



PERSONAL INFORMATION

Elisa Varini



 CNR – IMATI, the Italian National Research Council – Institute for Applied Mathematics and Information Technologies “Enrico Magenes”, via Corti, 12 – 20133 Milano, Italy

 [Redacted]

 [Redacted]

 <https://scholar.google.it/citations?hl=it&user=Cnw9bWkAAAAJ>

ORCID ID orcid.org/0000-0002-5365-4249

Nationality Italian

Current Position Researcher at CNR-IMATI in Milano

RESEARCH INTERESTS

Summary

My research interests concern the stochastic modelling of seismic sequences and the exploration of the statistical tools for the prediction. I focus on the point processes and their use in dynamical modelling of complex multiscale systems (self-correcting and self-exciting point processes, Markov modulated Poisson processes, hidden Markov models, generalized Weibull failure models). I apply Bayesian statistical methods to make inference on these complex models; I extensively use the Markov Chain Monte Carlo and the sequential Monte Carlo methods in order to obtain the estimate and the uncertainty measure of target quantities. In the frame of the European project UPStrat-MAFA, I was involved in modelling the attenuation of macroseismic intensity through a Beta-Binomial model with application to several European countries. I am also interested in clustering methods as regards the identification of earthquake clusters and the characterization of their topological structure through network theory. I am currently involved in the implementation of a procedure, based on statistical methodologies, for the multi-hazard risk assessment of residential buildings, able to consider the cascade effects related to the phenomenon of volcanic eruptions (lava flows, ash, pyroclastic flows and earthquakes).

Bibliometric Indicators

SCOPUS: h-index 9, citations 138, documents 20
 Google Scholar: h-index 12, citations 325, i10-index 14

WORK EXPERIENCE

From 16/11/2011 to today

CNR Researcher (Ricercatore a tempo indeterminato)

CNR – IMATI Milano

- Stochastic modelling of seismic sequences and statistical tools for the prediction, in an attempt to incorporate physical conjecture/information into the probabilistic framework
- Point processes, especially the self-exciting and the self-correcting point processes, and their use in dynamical modelling (hidden Markov models, state-space models)
- Bayesian statistics, Markov Chain Monte Carlo and sequential Monte Carlo methods for uncertainty assessment/analysis
- Probabilistic modelling of macroseismic attenuation and forecast of damage scenarios
- Clustering methods
- Analysis of temporal variations of seismicity through probability distributions inspired by non-extensive statistical physics
- Multi-hazard risk assessment of buildings, in particular as regards probabilistic aspects.

From Feb 2011 to May

Research activity (Collaborazione di ricerca)

CNR – IMATI Milano

- Development of advanced methods for the Bayesian inference of Markov models in environmental applications

From Jun 2010 to Dec 2010

Research grant (Borsa-lavoro)

CNR – IMATI Milano

Funded by the Councilwomen of Equality and by AFOL of the Province of Milan

- Unsupervised learning and stochastic modelling for the analysis of macroseismic data in order to improve the ground-motion relations in the Province of Milan

From Jul 2010 to Nov 2010 Research activity (Collaborazione di ricerca)

CNR – IMATI Milano

- Software development of estimation methods of hidden Markov and semi-Markov models by particle filtering and Monte Carlo techniques, for environmental applications and climate data analysis

From Jan 2009 to Apr 2010 Temporary research position (Ricercatore a tempo determinato)

CNR – IMATI Milano

Funded by the Italian Department of the Civil Protection (DPC) in the frame of the 2007-2009 Agreement with the National Institute of Geophysics and Volcanology (INGV).

- Development of hidden Markov models for seismic sequences

From 2004 to 2008 Research grant (Assegno di ricerca)

CNR – IMATI, Milan

Partially funded by DPC in the frame of the 2004-2006 DPC-INGV Agreement.

