Foreword

By the NODYCON 2025 co-Chairs

Welcome to the Fourth International Nonlinear Dynamics Conference (NODYCON 2025)!

Following the successful editions of NODYCON in 2019, 2021, and 2023 held in Rome, this year's conference marks the first edition hosted in the United States, at Stevens Institute of Technology in Hoboken, New Jersey under the auspices of the International Nonlinear Dynamics Society (NODYS). NODYCON continues the legacy of the Nonlinear Vibrations, Stability, and Dynamics of Structures Conference series initiated in 1986 at Virginia Tech by the late Prof. Ali H. Nayfeh, a pioneering figure in the field and founder of the journal *Nonlinear Dynamics*.

NODYCON 2025 is co-chaired by Prof. Walter Lacarbonara of Sapienza University of Rome and by Prof. Muhammad Hajj, Chair of Civil, Environmental, and Ocean Engineering at Stevens and long-time collaborator of Prof. Nayfeh. This edition features a dynamic scientific and social program including several keynote lectures, topical lectures, a panel on AI and nonlinear dynamics, thematic oral sessions that highlight the most recent advancements in nonlinear dynamics. A major innovation this year is NODYCON 2025 Virtual, a parallel online event held from June 23 to 25, enabling broader participation from the global nonlinear dynamics community.

We are proud to continue supporting excellence across all career stages. In addition to the Springer Ali H. Nayfeh Awards for the best student papers, this edition supports again two major distinctions: the Springer Ali H. Nayfeh Senior Award, recognizing exceptional mid- or late-career contributions in research, education, and leadership in nonlinear dynamics, and the NODYS Early Career Award, honoring outstanding achievements and a strong trajectory in the early stages of a research career.

The call for papers attracted outstanding international engagement. After a rigorous review process involving external referees and program committees, hundreds of contributions were selected for oral presentations. These cover a diverse range of topics from data-driven methods, metamaterials, and nonlinear control to network dynamics, presented across eight in-person and five online parallel sessions.

We are pleased to report that over 140 full papers have been submitted for publication in *Advances in Nonlinear Dynamics – Proceedings of the Fourth International Nonlinear Dynamics Conference (NODYCON 2025)*. These proceedings, published by Springer Nature, will be indexed in leading databases including Web of Science, Scopus, and EI.

The continued success of NODYCON is driven by the dedication and enthusiasm of researchers worldwide. We extend our heartfelt thanks to the Organizing, Program, Steering, and International Advisory Committees, as well as to the many external reviewers for their invaluable contributions.

We also gratefully acknowledge the support of Stevens Institute of Technology, NODYS, Sapienza University of Rome and our sponsor Springer Nature.

We hope you enjoy an inspiring and memorable experience at NODYCON 2025, whether attending in person or online. Let us also remember that NODYCON is more than a scientific conference; it is a space to connect, build friendships, and foster meaningful human interactions that extend beyond research, for a better, more collaborative world.

Walter Lacarbonara and Muhammad Hajj
Co-Chairs, NODYCON 2025
June 2025

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NODYCON 2025 Awards

NODYCON 2025 features three types of awards.

- The Ali H. Nayfeh Prizes (1st, 2nd, and 3rd Prize), in honor of Nonlinear Dynamics's founding editor, the late Professor Ali H. Nayfeh, supported by Springer for the best papers presented by graduate students at NODYCON 2025.
- The Ali Nayfeh Senior Award jointly supported by Springer and NODYS
- The Early Career Award supported by the NODYS Society.

The Award committee for the Ali H. Nayfeh Prizes includes:

- Prof. Americo Barbosa da Cunha J., Universidade do Estado do Rio de Janeiro, Brasil
- Prof. D. Dane Quinn, The University of Akron, USA
- Prof. D. Olivier Thomas, Conservatoire National des Arts et Metiers, France.

The Award committee for the Ali Nayfeh Senior Award and the Early Career Award Includes:

- Prof. Paulo Batista Gonçalves, Pontifícia Universidade Católica do Rio de Janeiro, Brasil
- Prof. Muhammad Hajj, Stevens Institute of Technology, USA
- Prof. Fabrizio Vestroni, Sapienza University of Rome, Italy.

Ali H. Nayfeh, Professor Emeritus of Nonlinear Dynamics,
21 December 1933 – 27 March 2017

ALI H. NAYFEH PRIZES

The evaluation criteria for the Ali H. Nayfeh Prizes were based on the quality of the written paper, with particular emphasis on novelty, achievement, and potential impact. Eligible papers were submitted to the NODYCON 2025 Special Issue of Nonlinear Dynamics or to the NODYCON 2025 Springer Proceedings.
We are pleased to announce the recipients of the Ali H. Nayfeh Prizes for 2025:

1st Place – Pritam Ghoshal
For the paper "Exploiting Bistability and Viscoelasticity in Reservoir Computing", co-authored with James Gilbert and Anil Bajaj.

2nd Place – Soumyabrata Maiti
For the paper "Effect of Friction and Stiffness Nonlinearity on Vibrations of a Disc Brake Caliper and Its Control Prospects",
co-authored with Anish Kumar and Hussain Kanchwala.

3rd Place – Elena Rybalova
For the paper "Peculiarities and Synchronization of Randomly Interlayer Coupled Networks of Chaotic Maps",
co-authored with Vladislav Averyanov and Galina Strelkova.

ALI H. NAYFEH SENIOR AWARD & NODYS EARLY CAREER AWARD

The Nonlinear Dynamics Society (NODYS) solicited nominations for the Ali H. Nayfeh Senior Award and the NODYS Early Career Award.
The Senior Ali H. Nayfeh Award was established to recognize exceptional impact of research contributions and education of researchers and/or practitioners, and general leadership in advancing the field, attracted outstanding nominations.

The 2025 Ali H. Nayfeh Senior Award is jointly awarded to:

- **Prof. Giuseppe Rega**, Sapienza University of Rome
- **Prof. Fabrizio Vestroni**, Sapienza University of Rome

in recognition of Prof. Rega's *seminal contributions to the field of nonlinear dynamics that have shaped international research and academic programs and collaborative networks;*

in recognition of Prof. Vestroni's *influential career in academia, research and professional practice that advanced structural design and analysis by emphasizing nonlinear dynamics.*

The 2025 NODYS Early Career Award is awarded to:

Prof. Amal Z. Hajjaj, Loughborough University

in recognition of her *significant contributions to the development of miniaturized sensors with exceptional capabilities rooted in exploiting nonlinear phenomena.*

NODYCON 2025 AT A GLANCE

SUNDAY, June 22

1:00 PM - 5:00 PM	5:00 PM - 8:30 PM
BC Registration **3:00 PM - 4:30 PM** **BC room 122** *Workshop* *"Navigating Scientific Publishing: from Manuscript Structure to Publication"*	**BC** Welcome Party

Conference Buildings
UCC - University Complex Center
BC - Babbio Center
GATN - Gateway North

 UCC  BC  GATN

MONDAY, June 23

7:30 AM 8:30 AM	8:45 AM	9:15 AM	9:50 AM	10:30 AM	11:00 AM	11:35 AM	12:10 PM	1:45 PM	3:15 PM	4:00 PM 5:45 PM
UCC Tech Flex Breakfast	**UCC Tech Flex** Opening	**UCC Tech Flex** **Keynote #1**	**UCC Tech Flex** **Panel**	**UCC Tech Flex** Coffee break	**UCC Tech Flex** **Keynote #2**	**UCC Tech Flex** **Keynote #3**	**UCC Tech Flex** Lunch	**BC room 104** *Reduced-Order Models* **BC room 122** ***Topical Lecture #1*** *Passive Energy Damping* **BC room 219** *Fluid-Structure Interaction* **BC room 220** *Advanced System Stability* **BC room 221** *Artificial Intelligence & Machine Learning I* **BC room 319** *Nonlinear Vibration Control I* **BC room 320** *Computational Nonlinear Dynamics I* **BC room 321** *Mechanical Systems and Structures I*	**Babbio Center** Coffee break	**BC room 104** *Computational Nonlinear Dynamics II* **BC room 122** ***Topical Lecture #2*** *Mode Inter. Energy Transf.* **BC room 219** *Networks Synchronization* **BC room 220** *Multibody Systems Dynamics* **BC room 221** *Ecosystem Dynamics* **BC room 319** *Biosystem Dynamics* **BC room 320** *MEMS - NEMS I* **BC room 321** *Nonlinear Vibration Control II* **GATN room 103** *Fractional Order Systems*

TUESDAY, June 24

7:30 AM 8:30 AM	8:45 AM	9:20 AM	10:00 AM	10:45 AM	12:00 PM	1:30 PM 3:30 PM	6:00 PM 10:00 PM
UCC Tech Flex Breakfast	**UCC Tech Flex** **Keynote #4**	**UCC Tech Flex** **Keynote #5**	**UCC Tech Flex** Coffee break	**BC room 104** ***Topical Lecture #3*** *Mech. Syst. and Struct. II* **BC room 122** ***Topical Lecture #4*** *AI and ML II* **BC room 219** *Bifurcation and Dynamic Instability* **BC room 220** *Nonsmooth systems* **BC room 221** *Experimental Dynamics* **BC room 319** *Control of Nonlinear Systems I* **BC room 320** *System Identification and SHM* **BC room 321** *Mechanical Systems and Structures III*	**UCC Tech Flex** Lunch	**BC room 104** ***Topical Lecture #5*** *MEMS - NEMS II* **BC room 122** ***Topical Lecture #6*** *Comp. Nonlinear Dyn. III* **BC room 219** *Energy Harvesting* **BC room 220** *Metamaterials I* **BC room 221** *Mechanical Systems and Structures IV* **BC room 319** ***Topical Lecture #7*** *Comp. Nonlinear Dyn. IV* **BC room 320** *Mechanical Systems and Structures V* **BC room 321** *Control of Nonlinear Systems II*	**Boat Tour, Banquet & Awards Ceremony**

WEDNESDAY, June 25

7:30 AM 8:30 AM	8:45 AM	9:15 AM	9:45 AM	10:15 AM	11:00 AM	12:30 PM	1:45 PM	2:30 PM 3:00 PM
UCC Tech Flex Breakfast	**UCC Tech Flex** **Keynote #6**	**UCC Tech Flex** **Keynote #7**	**UCC Tech Flex** **Keynote #8**	**UCC Tech Flex** Coffee break	**BC room 104** *Nonlinear PDEs/ODEs* **BC room 122** ***Topical Lecture #8*** *Metamaterials II* **BC room 219** *Composite Structures* **BC room 220** *Stochasticity and Noise* **BC room 221** *Artificial Intelligence and Machine Learning III*	**UCC Tech Flex** Lunch	**UCC Tech Flex** **NODYS General Assembly**	**UCC Tech Flex** **Closing Ceremony**

PLENARY PROGRAM

SUNDAY – June 22, 2025	
01:00 PM – 05:00 PM EDT (Eastern Daylight Time)	**REGISTRATION , BABBIO CENTER**
05:00 PM – 08:30 PM EDT (Eastern Daylight Time)	**WELCOME RECEPTION, BABBIO CENTER**

MONDAY – June 23, 2025	
07:30 AM – 08:30 AM EDT (Eastern Daylight Time)	**CONTINENTAL BREAKFAST**
8:45 AM – 9:15 AM EDT (Eastern Daylight Time)	**OPENING CEREMONY**
9:15 AM – 9:50 AM EDT (Eastern Daylight Time)	**A RETROSPECTIVE AND PROSPECTIVE JOURNEY THROUGH NONLINEAR DYNAMICS IN MECHANICS** PROF. GIUSEPPE REGA
9:50 AM – 10:30 AM EDT (Eastern Daylight Time)	**PANEL ARTIFICIAL INTELLIGENCE AND NONLINEAR DYNAMICS: MODELING COMPLEXITY WITH INTELLIGENCE** RANDY SOPER, BRENDAN ENGLOT, C NATARAJ, BALAKUMAR BALACHANDRAN
10:30 AM – 11:00 AM EDT (Eastern Daylight Time)	**COFFEE BREAK**
11:00 AM – 11:35 AM EDT (Eastern Daylight Time)	**SYNCHRONIZATION IN NETWORKS OF NONLINEAR SYSTEMS: A MODULAR ANALYSIS AND DESIGN PERSPECTIVE** N. VAN DE WOUW
11:35 AM – 12:10 PM EDT (Eastern Daylight Time)	**EMULATING NONLINEAR DYNAMICS IN HARDWARE-IN-THE-LOOP ENVIRONMENTS** GÁBOR STÉPÁN

