



PhD in Mathematics

As a mathematician specializing in probability, stochastic processes, and statistical inference, I bring a strong foundation in applied statistical mechanics and quantitative modelling, with interdisciplinary research experience across socio-economic systems, public health, and institutional governance. My work advances rigorous methods for analyzing and forecasting dynamic, network-driven phenomena and implementing machine-learning pipelines, providing a solid basis for developing human-in-the-loop, multilingual AI tools for the detection and socio-legal analysis of toxic online communication.

Experience

Teaching Experience

Adjunct Professor in Environmental Economics

Oct 2025 – Present

I teach environmental economics and data-driven decision science, integrating AI and statistical modeling to address sustainability and policy challenges through applied, evidence-based learning.

Key Affiliations: Rimini Campus, University of Bologna

- Teach environmental economics and data analytics, emphasizing AI applications in policy, resource management, and optimization.
- Supervise applied projects and develop research-integrated curricula using Python, R, and interdisciplinary learning methods.

Research Experience

Senior Research Fellow in Computational Modeling and Decision Science

Jul 2007 – Present

I conduct interdisciplinary research in statistical learning, stochastic modeling, and probabilistic analysis of complex socio-economic, environmental, and health systems. Funded by national and international grants, including the European Commission and Italian Ministry of Education, I have published in top Q1 journals and presented at major conferences. My work connects theory with data to support policy and strategic decisions under uncertainty.

Key Affiliations: University of Bologna, Yazd University, Iran's National Elites Foundation, Aster Innovazione Attiva, Universiti Teknologi Malaysia:

- Contributed to internationally funded research supported by the European Commission and national ministries.
- Published and presented globally on statistical, socio-economic, and environmental-health modelling.
- Developed AI-driven policy models and mentored students in statistics, machine learning, and modelling.

Business Experience

AI & Data Science Research Scientist

Nov 2015 – Dec 2023

Led AI projects in healthcare, manufacturing, and finance, focusing on modeling, optimization, and data insights. Bridged theory and practice in risk and efficiency. Skilled in Python, R, SQL, leadership, and project management.

Key Collaborations: BuDiPedia, Magicardio, Dolsar, DoctorsConvey, Efficacy, PersiProdotti, Persilia

- Led data-driven initiatives optimizing processes, reducing costs, and enhancing risk assessment through advanced predictive modelling.
- Integrated and analysed clinical, operational, and financial data to inform strategic decisions.
- Developed dashboards and reports while guiding teams on AI adoption and resource planning to drive growth.

Education

PhD Degree – Università di Bologna, Italy

Mathematics, (January 2012 – July 2015)

Ph.D. Thesis Title: Predictability in Social Science. The Statistical Mechanics Approach.

Highlighted Statement of Purpose:

- Conducted thermodynamic computational analyses of chemical phase transitions using stability assessment, steady-state evaluation, and Monte Carlo simulations of critical phenomena.
- Applied statistical physics and dynamical principles to socio-economic systems by modeling Weberian social actions and McFadden's economic choices as Boltzmann machines within Markov Random Fields, and interpreting social network macrostates via Hamilton's principle of stationary action.

Master Degree – Universiti Teknologi Malaysia, Malaysia

Applied Mathematics, (January 2008 – September 2010)

Grade: A (Grade Point: 4.00 out of 4.00)

Master Thesis Title: The Cutting Angle Method for Optimal Control Problems.

Bachelor Degree – Azad University of Hamedan, Iran

Applied Mathematics, (September 2003 – February 2006)

Skills

AI Modelling & Statistical Learning	10 Years
Forecasting & Pattern Recognition	9 Years
Data Mining & Machine Learning	9 Years
Control Theory & System Analysis	7 Years
Operations Research & Simulations	7 Years
Engineering Optimization	7 Years

Professional Programming

Excel Data Science	9 Years
R Data Mining	9 Years
MATLAB Data Analysis	9 Years
Python Machine Learning	7 Years
Stata Statistics	7 Years
MySQL Data Management	5 Years
C/C++/C#/Java OOP	5 Years
Wolfram Mathematica Optimization	3 Years

Project Highlights

[Optimal Management of Environmental and Resource Stocks in Space and Time](#) (@ Alma Mater Studiorum - Università di Bologna);

[Incident trends of selected endocrine-related diseases and conditions in Europe and North America, and the Contribution of Changes in Human Reproduction](#) (@ Alma Mater Studiorum - Università di Bologna);

