Abhishek Dey

Address

Office
EE-227, Department of Electrical Engineering
National Institute of Technology Rourkela
Rourkela, Odisha-769088, India.
Email deyab@nitrkl.ac.in
abhidey1988@gmail.com

Home
B510, Verghese Kurien Hall,
NIT Rourkela.
Rourkela, Odisha-769088, India.
Skype id: abhidey1988

Research Interests

Control and dynamical systems, system modeling and identification, systems biology, synthetic biology.

Work Experience

Mar 2020 - Present | **Assistant Professor**
Institute | National Institute of Technology Rourkela

July 2021 - January 2023 | **Visiting Associate**
Institute | California Institute of Technology
Project title | Modeling and Implementation of Cell-free Pesticide Remediation System
Mentor | Prof. Richard M. Murray
Summary | This project investigates a novel method for constructing a cell-free bioremediation system for toxic pesticides. For this, we have developed a model using Python-based toolboxes, and implemented a biomolecular circuit that can sense and remediate organophosphorus pesticides. Overall, the project advances the current understanding of cell-free biosensors and their application in remediation.

Feb 2019 - Dec 2019 | **Research Associate**
Project title | Metabolic Regime Control for Production of Biotherapeutics in *E. coli*
Institute | Indian Institute of Technology Delhi
Mentor | Prof. James Gomes
Summary | This project aimed to offer an approach for optimization and control of bioprocesses in the context of productivity and reproducibility. Rather than just relying on broader variables such as cell mass, substrate, and product, the proposed approach utilised information on metabolic pathway intermediate concentrations which more accurately depict the variability of the metabolic regime during the course of a bioprocess.

Jul 2013-May 2019 | **PhD Scholar**
Thesis title | Modeling and Identification of Biomolecular Systems
Institute | Indian Institute of Technology Delhi
Advisor | Prof. Shaunak Sen
Summary | Modeling and identification are integral in understanding any natural system and in designing new ones. In case of biomolecular systems, challenges arise due to their nonlinear, complex, and stochastic nature. Given these challenges, the general problems of estimating parameters from noisy measurements and obtaining approximate models in biomolecular systems are relatively unclear. The thesis combined theoretical, computational and experimental approaches to develop useful linear approximate models from nonlinear and complex ones in biology, used models to predict response to dynamic variations, and estimated

model parameters from noisy data using an improved Kalman filter algorithm for such systems. Overall, the modeling and identification problems addressed in this thesis will aid in the analysis and design of biomolecular networks.

Jul 2010-Apr 2011 | **Management Trainee**
Organization | Calcutta Electric Supply Corporation Ltd.

Education

December 2019 | **Ph.D.**
Indian Institute of Technology Delhi
CGPA: **9.25**

July 2013 | **Master of Technology in Control Systems Engineering**
Indian Institute of Technology Kharagpur
CGPA: **8.53**

May 2010 | **Bachelor of Engineering in Electrical Engineering**
Indian Institute of Engineering Science and Technology, Shibpur
Percentage: **72.13**%

April 2006 | **Higher Secondary Examination**
Jalpaiguri Zilla School
Percentage: **86.2**%

April 2004 | **Secondary Examination**
Jalpaiguri Zilla School
Percentage: **86.38**%

Publications

Journals

A. Dey, V. Bokka and S. Sen (2020). Dependence of a bacterial growth rate on temperature changes. IET Systems Biology, 14(2), 68-74.

A. Dey and S. Sen (2018). Describing function-based approximations of biomolecular systems. IET Systems Biology, 12(3), 93-100.

V. Bokka, **A. Dey** and S. Sen (2018). Period-amplitude co-variation in biomolecular oscillators. IET Systems Biology, 12(4), 190-198.

Conferences

A. Dey, K. Chakrabarti, K. K. Gola and S. Sen (2019). A Kalman Filter Approach for Biomolecular Systems with Noise Covariance Updating. In 6th Indian Control Conference (ICC), Hyderabad, India, (pp. 262-267)

R. Relan, **A. Dey** and S. Sen (2019). The best linear approximation of biomolecular systems. In 5th Indian Control Conference (ICC), New Delhi, India, (pp. 51-56).

