

GCON – Systems & Control

Results and Perspectives – 2025/2026

Permanent Researchers

Marcelo D. Fragoso		PhD Imperial College, 1986
Marcos G. Todorov		DSc LNCC, 2011
Paulo A. A. Esquef		DSc (Tech) Helsinki Univ. Tech., 2004
Allan Jonathan da Silva		DSc LNCC, 2021

Collaborating Researchers

Carlos E. de Souza		Dr. Ing. Paris VI, 1980
Gilberto O. Corrêa		PhD Cambridge, 1983
Paulo C. M. Vieira		DSc PUC-RJ, 1988
Jack Baczynski		DSc UFRJ, 2000
Bernardo M. de Carvalho		DSc UFRJ, 2015

Research Interests

- Control and filtering methods for classes of **nonlinear dynamic systems**
- Stochastic methods applied to **finance**
- **Reliability** Assessment and Control
- **Robust estimation** of signals/systems
- **Stochastic modeling** and control
- Modeling of discrete **signals** and systems
- Chaos Theory and **Hyperbolic Dynamics**



- Publications exceed **11,300 WoS citations** (books not included)
 - ↪ two books published by Springer (series Probability and its Applications)
 - ↪ **47,000** downloads on SpringerLink, **2,700+** Google Scholar citations
- **Fellowships:** IEEE, AAIA, AIIA, IFAC, ABC, ANE, CNPq-1A, CNPq-2
- **Past projects:** Pronex, Universal/CNPq, Instituto do Milênio, CNE/Faperj, JCNE/Faperj.
- **Technical committees:** CA-CNPq, Capes, Faperj, Fapesp, INRIA, IFAC Council, NWO (The Netherlands Organisation for Scientific Research), Stochastic Systems (Int. Federation of Automatic Control)
- **Editor and member of Editorial Board of international journals**
- **Distinguished Lecturer** (IEEE Control Systems Society)



RESEARCH PROJECTS



Academic Activities in 2025 – Research Projects

Current projects

- *“Control and Filtering of Dynamic Systems Subject to Uncertainties”*
- *“Stochastic Control with Two-Time-Scale Failure Detection”*
 - ↪ CNPq PQ grants (1A & 2)
- *“Stochastic Analysis of Non-Markovian Phenomena”*
 - ↪ Capes, MATH–AmSud (UnB, France, Colombia)
- *“Analysis and Control of Complex Stochastic Systems”*
 - ↪ Faperj, JCNE grant
- *“Chaos Theory and hyperbolic dynamics: topological, geometrical and statistical aspects”*
 - ↪ CNPq grant



MISCELLANEOUS ACADEMIC ACTIVITIES



Academic Activities in 2025

Supervision of Defended Thesis / Dissertation (1)

- C^1 -generic continuum-wise expansive surface diffeomorphisms and gluing-orbit.
Ph.D. thesis - UFMG

Supervision of Post-Doc Studies (1)

- Networked Control

Supervision of Master's Thesis (3)

- Pricing of fixed income derivatives using multinomial trees
- Quantum Reinforcement Learning
- Stochastic Control

Graduate Courses Taught – LNCC (4)

- Linear Algebra; Linear Systems, Digital Signal Processing; Probability and Stochastic Processes



Academic Activities in 2025

Internal Committees (4)

- CPG, CAS, CEQ, PIBIC

External Committees / Ad Hoc Refereeing

- Reviewer for “Bulletin des sciences mathématiques”, “Chaos, solitons and fractals”, “Computational Economics”, “Modern Stochastics: Theory and Applications”, “Topology and its Applications”, and “Math Reviews”.
- CNPq, Faperj, Fapesp, PCI/IMPA
- TPC (Editor-at-Large) – 64th IEEE Conf. Decision and Control



Academic Activities in 2025

Talks and Seminars (3)

- Talk at IMPA - “Anosov diffeomorphisms and self-similar hyperbolicity”
- Online talk at VII Jornadas Ecuatorianas de Matemática - “Shadowing in hyperspace”
- Talk at University of Illinois Urbana-Champaign - “Some Topics in Control, Filtering, and Homogenized Analysis of Markov Switching Systems”