[Development of Stochastic Multi-objective Dynamic Programming with Application to Multi-Reservoir Systems Operation Management](#) (@ Yazd University, funded by Iran's National Elites Foundation);

[Predictability in Social Science. The Statistical Mechanics Approach](#) (@ Alma Mater Studiorum - Università di Bologna);

[Applicazioni in ambito biomedico e socio-sanitario di problemi inversi di grande complessità](#) (@ Aster Innovazione Attiva, and funded by European Commission (European Social Fund));

[Stochastic Processes and Interacting Particle Systems](#) (@ Università di Bologna, and funded by Italian Ministry of Education, University and Research in collaboration with CINECA (FIRB Program - Futuro in Ricerca));

[The Hybrid Cutting-angle Method for Global Optimization of Optimal Control Problems](#) (@ Universiti Teknologi Malaysia, and funded by Malaysian Minister of Education (Fundamental Research Grant Scheme)).

Selected Publications & Conferences

(Dynamic Systems Modelling, Game-Theoretic Decision Making, and Environmental-Economic Optimization)

- (Pre-print) S.A. Seyed, A. Xepapadeas, E. Agliardi, [Cooperative and non-cooperative solutions in a dynamic model of forest management](#), 2024-2025;
The paper models forest management under different governance regimes, showing that cooperative approaches valuing biodiversity achieve better ecological and economic outcomes than non-cooperative ones. It highlights the importance of internalizing ecological values and flexible cooperation for sustainable forest management.

(Computational Biomedicine, Data-Driven Inference, and Translational Health Analytics)

- (Pre-print) S.A. Seyed, S. Sottile, M. Abedini, P. Boffetta, et al., [ML-Based Antibody Kinetics: Longevity of Protection in SARS-CoV-2 Vaccine Recipients – ORCHESTRA Project](#), 2024-2025;
Using trigonometric-log normalization and a neural-network classifier, this study analyzed antibody responses in European healthcare workers to distinguish vaccine-induced, adaptive, and hybrid immunity. The model outperformed diffusion-based approaches, capturing individual immune trajectories, demographic effects, and seasonal waning, thereby supporting tailored booster strategies and occupational health planning.
- (Pre-print) S. Sottile, S.A. Seyed, M. Abedini, P. Boffetta, et al., [The immune response of vaccine recipients to Covid-19 infection – ORCHESTRA Project](#), 2024-2025;
Applying shifted transformation and the Bass diffusion model, this study investigated antibody dynamics in healthcare workers across Europe, contrasting homologous and heterologous vaccination strategies. Homologous regimens demonstrated more sustained and robust immunological responses, while demographic factors substantially influenced antibody variability.
- S.A. Seyed, S. Sottile, M. Abedini, P. Boffetta, F. S. Violante, V. Lodi, et al., [Antibody Kinetics of Immunological Memory in SARS-CoV-2-Vaccinated Healthcare Workers – The ORCHESTRA Project](#), Vaccines, 2025, 13(6), 611. (Impact Factor: 5.2, CiteScore Best Quartile: Q1);
Utilizing a shifted transformation for normalization and the Bass diffusion model, the study predicted antibody dynamics and adaptive immunity to SARS-CoV-2 in healthcare workers across multiple demographics. This methodology enabled robust analysis despite internal data gaps, informing strategies for vaccination and infection control.

(Environmental Decision Science, Institutional Analysis, and Complex Systems Modelling)

