Research topics

The research topics of the applicants should be aligned to the field of expertise of one of the potential advisors. This is a prerequisite for the advising process to be efficient and the research exchange to be successful. The aim of this application procedure is to ensure this matching. The list of mentors and their broad field of expertise follows. The applicants are invited to mention in their application if one of the advisors seems particularly relevant to their topic. Some particularly relevant publications are listed below.

Anna Carbone, Professor at POLITO:
Main topics: Fluctuation processes in non-equilibrium. Fractional Brownian motions. Long-range correlated series (1d), images (2d) and structures (3d). Interdisciplinary applications in the environmental context (e.g via satellite data).
Additional topics: Analysis of long range correlated time or space sequences in finance or biophysics (EEG, Genomic Sequences)
Publications:
https://scholar.google.com/citations?hl=en&user=INBplj8AAAAJ&view_op=list_works&sortby=pubdate

Giorgio Kanadakis, Professor at POLITO:
Main topics: Lotka-Volterra predator-prey model. Model of competition in population dynamics. SIR and generalized epidemic models.
Additional topics: Generalized statistics
Publications:
https://scholar.google.com/citations?hl=en&user=pFlYesUAAAAJ&view_op=list_works&sortby=pubdate

Guillaume Deffuant, researcher at INRAE:
Main topics: Individual based models of socio-ecological systems. Opinion dynamics. Collective emergent properties from individual interactions.
Additional topics: Theory of sustainable management. Viability theory.
Publications: https://scholar.google.fr/citations?user=xwYTdNwAAAAJ&hl=fr&oi=ao

Jean-Denis Mathias, Researcher at INRAE:
Main topics: dynamical modelling of social-ecological systems. Resilience. Viability theory.
Additional topics: decision-making modelling
Publications: https://scholar.google.com/citations?user=nSTQ3ccAAAAJ&hl=fr&oi=ao

Jean-Baptiste Pichancourt, Researcher at INRAE:
Main topics: mathematical models of (social-)ecological systems dynamics, Control/Governance of social-ecological systems, bio-cultural diversity theory
Additional topics: Control theory, adaptation theory, optimal control, matrix/tensor algebra, differential equations, supply chain modelling, demographic modelling
Publications: https://scholar.google.com/citations?user=RbRrJgoiaYQC

Examples of relevant publications

A Carbone, P Murialdo, A Pieroni, CT Quitl, Atlas of Urban Scaling Laws. Journal of Physics: Complexity 3 025007 (2022) **DOI**: 10.1088/2632-072X/ac718e

A Carbone, L Ponta, Relative cluster entropy for power-law correlated sequences, SciPost Phys. 13, 076 (2022) **DOI**: 10.21468/SciPostPhys.13.3.076

P Mazzetti, A Carbone, Periodic and Non-Periodic Brainwaves Emerging via Stochastic Synchronization of Closed Loops of Firing Neurons, Algorithms 15 (11), 396 (2022) **DOI**: 10.3390/a15110396

G. Deffuant and N. Gilbert (eds). Viability and resilience of complex systems. (2011). Springer.

G Kaniadakis, Novel predator-prey model admitting exact analytical solution, Physical Review E 106 (4), 044401 (2022) **DOI** 10.1103/PhysRevE.106.044401

G Kaniadakis et al. The κ-statistics approach to epidemiology, Scientific Reports 10, 19949 (2020) **DOI** 10.1038/s41598-020-76673-3

JD Mathias et al. Grounding Social Foundations for Integrated Assessment Models of Climate Change. Earth's Future. (2020).