Academic Curriculum Vitae

Personal Data

Name and Surname: Malbor Asllani
Place and Date of Birth: Elbasan, Albania | 9 June, 1985
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Work Experience

Aug. 2022–Now	Assistant Professor | *Department of Mathematics, Florida State University, U.S.A.*
Jan. 2021–Jul. 2022	Assistant Professor | *School of Mathematics & Statistics, University College Dublin, Ireland*
Nov. 2018–Dec. 2020	(Senior) Postdoctoral Researcher | *Department of Mathematics and Statistics & MACSI*[a]*, University of Limerick, Ireland*
Jan. 2018–Jan. 2019	Visiting Researcher | *Mathematical Institute, University of Oxford, UK*
Oct. 2016–Oct. 2021	FNRS Research Fellow (*Chargé de recherche*) | *Department of Mathematics & naXys*[b]*, University of Namur, Belgium*
Jan. 2015–Sept. 2016	(Junior) Postdoctoral Researcher | *Department of Mathematics & naXys, University of Namur, Belgium*

[a] Mathematics Applications Consortium for Science and Industry
[b] Namur Institute for Complex Systems

Education

2015 PhD in Applied Mathematics
University of Insubria & University of Florence, Italy
Thesis: *Reaction-diffusion models on a network: stochastic and deterministic pattern formation*
| Advisors: Prof. Duccio Fanelli & Prof. Stefano Serra Capizzano

2011 MSc in Engineering Mathematics
University of Florence, Italy
Thesis (Italian): *Non-equilibrium dynamics in systems with long-range interactions*
| Supervisors: Prof. Duccio Fanelli and Prof. Timoteo Carletti

2007 BSc in Electronics Engineering
Marche Polytechnic University, Italy

Areas of Interest

Complex systems; Network science; Mathematical biology; Stochastic processes; Data science; Computational neuroscience

–My research focuses on studying nonlinear phenomena arising mainly in biological/ecological settings, with applications from data science. I use mathematical techniques from dynamical systems combined with spectral graph theory, probability, and numerical analysis to investigate coupled systems' self-organizing dynamics such as synchronization, pattern formation, and diffusion phenomena. My research also embraces data science applications for understanding the complex structures of real systems and their interplay with emergent collective dynamics. My interests also extend to ecosystem stability and species diversity, computational neuroscience, and social dynamics.

Languages

English: Fluent
Italian: Fluent
French: Advanced
Albanian: Mothertongue

Teaching activities

Florida State University

Fall term 2024 — *Methods of Applied Mathematics I* for Graduate students (23 students)

Fall term 2024 — *Calculus 2* for Undergraduate students (19 students)

Spring term 2024 — *Ordinary Differential Equations* for Undergraduate students (134 students)

Fall term 2023 — Organizer & Speaker of the *Biomathematics Seminar*

Fall term 2023 — *Probability for Applied Mathematics* for Graduate students (8 students)

Spring term 2023 — *Calculus 3* for 3nd year Undergraduate students (29 students)

Fall term 2022 — *Calculus 2* for 2nd year Undergraduate students (19 students)

University College Dublin

Spring term 2022 — *Differential & Difference Equations: Applications to Econ & Fin* for 1st year Undergraduate students (∼140 students) in Mathematics for Economy & Finance

Spring term 2022 — *Advanced Mathematical Methods* for 3rd year Undergraduate students (∼30 students) in Applied & Computational Mathematics

Autumn term 2021 — *Mathematics of Complex Networks* for 4th year Undergraduate students (∼20 students) in Applied & Computational Mathematics

Autumn term 2021 — *Multivariate Calculus for Engineering II* for 3rd year Undergraduate students (∼300 students) in Engineering

Spring term 2021 — *Differential & Difference Equations: Applications to Econ & Fin* for 1st year Undergraduate students (∼140 students) in Mathematics for Economy & Finance

Spring term 2021 — *Advanced Mathematical Methods* for 3rd year Undergraduate students (∼30 students) in Applied & Computational Mathematics

University of Limerick

Spring term 2020 — *Science Mathematics 4* for 3rd year Undergraduate students (∼100 students) in Biosciences

Fall term 2019 — *Stochastic Processes* for 4th year Undergraduate & 1st year Master students (∼40 students) in Mathematics

