019. [Recipient of Best Student Paper Award]
5. R Abdul Razak, S Srikant, H Chung, Distributed Adaptive Coverage Control of Differential Drive Robotic Sensors, preprint arXiv:1908.01161, 2019.
6. R Abdul Razak, S Srikant, H Chung, Distributed Coverage Control of Mobile Sensors: Generalized Approach using Distance Functions, Proc. 57th IEEE Conf. on Decision and Control (CDC), Dec. 2018.
7. R Abdul Razak, S Srikant, H Chung, Decentralized and adaptive control of multiple nonholonomic robots for sensing coverage, Int J Robust Nonlinear Control, vol. 28, no.6, pg. 2636-2650, 2018.
8. R Abdul Razak, S Srikant, H Chung, Decentralized Adaptive Coverage Control of Nonholonomic Mobile Robots, IFAC-PapersOnLine, Proc. 10th IFAC Symp. on Nonlinear Control Systems (NOLCOS), vol. 49, no. 18, pg. 410-415, Aug. 2016.
9. R Abdul Razak, M Bhushan, M N Belur, A P Tiwari, M G Kelkar, M Pramanik, Clustering of Self Powered Neutron Detectors: Combining Prompt and Slow Dynamics, IEEE Trans. on Nuclear Science, vol. 61, no.6, pg. 3635-3643, 2014.
10. R Abdul Razak, M Bhushan, M N Belur, A P Tiwari, M G Kelkar, M Pramanik, Data reconciliation and gross error analysis of self powered neutron detectors: Comparison of PCA and IPCA based models, Int J Advances in Engineering Sciences and Applied Mathematics, vol. 4, no. 1-2, pg. 91-115, 2012.

Publications & Presentations (contd..)

11. S Karikalan, M N Belur, C D Athalye and R Abdul Razak, Uncontrollable dissipative systems: observability and embeddability, Int J Control, vol. 85, no. 9, pg.1-19, 2013.
12. N Agrawal, R Narayanan, M Nambiar, R Abdulrazak, A Pandey, S Das, Parallel Implementation of PK-PD Parameter Estimation on GPU using Grid Search Method, presented at GPU Technology Conference, March 24-27 2014, San Jose.