- (Pre-print) P. Arjomandi A., T. Zobeidi, A. Shirzad, N. Komendantova, S.A. Seyed, M. Yazdanpanah, [Planning for Water Conservation under Environmental Pressures: The Interplay of Institutional Trust, Participation, and Rational Decision-Making](#), 2024-2025;
The study used an integrated behavioral model and structural equation modeling to reveal that farmers' participation beliefs and trust in institutions are strong predictors of water-saving intentions and behaviors in Iran's Urmia Lake Basin. Key factors like perceived behavioral control, subjective norms, and belief in solution effectiveness critically shape sustainable water use, offering valuable guidance for policy design.
- P. Arjomandi A., S.A. Seyed, N. Komendantova, M. Yazdanpanah, Matteo Mannocchi, [The Institutional Analysis and Development Framework: a mathematical representation in water arena, Perspective Article](#), Current Research in Environmental Sustainability, September 2025;
The study presents a mathematical formulation of the Institutional Analysis and Development (IAD) Framework for water demand and supply services, emphasizing that structuring institutional subsystems incurs context-dependent costs. These costs can be modeled using the IAD's action arena components and exogenous variables, enabling computational comparison of different institutional system states.
- P. Arjomandi A., S.A. Seyed, N. Komendantova, [Dynamics of Expectations, \(Dis\)satisfaction, and Participation in Changing States of Water Governance Systems](#), Conference of EGU General Assembly 2025, March 2025, the European Geosciences Union, Vienna, Austria;
This study investigates how water actors' expectations and satisfaction with supply and allocation shape participation and influence governance reforms across diverse models and contexts. Emphasizing the need to align expectations and promote collaboration, the research offers recommendations to strengthen governance and resilience in shared, fragmented water basins.
- P. Arjomandi, S.A. Seyed, N. Komendantova, E. V. Hulasu, Article, [Vertical fit of water governing systems: A regional assessment](#), Current Research in Environmental Sustainability, 1 January 2024. (Impact Factor: 6.6, CiteScore Best Quartile: Q1);
This study uses statistical mechanics to evaluate how the Urmia Lake Restoration Program (ULRP) restructured water governance, reducing system costs and improving alignment with ecological needs in Iran's Urmia Basin. The findings underscore ULRP's effectiveness in promoting water-saving and institutional reforms, offering a rapid, robust framework for integrated water management in water-stressed regions.
- P. Arjomandi A., S.A. Seyed, N. Komendantova, [Water Governing Systems: addressing conflicts between hydrological and institutional scales](#), Conference of EGU General Assembly 2022, May 2022, the European Geosciences Union, Vienna, Austria;
This study addresses mismatches between human-designed and hydrological systems in water governance, proposing a methodology that uses system cost formulation to diagnose and quantify inefficiencies. By comparing costs across different structural configurations, the approach evaluates how misalignments impact governance effectiveness and identifies sources of externalities.
- P. Arjomandi A., S.A. Seyed, E. Nabavi, S. Alikhani, [Exploring Water Governing System Fit Through a Statistical Mechanics Approach](#), Article, Journal of Water Research, March 2022. (Impact Factor: 11.5, Best Quartile: Q1);
This study uses statistical mechanics, and the Curie-Weiss Mean Field approach to analyze the fit between administrative and hydrological scales in water governance for Iran's Urmia Lake Basin. By modeling and comparing system costs across governing structures, it offers a framework to identify misfits and inform strategies for adaptive and effective watershed management.

(Socio-economic Modelling, Computational Mathematics, Advanced Statistics, and Monte-Carlo Simulations)

- P. Contucci, R. Sandell, S.A. Seyed, [Forecasting the integration of immigrants](#), Article, The Journal of Mathematical Sociology, Volume 41, Issue 2, May 2017. (Impact Factor: 1.3, CiteScore Best Quartile: Q1);
This study presents a theoretical and mathematical forecasting model using immigrant density to predict integration outcomes, tested with Spanish data. The framework demonstrates how integration measures can be forecasted and evaluated, offering insights into broader social implications.
- S.A. Seyed, [Predictability in Social Science, The statistical mechanics approach](#), Doctoral Thesis, Alma Mater Studiorum Università di Bologna, June 2015;
This study uses statistical mechanics—including mean field theory, stability analysis, and Monte Carlo simulations—to model and forecast immigrant integration as a socio-economic phase transition. By applying interdisciplinary computational frameworks, it robustly identifies integration mechanisms and accurately predicts trends as migration increases.

Selected Publications & Conferences

(Intelligent Systems, Signal Processing, and Network Optimization)

- H. Lotfi, A.A. Shojaei, [S.A. Seyed](#), [Multi-objective distribution feeder reconfiguration along with optimal sizing of capacitors and distributed generators regarding network voltage security](#), Article, Journal of Electric Power Components and Systems, December 2021. (Impact Factor: 1.276, Best Quartile: Q4)

This study proposes a multi-objective approach to distribution network reconfiguration by optimally sizing distributed generators and capacitors, aiming to enhance reliability and voltage security using a modified gravitational search algorithm. The method, validated on 33- and 70-bus systems, outperforms traditional algorithms by reducing energy not supplied and improving voltage stability.

- [S.A. Seyed](#), [Optimization Models for Management of Multi-Reservoir Systems](#), Seminar of Faculty of Mathematical Sciences, November 2019, Yazd University;

This review examines optimization models for multi-reservoir system management, emphasizing balanced water supply, power generation, and allocation. It underscores advanced computational methods that improve decision-making and operational efficiency in complex reservoir networks.