- Analysis of sequential estimation methods applied to state-space models for seismic sequences

From 2000 to 2001 Research activity (Incarichi di collaborazione professionale)

CNR – IMATI Milano

- Development of Fortran software for Bayesian analysis of point processes and application to seismic sequences

EDUCATION AND TRAINING

2000, March 28 Degree in Mathematics

University of Parma

- Thesis: Fast algorithm for the solution of Hessenberg linear system

2005, March 18 PhD in Statistics

University Bocconi, Milano

- PhD thesis: Sequential estimation methods in continuous-time state-space models

PERSONAL SKILLS

Mother tongue(s)	Italian				
Other language(s)	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interact	Spoken production	
English	B2	B2	B2	B2	B2
French	B1	B1	A2	A2	B1
Levels: A1/2: Basic user - B1/2: Independent user - C1/2 Proficient user Common European Framework of Reference for Languages					

NATIONAL AND INTERNATIONAL GRANTS

2022-2025 Responsible of CNR-IMATI for the Research project “National Centre for HPC, Big Data and Quantum Computing”, tematica “Simulazioni, calcolo e analisi dei dati ad alte prestazioni” Codice CN00000013 – in the frame of Piano Nazionale di Ripresa e Resilienza, Missione 4 Istruzione e ricerca - Componente 2 Dalla ricerca all’impresa – Investimento Investimento 1.4, supported by the European Union – NextGenerationEU.

2022-2025 Participant in the Research project RAISE “Robotics and AI for Socio-economic Empowerment” Codice ECS00000035 – in the frame of Piano Nazionale di Ripresa e Resilienza, Missione 4 Istruzione e ricerca - Componente 2 Dalla ricerca all’impresa – Investimento 1.5, supported by the European Union – NextGenerationEU.

- 2021-2022 Responsible of CNR-IMATI for the Research agreement between INGV (Italian Institute of Geophysics and Volcanology) and IMATI-CNR in the frame of Project INGV Pianeta Dinamico (Codice Unico Progetto: CUP D53J19000170001) supported by MIUR (Fondo finalizzato al rilancio degli investimenti delle amministrazioni centrali dello Stato e allo sviluppo del Paese, legge 145/2018), Tema 8 – PANACEA 2021. CNR-IMATI budget: 10.000 euro.
- 2019-2021 Participant in Working Program 2: Volcanoes. Task 13: Seismic hazard assessment induced by local events in Ischia, Agreement B2 2019-2021 between the Italian Institute of Geophysics and Volcanology (INGV) and the Italian Civil Protection Department (DPC).
- 2019-2023 Participant in the COST Action CA18109 AGITHAR - Acceleration Global science In Tsunami HAZard and Risk analysis, supported by COST (European Cooperation in Science and Technology)
- 2017-2019 Participant in PRIN 2015 (Progetti di ricerca di Rilevante Interesse Nazionale) – Complex space-time modeling and functional analysis for probabilistic forecast of seismic events, 3 years, Principal investigator G. Adelfio, Decreto Direttoriale MIUR n.1827 del 20/09/2016. Total budget: 126.661 euro, CNR-IMATI budget: 15.000 euro
- 2016 Participant in the Project MPS16: the update of the Italian seismic hazard maps, (1 years), Agreement 2015 between Italian Seismic Hazard Center (CPS) of INGV and DPC. CNR-IMATI budget: reimbursement of expenses for activities related to the project
- 2012-2014 Participant in the Progetti Premiali 2012 - MIUR, Linea di intervento 2, prog. n.24: MATHTECH - La matematica per la società e l'innovazione tecnologica., (3 years), D.M. 25 novembre 2013, prot. n. 973
- 2012-2013 Participant in the EU research project Urban Disaster Prevention Strategies Using MAcroseismic Fields and FAult Sources (UPStrat-MAFA), (2 years), Grant Agreement n. 230301/2011/613486/SUB/A5. Budget: 605.329 euro. CNR-IMATI budget: 75.000 euro
- 2007-2009 Participant in the Project S1 - Analysis of the seismic potential in Italy for the evaluation of the seismic hazard, (2 years), funded in the frame of the Agreement 2007-2009 DPC-INGV. CNR-IMATI budget: 45.000 euro
- 2004-2006 Participant in the Project S2 - Evaluation of seismogenic potential and probability of strong earthquakes in Italy, (2 years), funded in the frame of the Agreement 2004-2006 DPC-INGV. CNR-IMATI budget: 50.000 euro

TEACHING ACTIVITY

- 2017-2018 Teaching assistant
 2015-2016 University of Milan – Department of International, Legal, Historical and Political Studies
 ▪ Course of Statistics.
- 2007-2008 Teaching assistant & Tutor
 2006-2007 University Bocconi, Milan – Economic Faculty
 2004-2005 ▪ Course of Statistics
 ▪ Course of Statistics-Sample Surveys
- 2003-2004 Teaching assistant
 University LIUC Carlo Cattaneo, Castellanza - Economic Faculty
 ▪ Course of Statistics.