12:10 PM – 01:45 PM EDT (Eastern Daylight Time)	**LUNCH BREAK**

TUESDAY – June 24, 2025

07:30 AM – 08:30 AM EDT (Eastern Daylight Time)	**CONTINENTAL BREAKFAST**
8:45 AM – 9:20 AM EDT (Eastern Daylight Time)	**AN EXAMINATION OF BISTABLE VISCOELASTIC STRUCTURES** ANIL K. BAJAJ
9:20 AM – 9:55 PM EDT (Eastern Daylight Time)	**VIBRATIONAL CONTROL: A MYSTERIOUS STABILIZATION MECHANISM IN INSECTS FLIGHT** HAITHEM TAHA
10:00 AM – 10:45 AM EDT (Eastern Daylight Time)	**COFFEE BREAK**
12:00 PM – 13:30 AM EDT (Eastern Daylight Time)	**LUNCH BREAK**
06:00 PM – 10:00 PM EDT (Eastern Daylight Time)	**BOAT TOUR, BANQUET & AWARDS CEREMONY**

WEDNESDAY – June 25, 2025

07:30 AM – 08:30 AM EDT (Eastern Daylight Time)	**CONTINENTAL BREAKFAST**
08:45 AM – 09:15 AM EDT (Eastern Daylight Time)	**NONLINEAR CONTROL OF A SPACE ROBOT FOR FAST TRACKING POSE TRAJECTORIES** HAIYAN HU
09:15 AM – 09:45 AM EDT (Eastern Daylight Time)	**VIBRATION ENERGY MANIPULATION THROUGH ACOUSTIC BLACK HOLE** LI CHENG
09:45 AM – 10:15 AM EDT (Eastern Daylight Time)	**REDUCED-ORDER MODELING IN STRUCTURAL DYNAMICS USING NONLINEAR NORMAL MODES** CYRIL TOUZÉ
10:15 – 11:00 EDT (Eastern Daylight Time)	**COFFEE BREAK**

12:30 PM – 01:45 PM EDT (Eastern Daylight Time)	LUNCH BREAK
01:45 PM – 02:30 PM EDT (Eastern Daylight Time)	NODYS GENERAL ASSEMBLY MEETING
02:30 PM – 03:00 PM EDT (Eastern Daylight Time)	CLOSING CEREMONY

KEYNOTES

A RETROSPECTIVE AND PROSPECTIVE JOURNEY THROUGH NONLINEAR DYNAMICS IN MECHANICS

9:15 AM – 9:50 AM EDT (Eastern Daylight Time) - June 23, 2025
UCC Tech Flex

Giuseppe Rega
Department of Structural and Geotechnical Engineering, Sapienza University of Rome, Italy

Nonlinear dynamics in mechanics has evolved into a well-defined discipline with a comprehensive methodological and phenomenological framework after over four decades of intense development. This significant maturation provides a timely opportunity to reflect on the field's historical evolution and to identify the innovations necessary to keep it aligned with the cultural and technological demands of a rapidly changing society. This presentation serves as a testament to the progressive growth of the nonlinear dynamics community, seen through the lens of a researcher who has had the privilege of maintaining close connections with numerous scholars and emerging researchers over the past forty years. It also provides a personal tribute to those who have been pivotal in shaping the field-those regarded as 'fathers' of the discipline-as well as to numerous esteemed colleagues and friends. The main research trajectories and key contributors are mapped against an evolutionary framework that spans from classical to hybridized topics. The discussion addresses challenges and future directions based on two key criteria: (i) Establishing connections with the foundational work of previous generations, highlighting how contemporary advances build upon past accomplishments: (ii) differentiating between challenges of intrinsic mechanical significance and the broader contributions that nonlinear dynamics can offer in the reliable modeling and effective control of various evolutionary phenomena, extending beyond mechanical systems.

BIO-SKETCH OF GIUSEPPE REGA

Giuseppe Rega is Professor Emeritus at Sapienza University of Rome. Past Chairman of EUROMECH Nonlinear Oscillations Conference Committee and Italian Association of Theoretical and Applied Mechanics, member of CISM Scientific Council. Past EiC of Meccanica, has been/is Advisor/AE/EBM of archival journals. Organised scientific events within EUROMECH, IUTAM, ASME, NNM, CISM, EURODYN. Plenary Lecturer at international conferences and academic institutions. Recipient of the 2017 ASME Lyapunov Award. Honored with Special Issues of Nonlinear Dynamics and International Journal of Nonlinear Mechanics for his 60th and 70th birthdays. Contributions to cable nonlinear dynamics, reduced-order modelling, control of oscillations and chaos, global dynamics for engineering safety, smart materials, coupled oscillators, thermomechanical problems.

SYNCHRONIZATION IN NETWORKS OF NONLINEAR SYSTEMS: A MODULAR ANALYSIS AND DESIGN PERSPECTIVE

11:00 AM – 11:35 AM EDT (Eastern Daylight Time) - June 23, 2025
UCC Tech Flex

Nathan van de Wouw
Dynamics and Control Section, Department of Mechanical Engineering
Eindhoven University of Technology, The Netherlands

Synchronization of oscillatory behavior in dynamical systems emerges naturally in biological processes and neuronal networks. Beyond natural systems, engineered synchronization is essential in applications such as power grids and robotic networks, where reliable, coordinated dynamics are paramount. This talk presents a modular framework for analysis and design of synchronization in networks of nonlinear systems, leveraging passivity-related principles from nonlinear system theory. The framework is structured around three fundamental dimensions:

- System Dynamics: Conditions for synchronization on the intrinsic behavior of individual systems.
- Network Topology: Requirements on the structural connectivity of the network.
- Coupling Laws: Design principles for interactions rules, with a novel focus on nonlinear coupling strategies.

This modular approach provides broad applicability, accommodating diverse nonlinear systems, network architectures, and coupling laws. Notably, we demonstrate the advantages of nonlinear coupling laws over traditional linear strategies, showing how selective activation of the coupling enhances synchronization efficiency. This framework offers new avenues for advancing synchronization in complex engineered and natural systems alike.

BIO-SKETCH OF NATHAN VAN DE WOUW

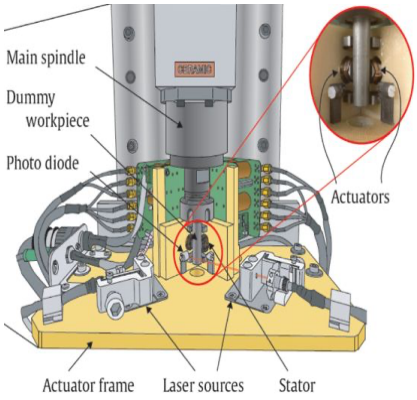
Nathan van de Wouw received his Ph.D. in Mechanical Engineering from Eindhoven University of Technology in 1999. He is currently a full professor and chair of the Dynamics and Control section at Eindhoven University of Technology. He was a part-time professor at Delft University of Technology (2015-2019) and an adjunct professor at the University of Minnesota (2014-2021). He co-authored the books “Uniform Output Regulation of Nonlinear Systems” (2008) and “Stability and Convergence of Mechanical Systems with Unilateral Constraints” (2008). In 2015, he received the IEEE Control Systems Technology Award for developing variable-gain control techniques for motion systems. He is an IEEE Fellow, Senior Editor for the IEEE Transactions of Control Systems Technology, and a board member of the Eindhoven AI Systems Institute and the High-Tech Systems Center.

EMULATING NONLINEAR DYNAMICS IN HARDWARE-IN-THE-LOOP ENVIRONMENTS

11:35 AM – 12:10 AM EDT (Eastern Daylight Time) - June 23, 2025
UCC Tech Flex

Gabor Stepan
Department of Applied Mechanics, Budapest University of Technology and Economics, Hungary

A widely used tool of engineering research and development is the hardware-in-the-loop (HIL) experiment. Instead of building the full prototype of a developed machine, only its most critical parts are constructed physically, while the rest of the machine is emulated by means of actuators, sensors, and digital control in between.



The control, however, introduces digital effects like delay and zero order hold. The dynamics of the real continuous system and the one constructed by means of the HIL experiment are compared from stability and nonlinear vibrations viewpoint in case of the stick-slip phenomenon. The limitations of HIL experiments are identified by means of Hopf bifurcation calculations, numerical simulations and dynamic measurements carried out on the corresponding experimental test rig. The results are applied for the development of HIL experiments on high-speed-milling where the parametric excitation in the delayed oscillatory system is not negligible. The goal, concept, and construction of the HIL test environment is presented together with the solution of some unexpected difficulties originated in the extreme fast dynamics of high-speed-milling. The comparison of the nonlinearities in the HIL structure and in the real cutting process are compared as a starting point for future research.

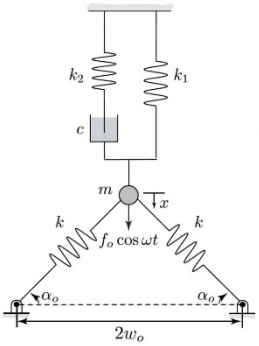
BIO-SKETCH OF GABOR STEPAN

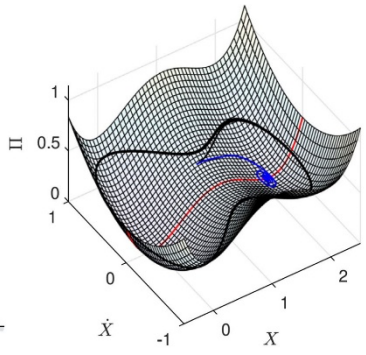
Gabor Stepan obtained PhD in mechanical engineering from Budapest University of Technology and Economics in 1982. He has held visiting researcher and professorship roles at several institutions. He is currently Professor Emeritus of Applied Mechanics at his alma mater and a fellow of CIPR and SIAM. He has received multiple prestigious awards, including the IFAC Delay Systems Lifetime Achievements Award, ASME Caughey Dynamics Award, and ASME Lyapunov Award. He is a member of the Hungarian Academy of Sciences, Academy of Europe, and Chinese Academy of Sciences. His research, supported by ERC Advanced and Proof-of-Concept Grants, focuses on nonlinear vibrations in delayed dynamical systems with applications in mechanical engineering and biomechanics.

AN EXAMINATION OF BISTABLE VISCOELASTIC STRUCTURES

8:45 AM – 9:20 AM EDT (Eastern Daylight Time) - June 24, 2025
UCC Tech Flex

Anil K. Bajaj
School of Mechanical Engineering, Purdue University, West Lafayette, IN, USA





This presentation will explore recent advancements in the study of the dynamics of bi-stable viscoelastic structures, motivated by their emerging applications in the development of mechanical and acoustic meta-materials. Drawing from several research studies, we focus on achieving a comprehensive analytical and numerical understanding of the complex dynamics inherent in these systems. Using a lumped-parameter von-Mises truss with viscoelastic elements as a representative model, we examine the influence of boundary conditions, elastic properties, and viscoelastic time scales on system stability.

The analysis includes a detailed investigation of periodic solutions arising from harmonic excitation and the application of Melnikov theory to identify chaotic behavior within the system. Additionally, we demonstrate how the bistable potential of the system can be actively modulated by altering the magnitude and frequency of high-frequency excitation. This effect is further enhanced by modifying the system's viscoelastic properties. The presentation will conclude by exploring how similar bi-stable structures occur in nature, offering insights into mechanisms such as sound generation in cicadas. It will also highlight potential applications of these systems in enhancing the performance of reservoir- based computing technologies.

BIO-SKETCH OF ANIL BAJAJ

Dr. Anil Baja is the Alpha P. Jamison Professor of Mechanical Engineering at Purdue University, where he has been a faculty member since 1981. His research focuses on nonlinear dynamics, structural vibrations, and stability in rotating and fluid-induced systems. He has published extensively, mentoring numerous graduate students, and has received
Several honors, including the ASME Thoms K. Caughey Dynamics Award and Purdue's Provost's Award for Outstanding Graduate Mentors.