- I.S. Amiri, M.M. Ariannejad, V. Kouhdaragh, [S.A. Seyed](#), P. Yupapin, [Microring Resonator Made by Ion-Exchange Technique for Detecting the CO₂, H₂O, and NaCl as Cladding Layer](#), Article, Journal of King Saud University – Science, January 2019. (Impact Factor: 3.829, Best Quartile: Q1);

This study simulates a Silicon-On-Insulator microring resonator (MRR) sensor capable of simultaneously detecting shifts in multiple resonance peaks for refractive index sensing. Using ion-exchange waveguides on glass substrates, the sensor's performance is evaluated for different claddings, revealing that H₂O provides higher Q-factor and FSR in the drop port, while CO₂ excels in the throughput port.

- V. Kouhdaragh, I.S. Amiri, [S.A. Seyed](#), [Smart Grid Load Balancing Methods to Make an Efficient Heterogeneous Network by Using the Communication Cost Function](#), Article, Journal of IET Networks, May 2018. (CiteFactor: 6.3, Best Quartile: Q2);

This study proposes a cost function-based method for optimally assigning smart grid nodes to radio access technologies, matching node-specific communication requirements with RAT characteristics. By considering key performance indicators like data rate, delay, reliability, and security, the approach achieves efficient load balancing and enhances heterogeneous network performance.

- I.S. Amiri, M.M. Ariannejad, M. Ghasemi, P. Naraei, V. Kouhdaragh, [S.A. Seyed](#), H. Ahmad, P. Yupapin, [Simulation of Microring Resonator Filters Based Ion-exchange Buried Waveguide Using Nano Layer of Graphene](#), Article, Journal of Optics, July 2017. (CiteFactor: 2, Best Quartile: Q3);

This study demonstrates that silver ion-exchange in glass enables the fabrication of low-loss buried waveguides, which are modeled using time-domain traveling wave methods for integration with microring resonator (MRR) devices. The resulting MRR system produces tunable dual-wavelength signals spaced 43–314 GHz apart, with applications in optical sensing, communications, switching, and millimeter-wave generation.

(Advanced Control Theory, Functional Analysis, and Numerical Optimization Methods)

- [S.A. Seyed](#), I.S. Amiri, S. Chaghervand, and V.J. Sorger, [The Numerical Solution of Continuous Time Optimal Control Problems with the Cutting Angle Method](#), Book, Nova Science Publishers, June 2018;

- [S.A. Seyed](#), I.S. Amiri, and S. Chaghervand, [A Note on Inheritance and Generalizability Properties in Optimal Control Problems](#), Book, Nova Science Publishers, January 2017;

- [S.A. Seyed](#), R. Ahmad, W.N. Kin, M.I. abd Aziz, [The Cutting Angle Method on Variational Problems](#), Proceedings of the 6th IMT-GT Conference on Mathematics, Statistics and its Applications (ICMSA2010), November 2010, Universiti Tunku Abdul Rahman, Malaysia;

- [S.A. Seyed](#), R. Ahmad, M.I. Abd Aziz, [Capability of Function Optimization Algorithms for Solving Functionals](#), Conference of ICMAE '10, August 2010, International Islamic University Malaya, Malaysia;

- [S.A. Seyed](#), [Cutting angle method for optimal control problems](#), Master Thesis, Universiti Teknologi Malaysia, Faculty of Science., September 2010;

- [S.A. Seyed](#), R. Ahmad, M.I. Abd Aziz, [Inheritance of function properties for functionals](#), International Conference and Workshops on Basic and Applied Sciences (2nd : 2009 : Johor), Malaysia.

Academic References

Dr. Anastasios Xepapadeas

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Dr. Saeid Alikhani

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Training, Certificates & Awards

- PRIN 2022 fellowship for Postdoctoral Researchers, 2025;
- CEFIC grant for Postdoctoral Researchers, 2024;
- Chamran Scientific Award for Postdoctoral Researchers, 2019;
- Training Internship for Entrepreneur Exchange Programme, 2018;
- University Teaching Certification, 2014;
- Doctoral Spinner 2013 Global Grant, 2012;
- Master Research Student Grant, 2008;
- Undergraduate's Tuition Fee Waiver, 2003.

Personal Statement

I am a versatile, hardworking and diligent person who develops a mature, innovative and responsible approach to the tasks that I undertake.