ORGANIZATION OF SCIENTIFIC MEETINGS

- 2023 Executive director of ABS – the Applied Bayesian Statistics School, organized by CNR-IMATI
- 2021 Chair of the Organizing Committee of BISP12 – the Twelfth Workshop on Bayesian Inference in Stochastic Processes, organized by CNR-IMATI

- 2022 Co-convenor of a session at the Third European Conference on Earthquake Engineering and Seismology (3ECEES)
- From 2019 Co-convenor of a session at the European Geosciences Union (EGU) General Assembly

FURTHER INFORMATION

Visiting experiences

- Institute of Statistical Mathematics, Tokyo, Japan (2008, 2014, 2018, 2020) as visiting researcher
- School of Mathematics, Statistics & Computer Science, Victoria University of Wellington, New Zealand (2006) as visiting researcher
- Department of Mathematics, University of Bristol, UK (2004, 2005) as visiting PhD student

Invited talks

- 2022, The International Statistical Seismology (StatSei) conference, Cargèse, France
- 2017, 61th World Statistics Congress – ISI2017, Marrakech, Morocco
- 2017, The 10th International Workshop on Statistical Seismology, Wellington, New Zealand
- 2010, International Workshop on Applied Probability (IWAP), Madrid, Spain
- 2009, Sixth Workshop on Bayesian Inference in Stochastic Processes, Bressanone, Italy

Memberships

- ISI – TIES (International Statistical Institute - International Environmetrics Society)
- ISBA – EnviBayes (International Society for Bayesian Analysis - Environmental Sciences Section)
- EGU (European Geosciences Union)
- SSA (Seismological Society of America)

Digital skills

- Fortran, C++
- R, Matlab

Evaluation of research results

- Referee of journals in Geophysics: Acta Geophysica; Annals of Geophysics; Bulletin of the Seismological Society of America; Journal of Seismology; Nonlinear Processes in Geophysics; Physica A; Pure and Applied Geophysics; Tectonophysics; Chaos, Solitons and Fractals.
- Referee of journals in Statistics: Annals of the Institute of Statistical Mathematics; Applied Mathematics; Computational Statistics and Data Analysis; Digital Signal Processing; Journal of Computational & Graphical Statistics; Methodology and Computing in Applied Probability; Statistics and Computing; Environmental and Ecological Statistics; Computational and Applied Mathematics.

ATTACHMENT

- List of the publications (since 2015)

Personal data

According to law 679/2016 of the Regulation of the European Parliament of 27th April 2016, I hereby express my consent to process and use my data provided in this CV

Date: Milano, 6 February 2023

Signature: Elisa Varini



List of the top publications in the main research field (since 2015)