VIBRATIONAL CONTROL: A MYSTERIOUS STABILIZATION MECHANISM IN INSECT FLIGHT

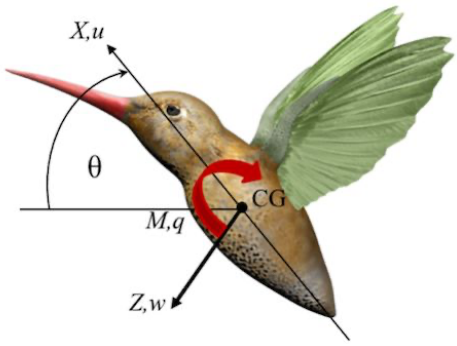
9:20 AM – 9:55 AM EDT (Eastern Daylight Time) - June 24, 2025

UCC Tech Flex

Haithem Taha

Mechanical and Aerospace Engineering, University of California, Irvine, USA

Insect flight has been a puzzle for aeronautical engineers and biologists for a century, particularly its flight stability. Over the past two decades, there has been a near-consensus among the biology and the engineering communities that insects are unstable at hover. This widely accepted result is based on direct averaging of the flight dynamics over the flapping cycle. From a different perspective, it is well-known to dynamicists that an oscillatory system (such as the inverted pendulum) may gain stability without feedback through a phenomenon called vibrational stabilization. In the honor of the 70th birthday of the great Pontryagain, Agrachev and Gamkrelidze developed a new calculus for time-varying systems: the chronological calculus. Using this less-known calculus, we showed a hidden passive stabilization mechanism that insects exploit through their natural wing oscillations: vibrational stabilization. The oscillations of an insect's body around the hovering equilibrium naturally stabilizes its flight dynamics, similar to the inverted pendulum. This stabilization technique cannot be captured using the direct averaging approach, commonly used in literature. It is a fascinating design by Nature where the flapping of the insect wings, that is inevitably needed to create an aerodynamic force for lifting, naturally provides stability for free without feedback.



BIO-SKETCH OF HAITHEM TAHA

Haithem Taha is a professor in the Department of Mechanical and Aerospace Engineering at the University of California, Irvine. He received a PhD degree in Engineering Mechanics at Virginia Tech simultaneously with an MSc degree in Mathematics. Taha's research interests span geometric nonlinear control theory, unsteady aerodynamics, theoretical mechanics and variational principles with applications to unconventional flight mechanics and variational principles with applications to unconventional flight mechanics such as bio-inspired flight. He is a Recipient of the NSF CAREER Award among several other awards. He is an AIAA Associate Fellow. Taha is particularly interested in the history and philosophy of mechanics and has several lectures on the topic.

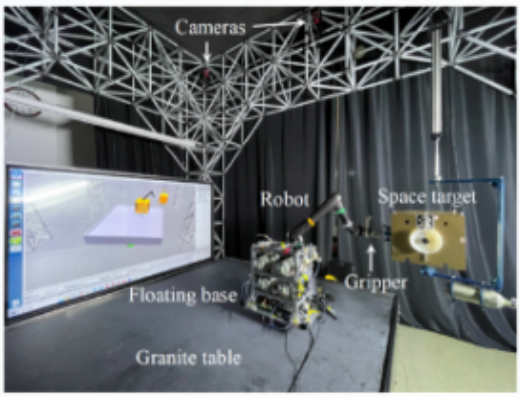
NONLINEAR CONTROL OF A SPACE ROBOT FOR FAST TRACKING POSE TRAJECTORIES

8:45 AM – 9:15 AM EDT (Eastern Daylight Time) - June 25, 2025

Haiyan Hu

School of Aerospace Engineering, Beijing Institute of Technology

Future space missions are calling for ultra-large space structures assembled on orbit by space robots. It is challenging to control flying space robots in such assembly due to the nonlinear dynamic coupling between robots and their floating base.



This lecture presents how to use Lie group structure of a robot configuration and to formulate the system momentum evolution equations. Then, it gives the design of manifold model predictive controller to solve a three-dimensional pose trajectory tracking problem. Furthermore, it presents the performance of the above controller in numerical simulations, emphasizing the momentum shaping and prediction horizon selection. Finally, the lecture demonstrates the trajectory tracking and object capturing experiments in a three-dimensional space via an air-bearing space robot simulator.

BIO-SKETCH OF HAIYAN HU

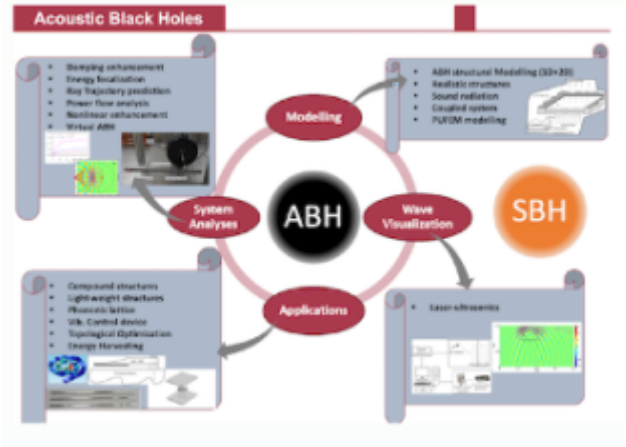
Dr. Haiyan Hu is The Chair Professor of Mechanics at Beijing Institute of Technology, China. He served as President of BIT from 2007 to 2017, President of Nanjing University of Aeronautics and Aeronautics from 2001 to 2007, and President of The Chinese Society of Theoretical and Applied Mechanics from 2010 to 2014. He has made recognized contributions to the nonlinear dynamics of controlled mechanical systems, the unfolding dynamics of large space structures on orbit, and the flutter control of aircraft structures. As such, he received The State Award of Natural Sciences twice in 2006 and 2012, and many honors, including Fellow of Chinese Academy of Sciences in 2007, Fellow of the World Academy of Sciences in 2010, Honorary Member of Hungary Academy of Sciences in 2022, Honorary Doctor of Moscow State University in 2015, and ASME Thomas Caughey Dynamics Award in 2023.

VIBRATION ENERGY MANIPULATION THROUGH ACOUSTIC BLACK HOLE EFFECT ENHANCED BY NONLINEAR ELECTROMECHANICAL COUPLING

9:15 AM – 9:45 AM EDT (Eastern Daylight Time) - June 25, 2025

Li Cheng
Department of Mechanical Engineering
The Hong Kong Polytechnic University

Energy manipulation in vibrating structures is critical for numerous engineering applications such as vibration mitigation, structural sound control and energy harvesting. Wave retarding structures, exemplified by acoustic black hole (ABH) structures, offer a promising solution. ABH features the slow wave effect inside a structure with reducing thickness, which entails non-reflective wave propagation of flexural waves and energy trapping.



These properties, however, are limited to the high frequency range above the so-called cut-on frequency. To address the this deficiency in linear system design, this talk discusses the option of introducing intentional electromechanical coupling into an ABH structure via surface-coated PZT patches with nonlinear electrical shunts or grounded cables. The target outcome is to produce effective electro-mechanical coupling and cross-frequency energy transfer, thus improving the low frequency benefits of the ABH. Numerical modelling, salient phenomena and the potential of the technique for vibration mitigation is discussed using beam examples.

BIO-SKETCH OF LI CHENG

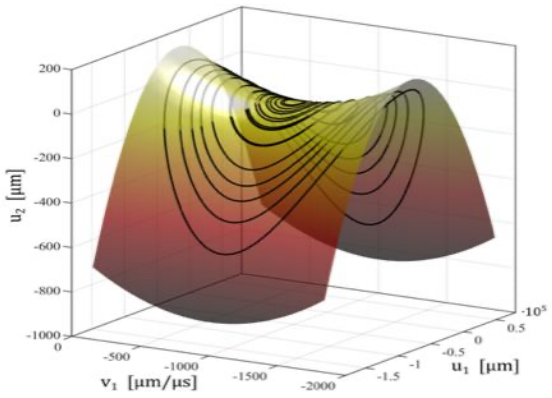
Dr. Li Cheng is Chair Professor and Associate Dean (Research) of the Faculty of Engineering at Hong Kong Polytechnic University and Director of the Consortium for Sound and Vibration Research (CSVR). He earned his Ph.D. from INSA-Lyon, France, and previously held a faculty position at Laval University, Canada, before joining PolyU in 2000. He is Deputy Editor-in-chief of the Journal of Sound and Vibration and serves as Associate Editor for several top journals, including Nonlinear Dynamics and Structural Health Monitoring. A Fellow of multiple prestigious societies, including the Royal Society of Canada and IIAV, he is currently President-elect of the International Institute of Noise Control Engineering(I-INCE).

REDUCED-ORDER MODELING IN STRUCTURAL DYNAMICS USING NONLINEAR NORMAL MODES

9:45 AM – 10:15 AM EDT (Eastern Daylight Time) - June 25, 2025

Cyril Touzé
ENSTA Paris, Institut Polytechnique de Paris
Institute of Mechanical Science and Industrial Applications (IMSIA)

Nonlinear Normal Modes (NNMs) defined as invariant manifold in the phase space, have been used since the 1990s in order to derive efficient and accurate reduced-order models (ROMs) in structural dynamics. In this tutorial presentation, NNMs will be defined in the light of the latest developments.



In particular, it will be shown how the parametrisation method for invariant manifolds allows unifying definitions, as well as offering a framework for automated high-order computations, that can be directly applied to Finite Element models. Applications in structural dynamics with distributed geometric nonlinearity will be highlighted and recent developments considering the coupling with different physical phenomena occurring e.g. in Micro-Electro Mechanical Systems (MEMs), or the consideration of a varying parameter in the method to tackle bifurcating systems, will be demonstrated.

BIO-SKETCH OF CYRIL TOUZÉ

Cyril Touzé earned his PhD in 2000 from Pierre and Marie Curie University, Paris, focusing on musical acoustics and nonlinear vibrations in gongs and cymbals. Currently a professor at ENSTA Paris, his research encompasses geometric nonlinearity in plates and shells, reduction methods using nonlinear normal modes and normal form theory, and vibration mitigation through nonlinear absorbers and acoustic black holes. He has developed advanced models for sound synthesis of gongs and cymbals and explored wave turbulence in plate vibrations. Recently, he has applied the parameterization method for invariant manifolds to model order reduction, utilizing NNMs for MEMs and aerospace FEM applications.

TOPICAL LECTURES

A HYSTERETIC CABLE ABSORBER: DYNAMIC CHARACTERIZATION AND RESPONSE MITIGATION

01:45 PM – 02:15 PM EDT (Eastern Daylight Time)

June 23, 2025

Fabrizio Vestroni

Department of Structural and Geotechnical Engineering, Sapienza University of Rome, Italy

A hysteretic absorber consisting of a mass suspended by cables is proposed to mitigate the response of the main structure through nonlinear modal coupling. The restoring force provided by the cables under flexure exhibits hysteretic behavior.

This hysteresis nonlinearity strongly affects the response of the structure, investigated through a 2DOF system, depending on the closeness to internal resonance conditions, with differences in the modal interactions between the cases close to 1:1 and 2:1 internal resonance. With respect to the search for optimized solutions, a map for the optimal selection of the modal parameters is defined, which provides a useful tool for absorber parameters. The analysis of the system behavior under impulsive excitation confirms the results obtained with respect to the performance of the optimized absorbers.

BIO-SKETCH OF FABRIZIO VESTRONI

Fabrizio Vestroni is an Emeritus Professor of Structural Mechanics at Sapienza University of Rome, where he previously served as Head of the Department of Structural and Geotechnical Engineering and Dean of the Faculty of Civil and Industrial Engineering. An influential researcher in structural dynamics, his work spans hysteretic systems, large-amplitude motion modeling, and structural health monitoring, with over 250 publications. He has coordinated numerous national and international research programs, served on editorial boards of leading journals, and received the prestigious Theodore von Karman Medal from ASCE in 2021. Prof. Vestroni has organized major conferences, co-authored a patent on passive vibration control, and held leadership roles in various academic and professional societies.

ON THE NONLINEAR RESPONSE OF CIRCULAR, CLAMPED PANELS

10:45 AM – 11:15 AM EDT (Eastern Daylight Time)
June 24, 2025

Lawernce Virgin
Department of Mechanical Engineering and Materials Science
Duke University, NC, USA

A laterally loaded, flat, thin, circular panel with its perimeter clamped is an archetypical case in structural behavior. Despite its relative geometric simplicity, it is capable of exhibiting a variety of interesting behavior, especially in the context of nonlinear dynamics. Linear theory provides estimates of deflection and natural frequencies, sometimes based on descriptions in terms of Bessel functions. For non-flat panels, the analysis becomes more complex due to initial geometric imperfections, pre-loading, or post-buckling effects (e.g., thermal loading).
This study examines a shallow axisymmetric shell subjected to lateral loading. First, we investigate quasi-static loading in a direction opposite to the initial deflection, leading to snap-through buckling and load-deflection discontinuities. Second, we apply dynamic excitation through shaken support, revealing highly nonlinear oscillations, including chaos. The focus is on experimental data to validate multiple equilibrium states and co-existing attractors using full-field non-contact measurements, particularly digital image correlation (DIC) and thermal imaging (FLIR).