A. Agarwal, **A. Dey**, R. Relan and S. Sen (2018). Nonparametric analysis of nonlinear distortions for biomolecular systems. In 5th IFAC conference on Advances in Control and Opti-

mization of Dynamical Systems (ACODS), Hyderabad, India, IFAC-PapersOnLine, 51(1), (pp. 313-318).

A. Dey and S. Sen (2015). Describing function-based approximations of biomolecular signalling systems. In 14th European Control Conference (ECC), Linz, Austria, (pp. 2292-2297).

A. Dey, S. Chakraborty and S. K. Das (2013). Stabilization of a cart-inverted pendulum system using a 2-periodic controller: simulation results. In 1st IEEE Conference on Systems, Process and Control (ICSPC), Kualalampur, Malayasia, (pp. 169-174).

Awards and Scholarships

2020 | **Fulbright-Nehru Postdoctoral Fellowship**
USIEF | *To pursue postdoctoral research at Caltech, CA, USA.*

2015 | **Received Overseas Travel Grant**
Linz, Austria | *from IIT Delhi*
for presenting in the 14th European Control Conference (ECC15)

2013 | **PhD research scholarship**
IIT Delhi | *from Ministry of Human Resource Development*

2011 | **Teaching assistant scholarship in M.Tech.**
IIT Kharagpur | *from Ministry of Human Resource Development*

2011 | **All India GATE Rank 344**
in Electrical Engineering

2006 | **WBJEE Rank 838**
in Engineering

Teaching and Mentoring Experience

2022 | Co-mentored a Caltech sophomore student
Co-Mentor | in summer undergraduate research fellowship (SURF) project of
Caltech | Feedback Control System in Synthetic Cells

2020-Present | Estimation of Signals and Systems EE6333
Instructor | Basic Electrical Engineering EE1000
NIT Rourkela | Optimal Control EE6302

2014-16 | Stochastic Filtering and Identification ELL705
Teaching Assistant | Introduction to Electrical Engineering course ELL100
IIT Delhi | Introduction to Electrical Engineering lab ELL100

2012-13 | Signal and Networks EE21101
Teaching Assistant | Undergraduate Control laboratory EE39009
IIT Kharagpur | Postgraduate Control laboratory EE69022

Organizing Activities

2019 IIT Delhi	Student Volunteer in the 5th Indian Control Conference.
2014 IIT Delhi	Student Volunteer in the International Workshop on Autonomous Vehicles and Mobile Robotics.

Other Information

2022	Attended Build-a-Cell Workshop 8 at Caltech, and was part of the *In silico* modeling sub-group.
2020 - 2021	Professor in charge - Departmental library, Control and Robotics Lab, Department of Electrical Engineering, NIT Rourkela.
2019 - present	Reviewer of IET Control Theory and Applications, IET Systems Biology, IET Signal Processing, IFAC World Congress.
2020 - present	Regular member of IEEE, IEEE Control System Society, and IEEE Circuits and Systems Society
2017-2020	Student member of IEEE and IEEE Control System Society
2016	Attended International Biological Engineering Meeting, IbEM 1.0 during 26-28 March 2016, organized by Jawaharlal Nehru University.
2014	Attended 3rd Winter School on Control and Optimization during 13-17 January 2014, organized by SYSCON, Indian Institute of Technology Bombay.

Computer Skills

Matlab, Python, LaTeX

Languages

Bengali, Native	Reading, Speaking, Writing
English,Fluent	Reading, Speaking, Writing
Hindi,Fluent	Reading, Speaking

Interests and Activities

Computer Programming, Yoga, Trekking, Photography

Community Services

- Volunteered and donated blood in NSS IIT Delhi activities.
- Informally associated with NSS IIT Delhi students to help stray dogs in campus.