Participation in Conferences (1)

- 64th IEEE Conf. Decision and Control (Rio de Janeiro)



Academic Activities in 2025

Mosqlimate Sprint 2025 Challenge (Prediction of Dengue Cases):

D-FENSE team (leader **Americo Cunha**)

Proposition of 2 prediction models for Dengue cases one for each Brazilian State

LNCC-ARp-2025-1 (model 150)

Best prediction performance for 5 States
(RO,PE,PI,TO,SC)

LNCC-SURGE-2025-1 (model 154)

Best performance for SP



SCIENTIFIC PAPERS



Academic Activities in 2025 (Papers)

OVERVIEW

Five (5) Papers Published in International Journals

Two (2) Papers Accepted to Journals and Conferences

Six (6) Papers Submitted to International Journals



Academic Activities in 2025 (Papers)

BREAKDOWN by Research Area

Stochastic Methods Applied to Finance

Published (1):

“Bond pricing and yield curve derivation in an extended Keynesian term structure model”.
APPLIED ECONOMICS LETTERS, 2025. (JCR 1.3)

Submitted (1):

“Affine Volterra Interest Rate Model with Stochastic Long-Term Mean: Risk Implications for Bonds and Option Pricing”, *Applied Stochastic Models in Business and Industry*. 2025.

↔ collaborations: Banco Central, UERJ, IUL (PT).



Academic Activities in 2025 (Papers)

Reliability Assessment and Control

Accepted (1):

“Optimal Accelerated Life Testing Design Under Constrained Resources Using Double Deep Q-Learning”. *QUALITY AND RELIABILITY ENGINEERING INTERNATIONAL*, 2025. (JCR 2.8)

Submitted (1):

“Beyond Static Schedules: Dynamic Maintenance Optimization with Double Deep Reinforcement Learning”, *Computers & Industrial Engineering*. 2025.

↪ collaborations: CEFET/RJ

Academic Activities in 2025 (Papers)

Stochastic Modeling and Control

Published (2):

"Solving Markov decision processes via state space decomposition and time aggregation. EUROPEAN JOURNAL OF OPERATIONAL RESEARCH, 2025. (JCR 6.0)

"Optimal Linear and Stationary Filter for Hidden Phase-Type Semi-Markov Models". IEEE TRANS. ON AUTOMATIC CONTROL, 2025 (JCR 7.0)

Submitted (1):

"Stabilizability of Network Control System under bounded disturbances: DoS attack case". IEEE control systems letters, 2025

↪ collaborations: USP, UNICAMP, UFABC, Univ. Southampton (UK), Univ. of Kerala (India)



Academic Activities in 2025 (Papers)

Chaos Theory and Hyperbolic Dynamics

Published (2):

"Shadowing in the hyperspace of continua. NONLINEARITY, 2025. (JCR 1.6)

"Stable/unstable continua of cw-expansive flows. Qualitative Theory of Dynamical Systems, 2025." (JCR 2.1)

Accepted (1):

"Gluing-orbit property, local stable/unstable sets, and induced dynamics on hyperspace. 2025. Journal of Mathematical Analysis and Applications.

Submitted (2):

"Transitivity of real Anosov diffeomorphisms. 2025. arXiv:2410.15740

"L-shadowing for the induced hyperspace homeomorphism. 2025. arXiv:2512.08677

Modeling of Discrete Signals and Systems

Submitted paper (1):

"Classification and Characterization of a Step Change in the Magnitude or Phase of an AC Signal", Submitted to IEEE Trans. on Industrial Informatics

Perspectives for 2026

Keep offering post-graduate courses

Keep participation in internal committees

Continue carrying out research in:

- ↪ Stochastic Control and Modeling
- ↪ Networked control
- ↪ Queueing control with waiting-time-dependent service time
- ↪ Synchrophasor analysis
- ↪ Prediction of dengue cases (report results of 2025)



Contact

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