BIO-SKETCH OF LAWRENCE VIRGIN

Lawrence Virgin is a professor of mechanical engineering and materials science at Duke University, where he has been a faculty member since 1998. He holds a BS from the University of Manchester and a PhD from University College London. His research focuses on nonlinear mechanics, particularly buckling and vibration, with applications in ship capsize, aeroelasticity, marine risers, and slender structures. He also explores 3D printing for teaching mechanics. He has published over 180 journal papers and two books: Introduction to Experimental Nonlinear Dynamics (2000) and Vibrations of Axially Loaded Structures (2007), both with Cambridge University Press.

NONLINEAR DYNAMICS OF WIND TURBINES

04:00 PM – 04:30 PM EDT (Eastern Daylight Time)

June 23, 2025

Stefano Lenci

Dipartimento di ingegneria Civile, Edile e Architetture

Università Politecnica delle Marche, Ancona, Italy

In this lecture I will discuss some intriguing aspects of the nonlinear dynamics of wind turbines, which are one of the best and most performant systems able to produce green energy, thus being part of the decarbonization energy transition that is a challenge for our future. The slenderness of wind turbine towers and blades leads to significant displacements, resulting in nonlinear oscillations, quasi-periodicity, and chaos. A key focus is the 1:1 internal resonance caused by nearly identical natural frequencies in the wind and perpendicular directions due to the axis-symmetric cross-section. The impact of vertical excitation from sea waves in floating offshore wind turbines will also be highlighted. The objective is to identify key phenomena using simple, insightful models rather than complex FEM analyses, which may obscure fundamental understanding.

BIO-SKETCH OF STEFANO LENCI

Stefano Lenci is professor of Structural Mechanics at the Polytechnic University of Marche, Ancona, Italy. He is Associate Editor of Nonlinear Dynamics, and member of the Editorial Board of renowned journals (Int. J. Non-Mechanics, Int. J. Mech. Sciences, etc.). He has been the president, and now is Past- and Vice-President of the Italian Association for Theoretical and Applied Mechanics (AIMeTA), adhering IUTAM. He is the Chair of European Nonlinear Oscillations Conference Committee (ENOCC), part of Euromech. His research interests are within the nonlinear dynamics of mechanical systems, where he investigated different cases with the aim of highlighting the most important phenomena lurking in the background. He authored 240+ journal papers.

THE X ENRICHED MULTIPLE SCALES FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS WITH COMPARISON TO COMPLEXIFICATION-AVERAGING

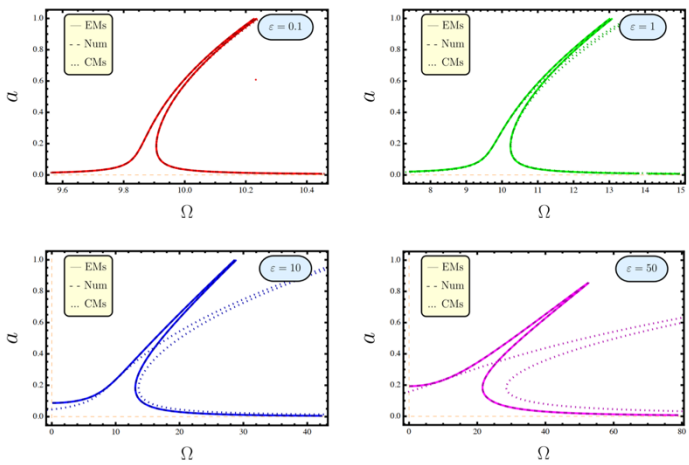
1:30 PM – 2:00 PM EDT (Eastern Daylight Time)

June 24, 2025

Michael Leamy

Georgia Tech, Atalanta, USA

We first overview the Enriched Multiple Scales (EMS) method for ordinary differential equations (ODEs) and then discuss (i) new research on extension of EMS to partial differential equations (PDEs) and (ii) alignment of EMS with Complexification-Averaging (CX-A). Solutions generated using the new EMS PDE procedure for a nonlinear beam are compared to the conventional multiple scales procedure and numerical solutions, documenting excellent EMS performance even when the forcing and/or nonlinear stiffness are large. Lastly, we present alignment of EMS with CX-A for ODEs, demonstrating that the two methods predict the same evolution equations at first-order for a Duffing system, but diverge at higher orders. This insight may lead to further developments of both methods.



BIO-SKETCH OF MICHEAL LEAMY

Dr. Leamy joined Georgia Tech in 2007 as an Assistant Professor. Prior, he was a Research Scientist in the Emerging Technology Office at the MITRE Corporation, a Federally Funded Research and Development Center, and an Assistant Professor at the United States Military Academy at West Point. Dr. Leamy has also been a Postdoctoral Fellow at the Technion, Israel's Institute of Technology, and a Research Associate at the NASA Langley Research Center

THE X-STRUCTURE/MECHANISM METHOD FOR ACHIEVING BENEFICIAL NONLINEARITY IN ENGINEERING

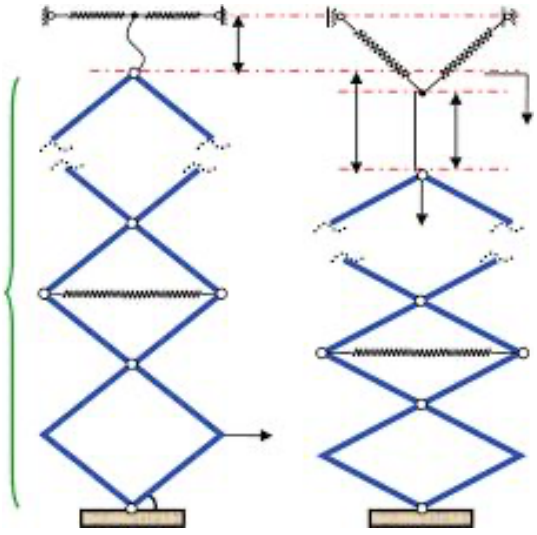
10:45 AM – 11:15 AM EDT (Eastern Daylight Time)

June 24, 2025

Xingjian Jing

City University of Hon Kong, Kowloon Tong, Hong Kong, China

Nonlinearity can take an important and critical role in engineering systems and thus cannot be simply ignored in structural design, dynamic response analysis, and performance optimization. A key issue is how to design or introduce beneficial nonlinearities into a system of concern, which is greatly demanded in many practical applications involving vibration control, energy harvesting, sensor systems and robot technology etc.



This talk presents the X-structure mechanism, a novel, bio-inspired approach for effectively utilizing nonlinearity in engineering systems, inspired by animal limb skeletons. It provides passive, low-cost, and adjustable nonlinear stiffness (high static, ultra-low dynamic), damping (dependent on frequency and amplitude), and inertia (low static, high dynamic). The resulting nonlinearity is controllable, designable, and easy to implement. The presentation systematically explores the research motivation, core bio-inspired concepts, and the distinct advantages of this method, highlighting its beneficial nonlinear properties. Applications span vibration control, energy harvesting, sensors, and robotic propulsion, supported by detailed case studies.

BIO-SKETCH OF XINGJIAN JING

Xingjian Jing is a Professor of Mechanical Engineering at City University of Hong Kong. He received his BS from Zhejiang University, MS and PhD in Robotics from the Chinese Academy of Sciences, and a PhD in Nonlinear Systems from the University of Sheffield. Before joining CityU, he held research and academic positions at the University of Southhampton and Hong Kong Polytechnic University. His research focuses on nonlinear dynamics, vibration, control, and robotics, with over 260 publications, 12800+ citations, and an H-index of 59. A senior IEEE member and top 2% highly cited scientist, he serves as Senior Editor of Mechanical Systems and Signal Processing and Associate Editor for multiple IEEE journals.

A CATALOGUE OF NONLINEAR PHENOMENA IN ELECTROSTATIC MEMS

01:30 PM – 02:00 PM EDT (Eastern Daylight Time)

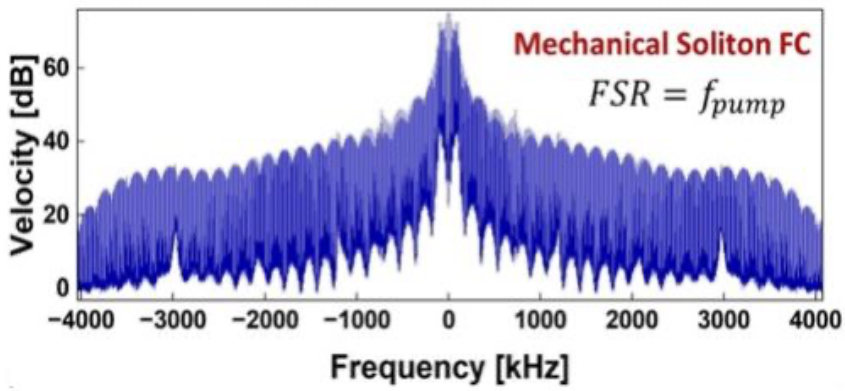
June 24, 2025

Eihab M. Abdel-Rahman

Depart. of Systems Design Engineering

University of Waterloo, CA

We exploit a comprehensive experimental study of electrostatic micro-electromechanical systems (MEMS) resonators under large excitations to present a catalogue of nonlinear phenomena at micro-scale. We encountered large oscillations, and thus nonlinearity, in three frequency ranges: a non-resonant region and two resonant regions. In those regions, we found a plethora of nonlinear phenomena including cascades of period-doubling bifurcations, bubble structure, homoclinic and cyclic-fold bifurcations, hysteresis, intermittencies, quasiperiodicity, chaotic attractors, odd-periodic windows within those attractors, Shilnikov orbits, and Shilnikov chaos.



Encounterin those complex phenomena under relatively high dissipation levels suggests that under lower dissipation they would be prevalent even at relatively low excitation levels. This calls for a new paradigm in the design of MEMS that seeks to manage dynamic phenomena rather than attempt to avoid them and, thereby, overly restrict the design space. We believe this is feasible given the repeatability and predictability of those phenomena.

BIO-SKETCH OF EIHAB ABDEL-RAHMAN

Eihab Abdel-Rahman is a Professor of System Design Engineering at the University of Waterloo, specializing in nonlinear dynamics in micro and nano sensors and actuators. His research has contributed to significant advancements in MEMS technology, including impact-based energy harvesters, bifurcation sensors, and novel micro power generators. He has played a key role in establishing systematic reduced-order modeling for MEMS and published over 300 journal and conference papers, filed 11 patents, and holds an H-index of 39. A member of ASME and the European Society of Mechanics, he is also the Section Editor-in-Chief for the MDPI journal Actuators.

EXPLOITING VIBRATIONS FOR INTERFACIAL ADHESION REGULATION: THEORY AND EXPERIMENTS

01:30 PM – 02:00 PM EDT (Eastern Daylight Time)

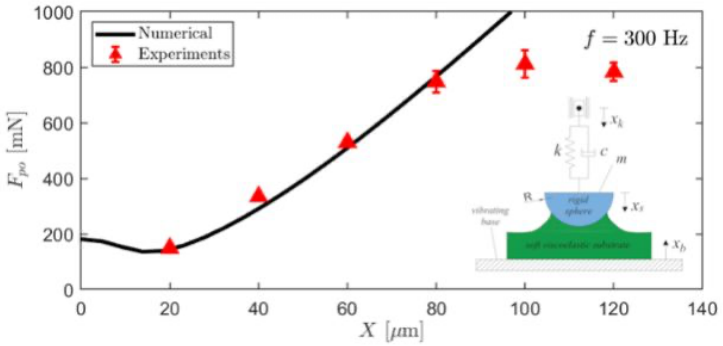
June 24, 2025

Antonio Papangelo

Department of Mechanics, Mathematics and Management

Politecnico di Bari, Italy

The term vibro-adhesion refers to the use of fast, low-amplitude vibrations to excite elastomeric substrates, enabling the rapid regulation of interfacial adhesion. It will be demonstrated that by carefully tailoring the excitation frequency and amplitude, the interfacial adhesion strength can be increased by more than 1400% compared to the adhesion force required to break the contact under quasi-static conditions (i.e., without vibration). This enhancement is made possible by viscoelastic dissipation within the substrate bulk. A soft contact can be interpreted as a problem involving an external crack that propagates and decreases when the crack heals.



I will introduce a reduced-order model to describe the mechanics of a vibro-adhesion problem involving the contact of a rigid spherical lens with a soft flat substrate. Adhesion is strongly enhanced near the system's resonance, driven by the rapid oscillation of the contact radius caused by substrate vibrations.

BIO-SKETCH OF ANTONIO PAPANGELO

Antonio Papangelo is an Associate Professor of Mechanical Design and Machine Construction at Politecnico di Bari, Italy. He earned his PhD in Mechanical Engineering from PoliBa in 2017and has been a visiting researcher at Sandia National Labs, Imperial College London, and Hamburg University of Technology. His research focuses on contact mechanics, adhesion, nonlinear vibrations, and viscoelasticity. He leads the TriboDynamics Lab, primarily funded by the ERC Starting Grant project SURFACE, which develops micro structured interfaces with tunable adhesion for applications in robotics and adhesive pads.