University of Namur

FALL TERM 2017 *Networks & Systems* for the 2nd year Master students (∼7-8 students) in Mathematics

University of Florence

2011-2014 During the PhD I was involved in Tutoring activities of *Calculus, Linear Algebra,* and *Geometry* for Undergraduate students (∼10-15 students) in Engineering

SUPERVISING ACTIVITIES

Ph.D. Students

2023-2028 Haoyang Qian Florida State University
Project title: *Spectral Modulariy: From opinion polarization to dimensional reduction*

2020-2024 Jean-François de Kemmeter (with Prof. Timoteo Carletti), University of Namur (Belgium)
Project title: *Nonlinear random walk processes in complex networks*

2018-2022 Bram Siebert (with Prof. James Gleeson), University of Limerick (Ireland)
Project title: *Dynamical processes in structured networks*

Master Students

2020-2021 Brian Hennessy, University College Dublin (Ireland)
Project title: *Emergence and shape of opinion polarization in real social networks*

2019-2020 Cédric Simal, University of Namur (& Limerick)
Project title: *Inferring the role of the local topology in the metapopulation spreading dynamics*

2017-2018 Riccardo Muolo (with Prof. Timoteo Carletti), University of Florence (Italy) (& Namur)
Project title: *Effects of nonnormality on Turing-like pattern formation*

2015-2016 Oltiana Gjata (with Prof. Timoteo Carletti), University of Florence (& Namur)
Project title: *Hamiltonian control: Extension to the Kuramoto model*

REVIEWING ACTIVITIES

– Reviewer for the scientific journals: *Science*; *Sci. Adv.*; *Phys. Rev. X*; *Phys. Rev. Lett.*; *Phys. Rev. E*; *PLoS One*; *Chaos*; *Proc. R. Soc. A*; *Phys. Rev. Res.*; *J. Stat. Mech.: Theory Exp.*; *Bull. Math. Biol.*; *SIAM J. Appl. Dyn. Syst.*; *Front. Phys.*; *Eur. Phys. J. B*; *Phys. A*; *Phys. Lett. A*; *Chaos Solitons Fractals*; *Commun. Phys.*; *Commun. Nonlinear Sci. Numer. Simul.*; *J. Complex Netw.*; *Appl. Netw. Sci.*; *Eur. J. Neurosci.*; *Transportmetrica A*

– Reviewer for research agencies *Italian Ministry of Education, Universities and Research (MIUR)*

– Reviewing Board Member for conferences/workshops *Complex Networks 2020–2024*; *CompleNet 2020*

GRANTS

2024-2026 *SEED (CRC) research grant* (∼ $ 96.000) granted as a Principal Investigator funded by the *Florida State University* for the project: *"Structure and dynamics of non-normal networks"*.
It is a 2 years research grant focused on funding PhD students as Research Assistants.

2023 *FYAP (CRC) research grant* (∼ $ 20.000) granted as a Principal Investigator funded by the *Florida State University* for the project: *"Localization properties of non-normal networks"*.

2016-2022 *FNRS research fellowship* (∼ € 180.000) granted as a Principal Investigator on a national competition funded by the *Fonds National de la Recherche Scientifique* of Belgium for the project: *"Competitive and diffusive processes in complex networks and time-delayed systems"*.
It is a 3 years research fellowship over a maximum of 6 years of extension period and only 2 projects were funded overall that year for the University of Namur.

FELLOWSHIPS

2018-2021 MACSI postdoctoral fellowship
2015-2017 BELSPO postdoctoral fellowship
2011-2014 PhD fellowship from University of Insubria

Other activities

2019-2021	Department member of the Athena Swan committee for gender equality
Fall term 2017	Co-organizer (with Prof. Anne-Sophie Libert) of the naXys Seminar activities
Spring term 2017	Co-organizer (with Prof. Renaud Lambiotte) of the naXys Seminar activities

References

Prof. James Gleeson	Department of Mathematics and Statistics & MACSI, University of Limerick james.gleeson@ul.ie
Prof. Timoteo Carletti	Department of Mathematics & naXys, University of Namur timoteo.carletti@unamur.be
Prof. Duccio Fanelli	Department of Physics, University of Florence duccio.fanelli@unifi.it
Prof. Philip K. Maini	Mathematical Institute, University of Oxford philip.maini@maths.ox.ac.uk
Prof. Renaud Lambiotte	Mathematical Institute, University of Oxford renaud.lambiotte@maths.ox.ac.uk