1. R Rotondi, E Varini, Temporal variations of the probability distribution of voronoi cells generated by earthquake epicenters, *Frontiers in Earth Sciences*, 2022, 10:928348, <https://doi.org/10.3389/feart.2022.928348>
2. G Molchan, E Varini, A Peresan, Productivity within the ETAS seismicity model, <https://arxiv.org/abs/2203.05253>
3. R Rotondi, G Bressan, E Varini, Analysis of temporal variations of seismicity through nonextensive statistical physics, *Geophysical Journal International*, 2022, ggac118, <https://doi.org/10.1093/gji/ggac118>
4. F Visini, B Pace, C Meletti, W Marzocchi, A Akinci, R Azzaro, S Barani, G Barberi, G Barreca, R Basili, P Bird, M Bonini, P Burrato, M Busetti, MM Cosimo Carafa, O Cocina, R Console, G Corti, N D'Agostino, S D'Amico, V D'Amico, M Dal Cin, G Falcone, U Fracassi, R Gee, V Kastelic, CG Lai, H Langer, FE Maesano, A Marchesini, L Martelli, C Monaco, M Murru, L Peruzza, ME Poli, S Pondrelli, A Rebez, R Rotondi, A Rovida, F Sani, M Santulin, D Scafidi, J Selva, D Slejko, D Spallarossa, A Tamaro, G Tarabusi, M Taroni, MM Tiberti, G Tusa, T Tuvè, G Valensise, P Vannoli, E Varini, A Zanferrari and E Zuccolo (2021) Earthquake rupture forecasts for the MPS19 seismic hazard model of Italy. *Annals of Geophysics*, 64(2), SE220, doi: 10.4401/ag-8608
5. J Behrens, F Løvholt, F Jalayer, S Lorito, MA Salgado-Gálvez, M Sørensen, S Abadie, I Aguirre-Ayerbe, I Aniel-Quiroga, A Babeyko, M Baiguera, R Basili, S Belliazzi, A Grezio, K Johnson, S Murphy, R Paris, I Rafliana, R De Risi, T Rossetto, J Selva, M Taroni, M Del Zoppo, A Armigliato, V Bures, P Cech, C Cecioni, P Christodoulides, G Davies, F Dias, HB Bayraktar, M González, M Gritsevich, S Guillas, CB Harbitz, U Kanoglu, J Macias, GA Papadopoulos, J Polet, F Romano, A Salamon, A Scala, M Stepinac, DR Tappin, HK Thio, R Tonini, I Triantafyllou, T Ulrich, E Varini, M Volpe and E Vyhmeister (2021) Probabilistic Tsunami Hazard and Risk Analysis: A Review of Research Gaps. *Frontiers in Earth Science* 9:628772. doi: 10.3389/feart.2021.628772
6. C Meletti, W Marzocchi, V D'Amico, G Lanzano, L Luzi, F Martinelli, B Pace, A Rovida, M Taroni, F Visini, and MPS19 Working Group (2021) The new Italian seismic hazard model (MPS19). *Annals of Geophysics*, 64(1), SE220, doi: 10.4401/ag-8579
7. G Lanzano, L Luzi, V D'Amico, F Pacor, C Meletti, W Marzocchi, R Rotondi and E Varini (2020) Ground motion models for the new seismic hazard model of Italy (MPS19): selection for active shallow crustal regions and subduction zones. *Bulletin of Earthquake Engineering*, 18:3487-3516, doi: 10.1007/s10518-020-00850-y
8. E Varini, A Peresan, and J Zhuang (2020) Topological Comparison Between the Stochastic and the Nearest-Neighbor Earthquake Declustering Methods Through Network Analysis. *Journal of Geophysical Research. Solid Earth*, 125, e2020JB019718, doi: 10.1029/2020JB019718
9. A Benali, A Peresan, E Varini, and A Talbi (2020) Modelling background seismicity components identified by nearest neighbour and stochastic declustering approaches: the case of Northeastern Italy. *Stochastic Environmental Research and Risk Assessment*, 17:775-791, doi 10.1007/s00477-020-01798-w
10. R Rotondi, E Varini (2019) Failure models driven by a self-correcting point process in earthquake occurrence modeling. *Stochastic Environmental Research and Risk Assessment*, 33:709-724, doi: 10.1007/s00477-019-01663-5
11. C Agostinelli, R Rotondi, and E Varini (2018) Clustering macroseismic fields by statistical data depth functions. In F Mola, C Conversano, and M Vichi, editors, *Classification, (Big) Data Analysis and Statistical Learning*, Studies in Classification, Data Analysis, and Knowledge Organization, pages 145-153. Springer, Print ISBN 978-3-319-55707-6, Electronic ISBN 978-3-319-55708-3
12. E Varini, R Rotondi, R Basili, and S Barba (2016) Stress release model and proxy measures of earthquake size. Application to Italian seismogenic sources. *Tectonophysics*, 682:147-168, doi: 10.1016/j.tecto.2016.05.017
13. R Rotondi, E Varini, and C Brambilla (2016) Probabilistic modelling of macroseismic attenuation and forecast of damage scenarios. *Bulletin of Earthquake Engineering*, 14:1777-1796, doi: 10.1007/s10518-015-9781-7
14. F Meroni, G Zonno, R Azzaro, S D'Amico, T Tuvè, CS Oliveira, MA Ferreira, F Mota de Sá, C Brambilla, R Rotondi, and E Varini (2016) The role of the urban system dysfunction in the assessment of seismic risk in the Mt. Etna area (Italy). *Bulletin of Earthquake Engineering*, 14:1979-2008, doi: 10.1007/s10518-015-9780-8
15. E Varini and R Rotondi (2015) Probability distribution of the waiting time in the stress release model: the Gompertz distribution. *Environmental and Ecological Statistics*, 22:493-511, doi: 10.1007/s10651-014-0307-2
16. G Zonno, R Azzaro, F Meroni, S D'Amico, T Tuvè, MA Ferreira, F Mota de Sá, CS Oliveira, C Brambilla, R Rotondi, and E Varini (2015) Applying the Disruption Index Procedure to Evaluate the Urban Seismic Risk in the Mt. Etna Area (Italy). In *Engineering Geology for Society and Territory*, volume 5, pages 371-374, Springer, doi: 10.1007/978-3-319-09048-1