MULTI-PHYSICS MODELING, DESIGN OPTIMIZATION, AND EXPERIMENTAL SYSTEM IDENTIFICATION: APPLICATIONS IN RENEWABLE ENERGY, SMART STRUCTURES, AND MECHANISM-FREE PROPULSION

11:00 AM – 11:30 AM EDT (Eastern Daylight Time)

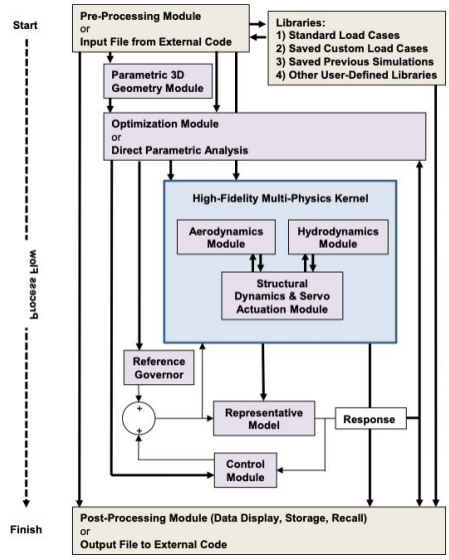
June 25, 2025

Onur Bilgen

Department of Mechanical and Aerospace Engineering

Rutgers University, New Brunswick, NJ, USA

There are many technical and regulatory challenges in designing, mass-manufacturing, operating, and recycling low-cost-high-energy-density wind and water turbines, and low-noise-long-range Urban Air Mobility aircraft.



Addressing these challenges requires innovative systems that integrate lightweight structures, smart materials, and advanced control strategies to maximize life-time performance. Such systems are critical for developing new classes of floating offshore wind turbines, hydrokinetic turbines, and vertical take-off/landing aircraft, where efficiency, durability, and noise reduction are paramount. This presentation highlights the author's research and that of his advisees from 2006 to 2024, focusing on interdisciplinary advancements in these areas, including structural dynamics, control systems, and materials engineering.

BIO-SKETCH OF ONUR BILGEN

Dr. Onur Bilgen, ASME Fellow, is an Associate Professor of Mechanical and Aerospace Engineering at Rutgers University. He earned his BS, MS, and PhD in Mechanical Engineering from Virginia Tech and completed a postdoctoral position at Swansea University, UK. His research focuses on multi-physics system modeling, design optimization, and adaptive structures, resulting in two book chapters, 49 journal articles, and 99 conference papers. He has led several U.S. government-funded projects, including DOE and ARPA-E initiatives on floating offshore wind turbines and hydrokinetic turbines, as well as a NASA ULI project on piezo composite trailing edges for commercial aircraft. He received the ASME/BOEING Structures & Materials Best Paper Award at AIAA SDM 2007.

MONDAY JUNE 23, 2025
PARALLEL SESSIONS

DAY 1 – Monday, June 23, 2025 **01:45 pm – 03:15 pm**

REDUCED-ORDER MODELS — BC ROOM 104

Chairs: Robert Szalai, Shobhit Jain

Leonardo Bettini Bálint Kaszás George Haller	Model Reduction to Spectral Submanifolds via Oblique Projection	01:45 pm – 02:00 pm
Shobhit Jain	Nonintrusive Model Reduction of Nonlinear Finite Elements Models via Spectral Submanifolds	02:00 pm – 02:15 pm
Ahmed Amr Morsy Paolo Tiso	Parametric Model Reduction via Spectral Submanifolds	02:15 pm – 02:30 pm
André de F. Stabile Alessandro Vizzaccaro Loïc Salles Alessio Colombo Attilio Frangi Cyril Touzé	Parameter-dependent model order reduction of mechanical systems: application to Hopf bifurcations	02:30 pm – 02:45 pm
Robert Szalai	Invariant Foliations for Data-Driven Reduced Order Modelling	02:45 pm – 03:00 pm
Max de Bono Thomas Hill Rainer Groh	Validating applied force reduced-order models without full-order simulation	03:00 pm – 03:15 pm

PASSIVE ENERGY DAMPING — BC ROOM 122

Chairs: Giuseppe Regga, Remco I.Leine

Fabrizio Vestroni	A Hysteretic Cable Absorber: Dynamic Characterization and Response Mitigation	01:45 pm – 02:15 pm
Balkis Youssef A. Yassine Karoui Remco I. Leine	Asymmetric vibro-impact NES with dry friction: An impact map approach	02:15 pm – 02:30 pm
Tobias Weidemann Lawrence A. Bergman Alexander F. Vakakis Malte Krack	Interaction between Anderson and Nonlinear Localization in a Forced Cyclic Chain of Oscillations with Vibro-Impact Nonlinear Energy Sinks	02:30 pm – 02:45 pm
Anargyros Michaloliakos Wei Ying Wong Ryan Davies Malakonda Reddy Lekkala Matthew Hall Lei Zuo Alexander F. Vakakis	Vibration Suppression of a Dynamic Subsea Cable by Bistable Nonlinear Energy Sink.	02:45 pm – 03:00 pm
Guilherme Franzini Stefania Lo Feudo Stéphane Job	Passive suppression of vibrations of a two-degree-of-freedom system using an omnidirectional vibro-impact nonlinear energy sink (O-VI-NES)	03:00 pm – 03:15 pm

DAY 1 – Monday, June 23, 2025 — 01:45 pm – 03:15 pm

FLUID-STRUCTURE INTERACTIONS — BC ROOM 219

Chairs: Niccolò Barni, Soon-Duck Kwon

Niccolò Barni Gianni Bartoli Claudio Mannini	Lyapunov-Based Stability Analysis of Bridges in Turbulent Flow	01:45 pm – 02:00 pm
Canh Hoang Phan Quang-Viet Vu Jae-Min Kim Soon-Duck Kwon	Transmission Tower Under Combined Yawed and Tilted Wind Action	02:00 pm – 02:15 pm
David Plaza Ruben Paredes Jia Mi Raju Datla Muhammad Hajj	Harvesting Energy From Ships Under Nonlinear Parametric Roll Using Passive Tuning Devices	02:15 pm – 02:30 pm
Daniella Aguiar Frederico Silva Renata Soares	Nonlinear vibration analysis of hyperelastic cylindrical shells with an internal fluid	02:30 pm – 02:45 pm
Ali Fasihi Grzegorz Kudra Maryam GhandchiTehrani Jan Awrejcewicz	Stability analysis and post-instability behavior of spinning fluid-conveying pipes with structural damping	02:45 pm – 03:00 pm
Mohammad Parsa Rezaei Grzegorz Kudra Krzysztof Witkowski Jan Awrejcewicz	Dynamics of Nonlinear Beams with Shear Thickening Fluid Supports	03:00 pm – 03:15 pm

ADVANCED SYSTEMS STABILITY — BC ROOM 220

Chairs: Agostino De Marco, Giuseppe Quaranta

Giuseppe Quaranta	Helicopter Ground Resonance Nonlinear Periodic Stability Analysis Using Time Invariant Approximations and Describing Function	01:45 pm – 02:00 pm
Karel van Dalen Rens van Leijden Andrei Faragau Jithu Paul Andrei Metrikine	Instability of a High-Speed Moving Mass Suspended Magnetically from a Periodically Supported Beam	02:00 pm – 02:15 pm
Leonardo Molino Agostino De Marco Sabato Manfredi	Energy-based Multiple-Input-Multiple-Output nonlinear control of fixed-wing aircraft	02:15 pm – 02:30 pm
Bernhard Ebner Manfred Plöchl Johannes Edelmann	Nonlinear stability analysis of a basic magnetic track brake model	02:30 pm – 02:45 pm
Reyolando Brasil	Experimental analysis of aerospace structures supporting non-ideal motors	02:45 pm – 03:00 pm
Haozhe Shu Mingpei Lin Hayato Chiba	Bifurcation Analysis Around Triangular Libration Points in the Circular Restricted Three-Body Problem	03:00 pm – 03:15 pm

DAY 1 – Monday, June 23, 2025 — 01:45 pm – 03:15 pm

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING I — BC ROOM 221

Chairs: Maor Farid, Léopold Trémant

Zihan Liu Utkarsh A Prashant Kambali C. Nataraj	Hybrid Modeling of Rotating Machinery Integrating Hamiltonian Mechanics	01:45 pm – 02:00 pm
Emmanuel Franck Léopold Trémant	Learning Non-Canonical Hamiltonian and Poisson Dynamics	02:00 pm – 02:15 pm
Emanuele Salgarollo Matteo Sangiorgio Fabio Dercole	A first step toward using AI to learn algorithms for time-series analysis	02:15 pm – 02:30 pm
Maor Farid	Unsupervised Data-Driven Response Regime Exploration and Identification for Dynamical Systems	02:30 pm – 02:45 pm
Riccardo Grammatico Giuseppe Quaranta Walter Lacarbonara	Deep learning techniques for resonant metamaterials design	02:45 pm – 03:00 pm
Byungjoon Min	The Stability of Correlated Boolean Networks	03:00 pm – 03:15 pm

COMPUTATIONAL NONLINEAR DYNAMICS I — BC ROOM 320

Chairs: Carlos Mazzilli, John Sanders

John Sanders	An unconditionally stable symplectic integrator for nonlinear dissipative systems	01:45 pm – 02:00 pm
Carlos Mazzilli Rodrigo Provasi Guilherme Franzini	Safe basin's GIM of an imperfection-sensitive system with unstable symmetric bifurcation	02:00 pm – 02:15 pm
Marina Esteban Emilio Freire Enrique Ponce Francisco Torres	Stability Analysis of Non-Hyperbolic Pseudo-Focus Points Via Complex Normal Forms	02:15 pm – 02:30 pm
Thibaut Vadcard Samuel Quaegebeur Fabrice Thouverez	A new reduction strategy for direct time integration of cyclic symmetric systems featuring unilateral contacts	02:30 pm – 02:45 pm
SIDHARTHA SANKAR ROY Kishore Chandra Biswal	Non-Linear Hybrid Eulerian-Lagrangian Model for Sloped Wall Liquid Dampers to Control Vibration of Multi-Degree of Freedom Structures	02:45 pm – 03:00 pm
Marcin Kapitaniak	Dynamic response of a shallow-draft floating wind turbine concept: Experiments and modelling	03:00 pm – 03:15 pm

DAY 1 – Monday, June 23, 2025 — 01:45 pm – 03:15 pm

MECHANICAL SYSTEMS AND STRUCTURES I — BC ROOM 321

Chairs: Yury Vetyukov, Paul Meehan

Paul Meehan	Investigation of nonlinear instabilities in slewing boom lifting machines	01:45 pm – 02:00 pm
Chencheng Lian Ji Wang	Vibration Frequency of Layered Fiber-Woven Materials	02:00 pm – 02:15 pm
Yury Vetyukov	Flexible rod partially sliding in an oscillating sleeve: ejection against gravity	02:15 pm – 02:30 pm
Hasan Albatayneh Mohammad Younis	Bistable MEMS Gas Detector Based on Nonlinear Bifurcations	02:30 pm – 02:45 pm
Andrzej Klepka	Nonlinear Acoustics for Damage Detection - Effects and Sources of Contact Type Damages	02:45 pm – 03:00 pm

NONLINEAR VIBRATION CONTROL I — BC ROOM 319

Chairs: Arnaldo Casalotti, Manuel Ferretti

Sarah Geyskens Jasper Juchem Kevin Dekemele Mia Loccufier	Virtual Mechanical System control law for vibration mitigation in a system with arctangent nonlinearity	01:45 pm – 02:00 pm
Arnaldo Casalotti Giovanni Migliaccio Francesco D'Annibale	Piezoelectric Control of Nonlinear Visco-Elastic Beams Subject to Follower Forces	02:00 pm – 02:15 pm
Krzysztof Kuliński Jacek Przybylski	The effect of piezoelectric actuation and elastic foundation on nonlinear dynamic response of axially restrained beams	02:15 pm – 02:30 pm
Jinhong Noh Pilkee Kim Yong-Jin Yoon	Using symmetry breaking to suppress vibration and reduce force transmission in shock-loaded bistable oscillators	02:30 pm – 02:45 pm
Manuel Ferretti Lorenzo Mancini Angelo Di Egidio	Longitudinal Seismic Vibration Protection of Pipelines in Underground Utility Tunnels	02:45 pm – 03:00 pm
Chia-Ming Chang	Preliminary Investigation of Track Nonlinear Energy Sink with Rotational Mass for Seismically Excited Buildings	03:00 pm – 03:15 pm