Publications

Preprints

[33] H. Qian, **M. Asllani**, "Explosive opinion polarization and depolarization with asymmetric perception", (Under Review) *Physical Review Letters* (IF: 9.161) (2024)

[32] **M. Asllani**, A. Arenas, "Towards a theory for the formation of chimera patterns in complex networks", (Under Review) *Physical Review E* (IF: 2.529) (2024)

[31] R. Muolo, T. Carletti, J. P. Gleeson, **M. Asllani**, "Reply to Comment on "Synchronization dynamics in non-normal networks: the trade-off for optimality"", (Under review) *Entropy* (IF: 2.494) (2022)

Journals

[30] R. Nartallo-Kaluarachchi, **M. Asllani**, G. Deco, M. L. Kringelbach, A. Goriely, R. Lambiotte, "Broken detailed balance and entropy production in directed networks", (To Appear) *Physical Review E* (IF: 2.529) (2024)

[29] J. F. de Kemmeter, A. Byrne, A. Dunne, T. Carletti, **M. Asllani**, "Emergence of power-law distributions in self-segregation reaction-diffusion processes", *Physical Review E* (IF: 2.529) **110**(1), L012201 (2024)

[28] R. Muolo, J. D. O'Brien, T. Carletti, **M. Asllani**, "Persistence of chimera states and the challenge for synchronization in real-world networks", *The European Physical Journal B* (IF: 1.6) **97**(1), 6 (2024)

[27] J.-F. de Kemmeter, T. Carletti, **M. Asllani**, "Self-segregation in heterogeneous metapopulation landscapes, *Journal of Theoretical Biology* (IF: 2.691) **554**, 111271 (2022)

[26] B. A. Siebert, J. P. Gleeson, **M. Asllani**, "Nonlinear random walks optimize the trade-off between cost and prevention in epidemics lockdown measures : the ESIR model, *Chaos, Solitons & Fractals* (IF: 9.922) **161**, 112322 (2022)

[25] **M. Asllani**, B. A. Siebert, A. Arenas, J. P. Gleeson, "Symmetry-breaking mechanism for the formation of cluster chimera patterns, *Chaos* (IF: 3.642) **32**, 013107 (2022)

[24] J. D. O'Brien, K. A. Oliveira, J. P. Gleeson, **M. Asllani**, "Hierarchical route to the emergence of leader nodes in real-world networks", *Physical Review Research* **3**(2), 023117 (2021)

[23] R. Muolo, T. Carletti, J. P. Gleeson, **M. Asllani**,"Synchronization dynamics in non-normal networks: the trade-off for optimality *Entropy* (IF: 2.494) **23**, 36 (2021)

[22] B. Siebert, C. L. Hall, J. P. Gleeson, **M. Asllani**, "Role of modularity in self-organisation dynamics in biological networks", *Physical Review E* (IF: 2.529) **102** 052306 (2020)

[21] **M. Asllani**, T. Carletti, D. Fanelli, P. K. Maini "A universal route to pattern formation in multicellular systems" *The European Physical Journal B* (IF: 1.500), **93**(7), 1–11 (2020)

[20] T. Carletti, **M. Asllani**, D. Fanelli, V. Latora "Nonlinear walkers and efficient exploration of a crowded network" *Physical Review Research*, **2** 033012 (2020)

[19] **M. Asllani**, B. R. da Cunha, E. Estrada, J. P. Gleeson "Dynamics imposes limits on detectability of network structures" *New Journal of Physics* (IF: 3.729), **22** 063037 (2020)

[18] S. Nicoletti, D. Fanelli, N. Zagli, **M. Asllani**, G. Battistelli, T. Carletti, L. Chisci, G. Inocenti, R. Livi, "Resilience for stochastic systems interacting via a quasi-degenerate network" *Chaos* (IF: 3.642) **29**, 083123 (2019)

[17] R. Muolo, **M. Asllani**, D. Fanelli, P. K. Maini, T. Carletti, "Patterns of non-normality in networked systems" *Journal of Theoretical Biology* (IF: 2.691) **480**, 81–91 (2019)