DAY 1 – Monday, June 23, 2025 — 04:00 pm – 05:45 pm

COMPUTATIONAL NONLINEAR DYNAMICS II — BC ROOM 104

Chairs: Massimo Cuomo, Ioannis Georgiou

Alexy MERCIER Louis JEZEQUEL	Approximated expressions of nonlinear generalized contact and friction forces for an intrusive stochastic approach based on properties of Chebyshev polynomials	04:00 pm – 04:15 pm
Massimo Cuomo Leopoldo Greco Alessandro Cammarata	Implicit Time Integrator for Cosserat Rods with Spherical Bezier Interpolation	04:15 pm – 04:30 pm
Paolo F. Ferrari Guilherme Franzini Carlos Mazzilli Celso P. Pesce José R. C. Piqueira	An extension of the direct parametrization method of invariant manifolds through automatic differentiation: Applications to autonomous systems	04:30 pm – 04:45 pm
Yilin Li Jianliang Huang Weidong Zhu	Enhancing Computational Efficiency and Convergence of the Incremental Harmonic Balance Method for Periodic Responses of a Nonsmooth Geared Rotor-Bearing System	04:45 pm – 05:00 pm
Ioannis Georgiou	Dynamics of Physical Magneto-Electro-Structural Systems: Interplay of Multi-Physics Nonlinearities Weaves Unusual Hysteresis Loops and Draws a Background of Hidden Attractors	05:00 pm – 05:15 pm
Rohit Radhakrishnan Induja Pavithran Valerie Livina Jürgen Kurths R. I. Sujith	Limits of using early warning signals for preventing tipping	05:15 pm – 05:30 pm
Rafael Sanchez Crespo Alexander D. Shaw Michael I. Friswell	Experimental Testing and Mathematical Modelling of Asynchronous Partially Contact Bouncing Motion in a Coupled Double Rotor System	05:30 pm – 05:45 pm

MODAL INTERACTIONS AND ENERGY TRANSFER — ROOM 122

Chairs: Muhammad Hajj, Emmanuel GOURDON, Mingwu Li

Stefano Lenci	Nonlinear Dynamics of Wind Turbines	04:00 pm – 04:30 pm
Hongming Liang Shobhit Jain Mingwu Li	Bifurcation analysis of quasi-periodic orbits of mechanical systems with 1:2 internal resonance via spectral submanifolds	04:30 pm – 04:45 pm
Emmanuel GOURDON	Nonlinear Energy Sink with Fractional Nonlinearity Linearly Coupled to a Main System for Low Level of Excitation in Acoustic Applications	04:45 pm – 05:00 pm
Nataly F. Segel Tobias Weidemann Hendrik D. Linder Malte Krack	Enhancing the Inter-Modal Targeted Energy Transfer of Vibro-Impact Absorbers through Geometric Optimization of the Contact Area	05:00 pm – 05:15 pm
Ashwin Manur Mohammad Bukhari Alexander F. Vakakis	Quantification of Nonlinear Energy Scattering in an Impulsively Excited Structure with Local Vibro-Impact Nonlinearities	05:15 pm – 05:30 pm
Róbert Rochlitz Bendegúz Dezső Bak	Effect of mass mistuning on the energy transfer in the mechanistic turbulence model	05:30 pm – 05:45 pm

DAY 1 – Monday, June 23, 2025 — 04:00 pm – 05:45 pm

NETWORKS SYNCHRONIZATION — BC ROOM 219

Chairs: Thomas Breunung, Eva Kaslik

Thomas Breunung Balakumar Balachandran	Noise-Assisted Synchronization in Networks of Coupled Mathieu Oscillators	04:00 pm – 04:15 pm
Shaghayegh Rahimpour koldeh Nikhil Bajaj D. Dane Quinn	Amplitude and Phase Interactions in Coupled MEMS-Colpitts Oscillators	04:15 pm – 04:30 pm
Eva Kaslik	Networks of Wilson-Cowan nodes with distributed delays	04:30 pm – 04:45 pm
Elena Rybalova Vladislav Averyanov Galina Strelkova	Peculiarities of Synchronization of Randomly Interlayer Coupled Networks of Chaotic Maps	04:45 pm – 05:00 pm
Jea-Hyun Park	Flocking and Obstacle Avoidance Phenomena in the Nonlinear Cucker-Smale Model with Ranked Hierarchical Free-Will Multi-Leadership Using the Comparison Principle	05:00 pm – 05:15 pm
Luiz Carlos Gadelha de Souza	Satellite Attitude Control Design Using SDRE Method for Orbit Injection Phase	05:15 pm – 05:30 pm
Ling Hong Jun Jiang	Fuzzy Optimal Control from Space Discretization to Machine Intelligence	05:30 pm – 05:45 pm

MULTIBODY SYSTEM DYNAMICS — BC ROOM 220

Chairs: Theresa Honein, Muhao Chen

Junaid Ali Gregory Shaver Anil Bajaj	A Set-valued Impact Law Approach for Modeling and Analysis of Rigid Contact Universal Joint with Clearance	04:00 pm – 04:15 pm
Theresa Honein Oliver O'Reilly	On the Dynamics of Transporting Rolling Cylinders	04:15 pm – 04:30 pm
Daniele Gualdi Silvio Sorrentino Alessandro De Felice	Perturbation analysis of stationary manifolds governed by nonlinear friction characteristics in automotive drivelines	04:30 pm – 04:45 pm
Josef Koutsoupakis Dimitrios Giagopoulos Sotirios Natsiavas Georgios Karyofyllas Panagiotis Seventekidis	Advanced Gear Contact Modeling for Drivetrain Condition Monitoring Applications	04:45 pm – 05:00 pm
Rom Levy Ari Dantus Yizhar Or	Analysis and Experiments of the Dissipative Twistcar - Direction Reversal and Asymptotic Approximations	05:00 pm – 05:15 pm
Shuo Ma Sikan Hu Muhao Chen	Dynamics of Membrane Structures Based on the Absolute Nodal Coordinate Formulation	05:15 pm – 05:30 pm

DAY 1 – Monday, June 23, 2025 — 04:00 pm – 05:45 pm

ECOSYSTEM DYNAMICS — BC ROOM 221

Chairs: Alexander Fidlin

Attila Genda Alexander Fidlin Stefano Lenci Oleg Gendelman	Seasonal Hunting and Food Fluctuations in the Lotka-Volterra Model	04:00 pm – 04:15 pm
Trilok Mathur Poonam Poonam Shivi Agarwal Komal Bansal	Modeling Gambling Behavior Dynamics with Fractional-Order Analysis: Insights into Prevention and Control Strategies	04:15 pm – 04:30 pm
Shivi Agarwal Trilok Mathur Ishu Dalal	An Expected Value Approach in Efficiency Assessment Through Integration of DEA with Rough Set Theory	04:30 pm – 04:45 pm
Semu Kassa Thabo Nketsang Gizaw Mengistu Tsidu	Effect of Climatic Factors in the Dynamics of Natural-Forage Dependent Livestock Production: The Case of Botswana	04:45 pm – 05:00 pm
Adriana Loredana Tanasie	Dynamics of a socioecological system with distributed time delays	05:00 pm – 05:15 pm

BIOSYSTEM DYNAMICS — BC ROOM 319

Chairs: Mihaela Neamtu, Antonio Zippo

Antonio Zippo Francesco Pellicano	Exploring Nonlinear Muscle Activation Patterns in Parkinson's Tremor	04:00 pm – 04:15 pm
Muhammad Imran Saira Batool Brett McKinney	Mathematical Modeling and Control Analysis for the Whooping Cough Using SVEITR Compartmental Model	05:30 pm – 05:45 pm
Ying Wu	High-Order Network Degree Revealed Shared and Distinct Features Among Adult Schizophrenia, Bipolar Disorder and ADHD	04:30 pm – 04:45 pm
Gengxiang Wang Andrew Bickerdike Yang Liu Antoine Ferreira	Modelling and Analysis of Microrobot Dynamics in Blood Vessels for Cancer Metastasis Detection	04:45 pm – 05:00 pm
Mihaela Neamtu	Dynamics of a time-delay model of dopamine-modulated prefrontal-limbic interactions in schizophrenia	05:00 pm – 05:15 pm
Mingpei Lin Hayato Chiba	Numerical analytical of Holf bifurcation in the glucose-insulin system and diabetes prediction	05:15 pm – 05:30 pm

DAY 1 – Monday, June 23, 2025 — 04:00 pm – 05:45 pm

MEMS-NEMS I — BC ROOM 320

Chairs: Eihab Abdel-Rahman, Mohammad Younis

Hamza Mouharrar HASSEN OUAKAD Masoud Akbari Kevin Musselman Skandar Basrour David Munoz Rojas Eihab Abdel-Rahman	Enhanced Resolution in Nonlinear NEMS-Based Optomechanical Frequency Combs	04:00 pm – 04:15 pm
Resul Saritas Mahmoud A. H. Galal Memik taylan Das Eihab Abdel-Rahman	Chatter in Dynamic Scanning Probe Lithography (d-SPL)	04:15 pm – 04:30 pm
Matteo Pozzi Jacopo Marconi Shobhit Jain Mingwu Li Francesco Braghin	Backbone Optimization of a MEMS Resonator using an Invariant Manifold-Based Reduced Order Model	04:30 pm – 04:45 pm
Zhiqiang Zhu Mu Li Wei Liu Qing Zhao Yuxi Wang Maolin Liao	Detection of downhole extreme conditions based on dynamic data measured by a newly developed micro-measurer	04:45 pm – 05:00 pm
Jonathan Ehrmann Thomas Sattel	Nonlinear dynamics analysis of parametrically excited MEMS-probes for enhancing dynamic AFM	05:00 pm – 05:15 pm
Ali Eskandari Mohammad Alzgool Yu Tian Mohammad Younis Shahrzad Towfighian	Investigation of Internal Resonance in a T-Shaped Electrostatic Levitation Actuator	05:15 pm – 05:30 pm

NONLINEAR VIBRATION CONTROL II — BC ROOM 321

Chairs: Simona Di Nino, Louis Mesny

Louis Mesny Guilhem Michon	Hybrid nonlinear energy sink with multiple threshold activations: simulation and experiment	04:00 pm – 04:15 pm
Cui Chao Jian Yang	Exploiting nonlinear inerter for beneficial vibration isolation performance	04:15 pm – 04:30 pm
Xiaoying Hu Chnunyan Zhou	Effect of translation-rotation coupling motion on a 3-Dof horizontal vibration isolation system	04:30 pm – 04:45 pm
Angelo Di Egidio Simona Di Nino Francesca Pancella Lorenzo Mancini Manuel Ferretti	Protection of Underground Utility Tunnel Contents from Transversal Earthquake Effects	04:45 pm – 05:00 pm
Arnaldo Casalotti Francesco D'Annibale	A Distributed Piezoelectric Damper for Vibration Control of Taut Strings	05:00 pm – 05:15 pm
Tatiana Figurina Dmitri Knyazkov	Motion of a System of Identical Bodies Along a Straight Line with Quadratic Friction	05:15 pm – 05:30 pm

DAY 1 – Monday, June 23, 2025 — 04:00 pm – 05:45 pm

FRACTIONAL-ORDER SYSTEMS — GATN ROOM 103

Chairs: Carla Pinto

Julia Calatayud Marc Jornet Carla Pinto	To Fractionalize or Not To Fractionalize Epidemiological Compartmental Models, That is the Question	04:00 pm – 04:15 pm
Paul-Erik Haacker Remco I. Leine	Towards Stability Analysis of Periodic Solutions of Fractional-Order Differential Equations	04:15 pm – 04:30 pm
Mark Edelman	On Asymptotic Theory of Generalized Fractional Maps	04:30 pm – 04:45 pm
Marius-F. Danca	Parrondo's paradox in fractional-order systems	04:45 pm – 05:00 pm
Alexandru Fikl	Adaptive step size controllers for fractional product integration methods	05:00 pm – 05:15 pm
Oana Brandibur	Dynamics of Fractional-Order Duffing Oscillators	05:15 pm – 05:30 pm
Pu Yuan	Fractional-Order Dependent Phenomena in Nonlinear PDE Systems: Diffusion Patterns and Long-Term Propagation	05:30 pm – 05:45 pm

TUESDAY JUNE 24, 2025
PARALLEL SESSIONS

DAY 2 – Tuesday, June 24, 2025		10:45 am – 12:00 pm

CONTROL OF NONLINEAR SYSTEMS I — BC ROOM 319

Chairs: Yangyang Chen , Nelson Rosa

Yangyang Chen	Biasing Self-Oscillations in Active Wires via Asymmetric Willis-type Viscosity	10:45 am – 11:00 am
Danilo Ciliberti Agostino De Marco Andrea Terracciano Pierpaolo Borrelli	Nonlinear Control Strategies in a Co-Simulation Framework for Hybrid Regional Aircraft Design Verification	11:00 am – 11:15 am
Nelson Rosa	Exploring the Optimality Landscape of Energetically Efficient Locomotion of a Two-Link Walking Robot Through Bifurcation Points in the Optimal Solution Set	11:15 am – 11:30 am
Muhao Chen Aguinaldo Fraddosio Andrea Micheletti Gaetano Pavone Mario Daniele Piccioni	Design and Analysis of Deployable Clustered Tensegrity V-Expander Plates	11:30 am – 11:45 am
Zsolt Iklódi Andras Bartfai Zoltan Dombovari	Stability of Turning in the Presence of Distributed Neutral Feedback Delay	11:45 am – 12:00 pm

MECHANICAL SYSTEMS AND STRUCTURES II — BC ROOM 104

Chairs: Giuseppe Habib

Xingjian JING	The X-structure/mechanism method for achieving beneficial nonlinearity in engineering	10:45 am – 11:15 am
Simone Venturini Alessandro Vigliani	Effects of segmentation in passive magnetic bearings on rigid rotor dynamics	11:15 am – 11:30 am
Máté B. Vizi Gábor Orosz Dénes Takács Gábor Stépán	Linearly decoupled lateral and longitudinal control of an autonomous unicycle	11:30 am – 11:45 pm
Yuankai Ren Hangyu Lu Giuseppe Habib	Wheel shimmy suppression through the piecewise nonlinear energy sink: elimination of detrimental isolas	11:45 am – 12:00 am

DAY 2 – Tuesday, June 24, 2025 — 10:45 am – 12:00 pm

ARTIFICAIL INTELLIGENCE AND MACHINE LEARNING II — BC ROOM 122

Chairs: Balakumar Balachandran

Lawrence Virgin	On the nonlinear response of circular, clamped panels	10:45 am – 11:15 am
A. Subrahamanian Moosath B. M. Kessels M.F. Shakib R.H.B. Fey N. van de Wouw	State extension and augmentation-based model updating using measured response data	11:15 am – 11:30 am
Pritam Ghoshal James Gibert Anil Bajaj	Exploiting Bistability and Viscoelasticity in Reservoir Computing	11:30 am – 11:45 am

BIFURCATION AND DYNAMIC INSTABILITY — BC ROOM 219

Chairs: Javier Ros

Beeraiah Thonti Sivakumar Sudarsanan Ramesh S Bhavi Anaswara Bhaskaran Manikandan Raghunathan Sujith Raman Pillai Indusekharan Nair	Dynamics of transition to periodic oscillations in a turbulent reactive flow system	10:45 am – 11:00 am
Chuang Yao Qinglong Li Mingpei Lin	Analytical bifurcation for center manifolds and their corresponding invariant manifolds in Hill problem	11:00 am – 11:15 am
Javier Ros Enrique Ponce	Saddle-Node Bifurcation of Periodic Orbits from Infinity in Symmetric 3D Piecewise Linear Systems via Zero-Hopf Bifurcation	11:15 am – 11:30 am
Julia Cantisán Gómez	Chaotic Resetting Effectiveness Scales with Uncertainty	11:30 am – 11:45 am
Beeraiah Thonti Shruti Tandon Premraj Durairaj R. I. Sujith	Strange Nonchaotic Attractor in a Self-organized Turbulent Reactive Flow System	11:45 am – 12:00 pm

DAY 2 – Tuesday, June 24, 2025 — 10:45 am – 12:00 pm

NONSMOOTH SYSTEMS — BC ROOM 220

Chairs: Rohit Chawla, Luiz Fernando Gonçalves

Alfredo Fantetti Alessandra Vizzaccaro	Understanding the Impact of Friction on Structural Dynamics	10:45 am – 11:00 am
Rohit Chawla Soumyajit Seth Vikram Pakrashi	Experimental Analysis of Discontinuity-Induced Bifurcations in Soft-Impact Oscillators Using Inductor-less Circuit	11:00 am – 11:15 am
Luiz Fernando Gonçalves Rodrigo Donizete Euzebio Vitor Emanoel Resplandes de Souza	Trajectories at non-regular points in planar discontinuous piecewise linear differential systems with centers and a non-regular switching discontinuity	11:15 am – 11:30 am
Rodrigo Donizete Euzebio	Asymptotic stability in a nonsmooth slow-fast climate system presenting boundaries	11:30 am – 11:45 am
Emanuel-Attila Kokovics Eva Kaslik Anca Radulescu	Stability and Bifurcations in a Ring of 2N-Coupled Wilson-Cowan Systems with Distributed Delays	11:45 am – 12:00 am

EXPERIMENTAL DYNAMICS — BC ROOM 221

Chairs: Francesco Pellicano, Alexander Fidlin

Francesco Pellicano Antonio Zippo	Complex Dynamic Phenomena in Shells with Random Excitation	10:45 am – 11:00 am
Attila Genda Alexander Fidlin	Identification of slow dynamics based on transient measurements and spatial averaging	11:00 am – 11:15 am
Paul Morel Jean-Luc Fayard Benoit Prabel Roberto Alcorta Sébastien Baguet	Experimental and numerical analysis of vibro-impact wear testing machines: application to the MUSE tribometer	11:15 am – 11:30 am
Alfredo Fantetti Jean Jung Alexander F. Vakakis Kathryn H. Matlack	Experimental measurements of solitary waves in granular crystals with friction	11:30 am – 11:45 am

DAY 2 – Tuesday, June 24, 2025 — 10:45 am – 12:00 pm

SYSTEM IDENTIFICATION AND SHM — BC ROOM 320

Chairs: Dario Anastasio

Andrea De Flaviis Rocco Alaggio Daniele Zulli	Dynamic identification of a nonlinear beam through the Hilbert-Huang Transform	10:45 am – 11:00 am
Ronwaldo Emmanuel Aquino Zachary Taylor Trevor Haskett Matthew Browne	Stick-Slip Friction Model to Characterize Amplitude-Dependent Frequency and Damping in Single-Axis Solar Trackers	11:00 am – 11:15 am
Dario Anastasio Ghislain Raze Stefano Marchesiello Gaëtan Kerschen	Identification of primary and secondary resonances: experimental continuation and broadband data-based modeling	11:15 am – 11:30 am
Anargyros Michaloliakos Benjamin Chang Lawrence A. Bergman Alexander F. Vakakis	Data-driven Method for Mechanical Systems with Closely Spaced Modes and Nonlinearities	11:30 am – 11:45 am
Hyun-Kyoung Kim Hyo-Gyoung KWAK	Quantifying the Impact of Windscreen on Plastic Shrinkage Cracks of Concrete: A Numerical Analysis of Bleeding and Evaporation	11:45 am – 12:00 pm

MECHANICAL SYSTEMS AND STRUCTURES III — BC ROOM 321

Chairs: N. van de Wouw

Athanasios Tsetas Gabriel Follet Sergio S. Gómez Andrei Metrikine	Non-Linear Dynamics of a Hydraulic Cylinder Coupled with a Flexible Structure	10:45 am – 11:00 am
Stijn van den Broek Abdullah Habboush Stan van Boheemen Simon R. Eugster N. van de Wouw	Modeling belt handling in industrial printing systems as a 1D continuum	11:00 am – 11:15 am
Lukas Huber Jithu Paul Andrei Faragau Karel van Dalen	Dynamic stability of a Hyperloop system employing a tubular shell theory	11:15 am – 11:30 am
Hasnaa KIBACH Alireza TURE SAVADKOOHI Claude-Henri LAMARQUE	On the Nonlinear Vibrations of an Elastica	11:30 am – 11:45 am
Ivana Bochicchio	Cable-Suspended Beam Systems: Recent Results for Linear and non-Linear Models	11:45 am – 12:00 pm

DAY 2 – Tuesday, June 24, 2025 — 01:30 pm – 03:30 pm

MEMS-NEMS II — BC ROOM 104

Chairs: Oded Gottlieb, Mohammad Younis

Eihab Abdel-Rahman	A Catalogue of Nonlinear Phenomena in Electrostatic MEMS	01:30 pm – 02:00 pm
Steven Shaw	The Effects of Nonlinearity and Noise in Tiny Oscillators Used for Timekeeping	02:00 pm – 02:15 pm
Dumitru Caruntu Miguel Martinez	Fringe Field Actuation Of Electrostatically Actuated Mems Cantilever Resonators: Capacitance Model	02:15 pm – 02:30 pm
Chen Shmulman Oded Gottlieb	Nonlinear response of thermo-visco-elastic nano-resonators to magnetomotive excitation	02:30 pm – 02:45 pm
Omar Abuzaid Mohammad Matahen Mohammad Younis	Mode Localization in Mechanically Coupled Microbeam Resonators with Potential Application for Sensing	02:45 pm – 03:00 pm
Mohammad Matahen Hasan Albatayneh Mohammad Younis	A Threshold Sensor Utilizing a Resonant Microbeam Coupled with a Resistive Sensor for Simplified Readout	03:00 pm – 03:15 pm
Thomas Hinds Amro Koshak Nikhil Bajaj	Experimental Demonstration of the Effects of Time-Delayed Nonlinear Feedback in Microresonators	03:15 pm – 03:30 pm

COMPUTATIONAL NONLINEAR DYNAMICS III — BC ROOM 122

Chairs: Giuseppe Habib, D. Dane Quinn

Michael Leamy	Enriched Multiple Scales for Ordinary and Partial Differential Equations with Comparison to Complexification-Averaging	01:30 pm – 02:00 pm
Max Miller Nidish Balaji D. Dane Quinn	An Extended Method of Multiple Scales	02:00 pm – 02:15 pm
A. Yassine Karoui Remco I. Leine	Computation of Nonlinear Normal Modes using Extended Invariant Cones	02:15 pm – 02:30 pm
Fabia Bayer Remco I. Leine	Numerical stability determination for periodic orbits with guaranteed convergence	02:30 pm – 02:45 pm
Roberto Alcorta Fabia Bayer	The Koopman-Hill projection for codim-2 bifurcation analysis: application to nonlinear vibrations	02:45 pm – 03:00 pm
Raffaele Capuano Nicolò Vaiana Luciano Rosati	Dynamic Response of MDoF Systems with Complex Rate-Independent Hysteretic Behavior: Preliminary Results	03:00 pm – 03:15 pm
Giuseppe Habib	Estimating Unstable Limit Cycles from Small Perturbations: A Minimal-Data-Driven Approach	03:15 pm – 03:30 pm

DAY 2 – Tuesday, June 24, 2025 — 01:30 pm – 03:30 pm

ENERGY HARVESTING — BC ROOM 219

Chairs: Takahiro Tsuchida, Alberto Di Matteo

Takahiro Tsuchida Kyoichi Oike	Output Voltage Statistics of Nonlinear Vibration Energy Harvesters Under Non-Gaussian Random Excitation	01:30 pm – 01:45 pm
Satyam Panda Shubham Baisthakur Vikram Pakrashi Breiffni Fitzgerald	Development of Reduced Order Data-Driven Models of Wind Turbine Blades	01:45 pm – 02:00 pm
Karthik Boddapati Andres F. Arrieta	Structural multistability for multi-speed wind energy harvesting from vortex-induced vibrations	02:00 pm – 02:15 pm
Marek Borowiec	Influence of the vibration range zone on the energy harvesting efficiency based on the magnetic rolling pendulum	02:15 pm – 02:30 pm
Alberto Di Matteo Antonina Pirrotta	Energy Harvesting from wave motion based on Tuned Liquid Column Damper with Dielectric Elastomer generator: theoretical and experimental study	02:30 pm – 02:45 pm
Yilin Kou Xiangyu Lu Daniel Deng Muhammad Hajj Binh Truong Lei Zuo	A Dynamic Model of Bio-Inspired Bistable Energy Harvester	02:45 pm – 03:00 pm
Hossam Alqaleiby Mahmoud Ayyad Muhammad Hajj	Neural optimization machine-based optimization of nonlinear energy harvesters under irregular excitation	03:00 pm – 03:15 pm