[16] **M. Asllani**, R. Lambiotte, T. Carletti, "Structure and dynamical behavior of non-normal networks" *Science Advances* (IF: 14.136), **4**, eaau9403 (2018)

[15] **M. Asllani**, P. Expert, T. Carletti, "A minimally invasive neurostimulation method for controlling epilepsy seizures", *PLoS Computational Biology* (IF: 4.475), **14**(7), e1006296 (2018)

[14] **M. Asllani**, T. Carletti, F. Di Patti, D. Fanelli, F. Piazza "Hopping in the crowd to unveil network topology", *Physical Review Letters* (IF: 9.161), **120**, 158301 (2018)

[13] **M. Asllani**, T. Carletti, "Topological resilience in non-normal networked systems" *Physical Review E* (IF: 2.529), **97**(4), 042302 (2018)

[12] O. Gjata, **M. Asllani**, L. Barletti, T. Carletti, "Using Hamiltonian control to desynchronize Kuramoto oscillators", *Physical Review E* (IF: 2.529), **95**, 022209 (2017)

[11] **M. Asllani**, T. Carletti, D. Fanelli, "Tune the topology to create or destroy patterns", *The European Physical Journal B* (IF: 1.500), **89**, 260 (2016)

[10] J. Petit, **M. Asllani**, D. Fanelli, B. Lauwens, T. Carletti, "Pattern formation in a two-component reaction-diffusion system with delayed processes on a network", *Physica A: Statistical Mechanics and its Applications* (IF: 3.263), **462**, 230 (2016)

[9] J. Petit, T. Carletti, **M. Asllani**, D. Fanelli, "Delay-induced Turing-like waves for one-species reaction-diffusion model on a network", *EPL (Europhysics Letters)* (IF: 2.753), **111**, 58002 (2015)

[8] D.M. Busiello, G. Planchon, **M. Asllani**, T. Carletti, D. Fanelli, "Pattern formation for reactive species undergoing anisotropic diffusion", *The European Physical Journal B* (IF: 1.500), **88**, 222 (2015)

[7] **M. Asllani**, D.M. Busiello, T. Carletti, D. Fanelli, G. Planchon, "Turing instabilities on Cartesian product networks", *Scientific Reports* (IF: 4.525), **5**, 12927 (2015)

[6] **M. Asllani**, D.M. Busiello, T. Carletti, D. Fanelli, G. Planchon, "Turing patterns in multiplex networks", *Physical Review E* (IF: 2.529), **90**, 042814 (2014)

[5] **M. Asllani**, J.D. Challenger, F.S. Pavone, L. Sacconi, D. Fanelli, "The theory of pattern formation on directed networks", *Nature Communications*, (IF: 14.919), **5**, 4517 (2014)

[4] L. Cantini, C. Cianci, D. Fanelli, E. Masi, L. Barletti, **M. Asllani**, "Stochastic amplification of spatial modes in a system with one diffusing species", *Journal of Mathematical Biology* (IF: 2.259), **69**, 1585-1608 (2013)

[3] **M. Asllani**, T. Biancalani, D. Fanelli, A.J. McKane, "The linear noise approximation for reaction-diffusion systems on networks", *The European Physical Journal B* (IF: 1.500), **86**, 476 (2013)

[2] **M. Asllani**, F. Di Patti, D. Fanelli, "Stochastic patterns on a network", *Physical Review E* (IF: 2.529), **86**, 046105 (2012)

[1] **M. Asllani**, D. Fanelli, A. Turchi, T. Carletti, X. Leoncini, "Statistical theory of quasi-stationary states beyond the single water-bag case study", *Physical Review E* (IF: 2.529), **85**, 021148 (2012)

PhD Thesis

[0] **M. Asllani** "Reaction-diffusion models on a network: stochastic and deterministic pattern formation", *University of Insubria Press* (2015)

Media Coverage

[III] **M. Asllani** "Updating Turing's model of pattern formation", *EurekAlert!* (2020)

[II] **M. Asllani**, T. Carletti "From Quantum Mechanics To Brain Neurostimulation: Abnormal Synchronization Of Neuronal Activity", *Science Trends* (2018)

[I] **M. Asllani**, T. Carletti (French) "Errer dans la foule pour dévoiler la topologie du réseau", *FNRS News* (2018)