METAMATERIALS I — BC ROOM 220

Chairs: Andrea Arena, Aline Souza de Paula

Andrea Arena Marco Lepidi	Two-degrees-of-freedom model simulating the nonlinear dynamics of pretensioned textile metamaterials	01:30 pm – 01:45 pm
Andre Albuquerque Thomas e Brandão Aline Souza de Paula Adriano Todorovic Fabro	Vibration attenuation in rotors through graded bi-stable resonators	01:45 pm – 02:00 pm
Vincent Mahé Adrien Mélot Benjamin Chouvion Christophe Droz	Wave-based reduction of finite phononic structures with nonlinear boundary conditions	02:00 pm – 02:15 pm
Americo Cunha Jr Glaucio Paulino	Structural Dynamics of Ordered and Disordered Waterbomb Origami Tubes	02:15 pm – 02:30 pm
Christopher Sugino	Wave Propagation in Time-Delayed Metamaterials	02:30 pm – 02:45 pm
João Norenberg Americo Cunha Jr Diego Misseroni	Multifunctional Nonlinear Metabeam for Energy Harvesting and Vibration Mitigation	02:45 pm – 03:00 pm
Kunwoo Kim Dahye Kim Jihyun Sung	Study on Linear and Nonlinear Characteristics of Double-Wall Gyroid TPMS Structure Implemented through 3D Printing	03:00 pm – 03:15 pm
Walter Lacarbonara Guruva Sawan Kumar	Highly Tunable Nonlinear Bandgaps in Metamaterials	03:15 pm – 03:30 pm

MECHANICAL SYSTEMS AND STRUCTURES IV ROOM 320

Chairs: Arnaldo Casalotti, Hyo-Gyoung KWAK

Arnaldo Casalotti Franco Milicchio Francesco D'Annibale Giovanni Formica	An Efficient Numerical Tool Towards SHM of Masonry Buildings	01:30 pm – 01:45 pm
Athanasios Tsetas Altayeb Malik Andrei Faragau Andrei Metrikine Apostolos Tsouvalas	Discovering Nonlinear Pile-Soil Interaction Models from Experimental Data	01:45 pm – 02:00 pm
Sina Behboudi Hao Bai Jian Deng	Dynamic Stability of Pile Foundations Under Seismic Excitations with Two Frequencies	02:00 pm – 02:15 pm
Hyunseung CHUNG Hyo-Gyoung KWAK	P-I Diagram Prediction of RC Beams Exposed to Blast Loading Based on Equivalent Load	02:15 pm – 02:30 pm
Andrew Bickerdike Gavin Tabor Yang Liu	CFD modelling of deployable microrobots in the bloodstream	02:30 pm – 02:45 pm
Kaidong Chen Emmanuel Detournay N. van de Wouw	Comparison between the DDE and PDE-ODE Models in Drilling: from the Perspective of the Evolution of the Rock Surface	02:45 pm – 03:00 pm
Lukas Huber Riccardo Mei Andrei Faragau Karel van Dalen	Extracting nonlinear shear stiffness and damping ratio from resonant column tests based on nonlinear viscoelasticity	03:00 pm – 03:15 pm
Salvatore Paolo Cavallaro Alessandro Vigliani	Modelling and Experimental Testing of a Rotor with Nonlinear Passive Magnetic Bearings	03:15 pm – 03:30 pm

CONTROL OF NONLINEAR SYSTEMS II ROOM 321

Chairs: Carmine Putignano, Onur Bilgen

Nida Ahsan Muhammad Hajj	Deep Reinforcement Learning for Inverted Pendulum Control: A Framework for Reward and Penalty Assignment	01:30 pm – 02:00 pm
Roshan S. Kaundinya Jonas G. Matt John I. Alora Luis A. Pabon Marco Pavone George Haller	Controlling soft robots using adiabatic spectral submanifolds	02:00 pm – 02:15 pm
Brian Carr Nabil Chalhoub Valery Pilipchuk	Finite Element Cable Model for Controlling the Towing Dynamics	02:15 pm – 02:30 pm
Mehmet Simsek Onur Bilgen	Robust Shape Adaptation of a Metastructure Concept with a modified Hybrid Position Feedback Control	02:30 pm – 02:45 pm
Manisha Lingala Sai Navaneet Pedddapalli Ju H. Park Sangmoon Lee	Discrete Latent Diffusion Motion Planning	02:45 pm – 03:00 pm
Simone De Carolis Carmine Putignano Leonardo Soria Giuseppe Carbone	Dynamic Interaction and Lift-Off Phenomena in Viscoelastic Contact Systems under Oscillatory Excitation: A Linear Modeling Approach and BEM Validation	03:00 pm – 03:15 pm
Muhammad Haq Nawaz Sebastian Oberst	Systematic Performance Metrics and Optimality Criteria of the Geometric Filter GHKSS	03:15 pm – 03:30 pm

DAY 2 – Tuesday, June 24, 2025 — 01:30 pm – 03:30 pm

MECHANICAL SYSTEMS AND STRUCTURES V — BC ROOM 221

Chairs: Krzysztof Kecik, Scott Kelly

Deepak Kumar Badri Prasad Patel	Nonlinear Periodic Vibroacoustic Analysis of Viscoelastic Plate in Time Domain	01:30 pm – 01:45 pm
Krzysztof Kecik	Influence of Electromechanical Coupling Modifications on the Energy Recovery Efficiency of a Magnetically Levitated Electromagnetic Vibration Harvester	01:45 pm – 02:00 pm
Shane Koscielniak	Mean-Square Resonator and Relation to Duffing Resonator	02:00 pm – 02:15 pm
Jaffry Jaman Roland Jones Amir Kadiric Alfredo Fantetti	The experimental dynamics of impacts of steel bouncing spheres	02:15 pm – 02:30 pm
Enxhi Sulollari Karel van Dalen alessandro cabboi	The Influence of Belt Flexibility on Friction Modulation and System Dynamics	02:30 pm – 02:45 pm
Scott Kelly Hamidreza Moradi	Reduced-Order Modeling and Analysis of a Freely Rolling Two-Link Planar Snakelike Robot	02:45 pm – 03:00 pm
Md Abu Sina Ibne Albaruni Alan Bowling	Stiff Solver Versus Model Reduction Approaches for Reducing Computational Time	03:00 pm – 03:15 pm
Bjarne Vergouwen Arash M. Zadeh Fard Lukas Bürger Shuyang Zhang Javier Del Fresno Zarza Simon Vanpaemel Frank Naets	Visco-hyperelastic material parameter identification of rubber bushings	03:15 pm – 03:30 pm

COMPUTATIONAL NONLINEAR DYNAMICS IV — BC ROOM 319

Chairs: Thomas Breunung, Silvio Sorrentino

Antonio Papangelo	Exploiting Vibrations for Interfacial Adhesion Regulation: Theory and Experiments	01:30 pm – 02:00 pm
Thomas Breunung Florian Kogelbauer	Can truly nonlinear dynamics be linearized?	02:00 pm – 02:15 pm
Florian DUPONT Luc LAURENT Antoine LEGAY	Model Order Reduction of Assembled Structures with Localized Nonlinearities in Transient Dynamic Analysis	02:15 pm – 02:30 pm
Adrien Mélot	Optimizing Bifurcations and Isolated Response Curves to Enhance the Performances of Nonlinear Energy Sinks	02:30 pm – 02:45 pm
Alessandro De Felice Daniele Gualdi Silvio Sorrentino	Resonant behaviour in the presence of both parametric and external harmonic inputs	02:45 pm – 03:00 pm
Nico Novelli Pierpaolo Belardinelli Stefano Lenci	Automatic sparse identification of hybrid systems	03:00 pm – 03:15 pm
Nicolo' Vaiana Luciano Rosati	Simulation of Hysteresis Loops with Evolving Shape: Preliminary Results	03:15 pm – 03:30 pm

WEDNESDAY JUNE 25, 2025
PARALLEL SESSIONS

DAY 3 – Wednesday, June 25, 2025 **11:00 am – 12:30 pm**

NONLINEAR PDE/ODEs — BC ROOM 104

Chairs: Airton Deppman

Hafiz Zeeshan Iqbal Hassan Amir Shah Eihab Abdel-Rahman	Nonlinear Dynamics and Landau Magnetization Effects in Coupled Drift Ion Acoustic Waves in Quantum Plasmas with External Periodic Forces	11:00 am – 11:15 am
Airton Deppman	Dynamics in Fractal Spaces	11:15 am – 11:30 am
Chaudry Khalique	A Study of a Generalized (3+1)-Dimensional Kadomtsev-Petviashvili Benjamin-Bona-Mahony Equation with Power Law Nonlinearity	11:30 am – 11:45 am
Muhammad Tahir Mustafa	Exact solutions of a non-linear PDE arising in biological processes	11:45 am – 12:00 am
Isaac A. García	The Poincaré Map Structure of Monodromic Singularities of Planar Vector Fields with Laurent Inverse Integrating Factor	12:00 am – 12:15 am
Susanna Maza	Periodic Orbits of Vector Fields in Arbitrary Dimension with Non-Autonomous Inverse Jacobi Multipliers	12:15 am – 12:30 pm

METAMATERIALS II — BC ROOM 122

Chairs: Muhammad Hajj, Mohammad Bukhari

Onur Bilgen	Multi-physics Modeling, Design Optimization, and Experimental System Identification: Applications in Renewable Energy, Smart Structures, and Mechanism-Free Propulsion	11:00 am – 11:30 am
Mohammad Bukhari Alexander F. Vakakis	Interband Targeted Energy Transfer and localization by means of Strong Geometric Nonlinearity in Locally Resonant Metamaterials	11:30 am – 11:45 am
Yuhao Liu Jian Yang	Low-frequency vibration suppression using nonlinear inerter-based diatomic metamaterials	11:45 am – 12:00 am
Ivana Kovacic Ljiljana Teofanov Rui Zhu Xiao Wang Jianlei Zhao	On the Existence of Finite and Semi-Infinite Vibration Attenuation Regions in the Chain of Mass-In-Mass Units: Theoretical and Experimental Results	12:00 am – 12:15 am
Sneha Srikanth Andres F. Arrieta	Multistable Metamaterials for Mitigating Impact Loads	12:15 am – 12:30 am

DAY 3 – Wednesday, June 25, 2025 — 11:00 am – 12:30 pm

COMPOSITE STRUCTURES — BC ROOM 219

Chairs: Tetyana Shmatko

Tetyana Shmatko Lidiya Kurpa	Analysis of nonlinear free vibration of sandwich auxetic honeycomb plates with a complex shape	11:00 am – 11:15 am
R. Sukanya K. V. Nagendra Gopal	Nonlinear free and forced vibration analysis of sandwich plates with auxetic core using the Homotopy Perturbation Method (HPM)	11:15 am – 11:30 am
Ankit Singh Chandel Pradyumna Sathyasimha Maloy Kumar Singha	Dynamic analysis of delaminated auxetic sandwich plates	11:30 am – 11:45 am
Ji Wang Chencheng Lian Huimin Jing Bin Huang Chaofeng Lu	The Analysis of Free Nonlinear Vibrations with Fractional Damping	11:45 am – 12:00 am

STOCHASTICITY AND NOISE — BC ROOM 220

Chairs: NA

Ketson Roberto Maximiano dos Santos Joao Gabriel da Costa de Souza Duarte	Efficient determination of survival probability for nonlinear multi-degree-of-freedom oscillators with fractional derivatives under non-stationary excitation	11:00 am – 11:15 am
Antonio Sellitto	Phonon-Boundary Scattering and Boundary Conditions: Application to the Heat Transfer in Nano-Systems	11:15 am – 11:30 am
Ankush Gogoi Satyam Panda Vikram Pakrashi Budhaditya Hazra	A computational framework for estimation of probability densities for stochastic systems on SO(3) manifold	11:30 am – 11:45 am
Elena Rybalova Nataliya Nikishina Galina Strelkova	Influence of Levy noise on chimera states and solitary states in neural networks	11:45 am – 12:00 am

DAY 3 – Wednesday, June 25, 2025 — 11:00 am – 12:30 pm

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING III — BC ROOM 221

Chairs: Sandip George

Raphaël Côte Emmanuel Franck Laurent Navoret Guillaume Steimer Vincent Vigon	Reduced Particle in Cell method for the Vlasov-Poisson system using auto-encoder and Hamiltonian neural networks	11:00 am – 11:15 am
Marcus Varanis Prashant Kambali Temitope Senboyejo Vinod Thakur C Nataraj	Nonlinear Cardiorespiratory Modeling for Enhanced CPR Chest Compression Dynamics	11:15 am – 11:30 am
Camilo Quiceno Quintero Sandip George	Exploring Complexity Changes in Diseased ECG Signals for Enhanced Classification	11:30 am – 11:45 am
Diana Florentina Jianu	Performance Analysis of ML Architectures for Predicting and Classifying Neural Conditions Using EEG Datasets	11:45 am – 12:00 am
Anca Radulescu Sarah Muldoon Johan Nakuci Eva Kaslik Alexandru Fikl	Using complex dynamics to compute brain networks	12:00 am – 12:15 am