Main Conferences, Workshops, Seminars & Schools

May 2024	Second Joint Alabama-Florida Conference on Differential Equations, Dynamical Systems and Applications, Tallahassee, U.S.A (Talk)
Mar. 2024	APS March Annual Meeting, Minneapolis, U.S.A (Talk + Poster)
Nov. 2023	Southeastern-Atlantic Regional Conference on Differential Equations, Florida Agricultural & Mechanical University, U.S.A (Invited Talk)
Mar. 2023	Seminar in Applied & Computational Mathematics, Florida State University, U.S.A (Invited Talk)
June 2023	SIAM Conference on Application of Dynamical Systems, Portland, U.S.A (Talk)

Mar. 2023	Northeast Regional Conference on Complex Systems, Potsdam, U.S.A (Talk)
Feb. 2023	Seminar in Computational & Applied Mathematics, Tufts University, U.S.A (Invited Talk)
Jan. 2023	Seminar in Data Science & Machine Learning, Florida State University, U.S.A (Invited Talk)
Nov. 2022	Seminar in Applied & Computational Mathematics, Florida State University, U.S.A (Invited Talk)
Sep. 2022	Seminar in Biomathematics, Florida State University, U.S.A (Invited Talk)
Jun. 2022	MPDEE'22, Models in Population Dynamics, Ecology and Evolution, Turin, Italy (online) (Talk)
Jan. 2022	Colloquium in Mathematics, Florida State University, U.S.A (Invited Talk)
Oct. 2021	CCS, Conference on Complex System, Lyon, France (online) (Talk)
Jul. 2021	NetSci, International School and Conference on Network Science, Indiana, U.S.A (online) (Talk & Poster)
Dec. 2020	CCS, Conference on Complex Systems, Mallorca, Spain (online) (3 Talks)
Sept. 2020	NetSci, International School and Conference on Network Science, Rome, Italy (online) (Talk)
Dec. 2019	Complex Networks 2019, Lisbon, Portugal (Poster)
Sep. 2019	Workshop "Dynamics on networked systems", Namur, Belgium (Invited talk)
Mar. 2019	CompleNet 2019, Tarragona, Spain (Talk)
Dec. 2018	Complex Networks 2018, Cambridge, UK (Talk)
Oct. 2018	Workshop: "Stochastic dynamics on large networks: Prediction and inference", Max Planck Institute for the Physics of Complex Systems, Dresden, Germany (Talk & Poster)
Sept. 2018	CCS, Conference on Complex Systems, Thessaloniki, Greece (2 Talks)
July 2018	ECMTB, European Conference on Mathematical and Theoretical Biology, Lisbon, Portugal
June 2018	NetSci, International School and Conference on Network Science, Paris, France (Poster)
Feb. 2018	IMT, Lucca, Italy (Invited talk)
Dec. 2017	BeNet'17, Ghent, Belgium (Talk)
Dec. 2017	Complex Networks, Lyon, France (Poster)
Nov. 2017	Macfung, Barcelona, Spain (Poster)
Mar. 2017	naXys, Namur, Belgium (Seminar)
Dec. 2016	BrainModes 2016: Coordinated brain activity, Brussels, Belgium (Poster)
Sept. 2016	Conference on Complex Systems (CCS) 2016, Amsterdam, Netherlands (2 Talks)
Mar. 2016	Complenet, Dijon, France (Talk)
Jan. 2016	VUB, Brussels, Belgium (Invited talk)
Oct. 2015	BeNet'15, Namur, Belgium (Talk)
June 2015	NetSci, International School and Conference on Network Science, Zaragoza, Spain (Talk)
May 2015	Graduate School: Non-linear phenomena, complex systems and statistical mechanics, Namur, Belgium (Talk)
May 2015	IAP DYSCO Study Day: Dynamical systems, control and optimization, Liege, Belgium (Poster)
Sept. 2014	European Conference on Complex Systems 2014, Lucca, Italy (Poster)
Oct. 2013	Dynamics and Network Structures, Marseille, France (Talk)
Aug. 2013	MPDEE'13 Models in Population Dynamics and Ecology, Osnabrueck, Germany (Talk)
Aug. 2012	Scuola Matematica Interuniversitaria, Perugia, Italy (Summer School)
June 2012	SummerSolstice2012/BioPhys2012, Arcidosso, Italy (Talk)