

## CURRICULUM VITAE

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B.Sc. Mathematics (1995, University of Pavia, Italy. Final grade: 110/110)  
Ph.D. Mathematical Statistics (2002, University of Pavia, Italy)  
Position: researcher at the Institute of Applied Mathematics and Information Technology  
- National Research Council (CNR) (2001)

### Recent research activity<sup>1</sup>

The researches carried out in the last years, considering both theoretical and applied topics, can be summarized in the following key words: metapopulation dynamic modeling and probabilistic evaluation of metapopulation management strategies; modelling of rainfall data; probabilistic pooling of partially incomplete and/or incompatible expert opinions. Applications concern climate, agro-meteorology and ecology.

- *Metapopulation dynamic modeling and probabilistic evaluation of metapopulation management strategies*

In cooperation with the University of Brescia (Italy) and the Institute of Agricultural Entomology - University of Milan (Italy) a new approach to deal with ranking of pre-defined ecosystem management options has been proposed. The approach, based on the Kullback-Leibler divergence, has been firstly applied to the evaluation of intervention strategies proposed by the Cantonal authorities (Canton of the Grisons, Switzerland) and aiming at the conservation of amphibians in the alpine Rhine valley, (Gilioli et al. 2008; Bodini et al. 2008). Then, it has been extended to pest control strategies for the Pine Processionary moth metapopulation in the National Park of Aspromonte Calabria, Italy (Gilioli et al. 2013). Related work concerns modeling of *Limantria dispar* (L.) metapopulation dynamics in Sardinia (Italy) and is carried out in cooperation with the University of Sassari.

- *Modeling of rainfall data.*

In cooperation with ARPA Sardegna (Italy), modeling of daily data and trend analysis of weather data have been considered, focusing on rainfall extreme events. Trends in extreme events have been analysed, and an analysis according to the Extreme Value Theory has been carried out to highlight the hydrogeological risk due to heavy rainfall and determine the return time for the most intense extreme events occurred in Central-East Sardinia (Bodini and Cossu, 2010). A complete characterization of the autumn-winter precipitations

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<sup>1</sup>References are to a few relevant papers in international journals and proceedings.

during the standard period 1961-1990 has been obtained by applying a hidden Markov model to daily data from selected sub-sets of meteorological stations. In Betrò, et al. (2008) a mixture of Weibull distributions has been proposed to model the daily rainfall amount so that the occurrence and intensity of extreme events could be captured; it has been shown that the obtained fit improve the one provided by more common distributions, so that the estimated model is also able to provide realistic simulations. The analysis of extreme events has been extended in time and space, and regional frequency analysis has been applied as well.

- *Probabilistic pooling of partially incomplete and/or incompatible expert opinions*

In cooperation with the Institute of Information Theory and Automation (UTIA, Prague), some new probabilistic and statistical techniques for the combination of partial, sometimes incompatible information expressed in terms of probability density functions have been introduced (Kárný et al. 2009; Kárný et al. 2014). This research has been carried out under the project 06/01-CNR Advanced techniques of Bayesian decision making in complex systems (2004-2006, 2007-2009).

*Related topics and applications.*

- Daily temperature data from several weather stations in Milano have been analyzed to assess the urban heat intensity effect, within the project INTEGRATE - *INnovazioni TEcnologiche per una Gestione Razionale del Tessuto Edilizio* (2014).
- In cooperation with CNR-IRPI, regional frequency analysis allowed in Calabria (Italy) an evaluation of the rainfall-runoff erosivity factor (Terranova et al. 2013).
- As a part of the project PROTERINA-C, the analysis of trends in weather data has been extended to daily temperature to both evaluate possible climate change in Sardinia and Liguria (Italy) and its effects on vegetation and to relate climate and wildfire risk (Bodini et al. 2012).
- Fuzzy Decision Theory has been proposed for the definition of a part of the Decision Support System developed within the project MoDeM\_IVM.
- In cooperation with CNR-IBIMET and INRA (Morocco) the effects of climate change on agriculture in Morocco have been studied as a part of the project CYCAS-MED: *Crop yield and climate change impacts on agriculture: adaptation strategies to desertification processes in the Mediterranean areas* (Bodini et al. 2011).
- In cooperation with the University of Sassari, data on a population of *L. brunneus* and *S. quercus* in cork oak forests in Sardinia have been analyzed to investigate the presence of spatial clusters of the infestation (Loi et al. 2012).
- Probabilistic methods to deal with uncertainty have been applied for the environmental risk assessment of plant pests (Contribution to EFSA Panel on Plant Health, 2011);

*Other topics.*

Minimum distance estimators; Bayesian inference; Bayesian robustness; modeling uncertainty, fuzzy sets and design of experiments are also topics of interest.

## Projects

- **MATHTECH** – Mathematics for better society and technological innovation (Progetto Premiale MIUR 2012, 2013-2015)
- **INTEGRATE** – INnovazioni TEcnologiche per una Gestione Razionale del Tessuto Edilizio (Framework agreement Regione Lombardia-CNR; 2013-2015)
- **MoDeM\_IVM** – A web-based system for real-time Monitoring and Decision Making for Integrated Vineyard Management (FP7 reference number: 262059) (2011-2012; principal investigator.)
- **CYCAS-MED** – Crop yield and climate change impacts on agriculture: adaptation strategies to desertification processes in the Mediterranean areas), (2010-2011; principal investigator.)
- **PROTERINA-C**: A system for the forecast and the prevention of the impact of the variability of the climatic conditions on the risk for the natural and urbanized environment (2009–2010; principal investigator for CNR–IMATI in the Cooperation Agreement with Regional Protection Agency of Sardinia.)
- **Por-Calabria 2000-2006**: Pericolosità legata ai fenomeni di intensa erosione idrica areale e lineare (2008–2009)
- **Project: 06/01-CNR** *Advanced techniques of Bayesian decision making in complex systems* (2003–2005; 2006–2008)

## Most recent congresses attended.

- 47th Scientific Meeting of the Italian Statistical Society (Cagliari, 11–13 Giugno 2014), (presentazione sollecitata)
- XXII SIte: Congresso della Società Italiana di Ecologia (Alessandria, 10–13 Settembre 2012), (invited presentation)
- SPATIAL<sub>2</sub>: Spatial Data Methods for Environmental and Ecological Processes (Foggia – Baia delle Zagare, 1–2 September 2011)
- V International Workshop on Spatio-Temporal Modelling (METMAV). Santiago de Compostela, 30th June – 2nd July 2010
- Convegno BIOD - Coltivare la biodiversità, Milano, 11-12 Giugno 2010
- Working Group F - Thematic Workshop: Flash Floods and Pluvial Flooding, Cagliari, 25-28 Maggio 2010
- TIES 2009: 20th annual meeting of the International Environmetrics Society
- 10th Plinius Conference on Mediterranean Storms, Nicosia (Cyprus), 21–24 September 2008
- S.Co 2007: Complex Models and Computational Intensive Methods for Estimation and Prediction, Venice (Italy), 6-8 September 2007 (invited presentation)
- TIES 2007: 18th annual meeting of the International Environmetrics Society, Mikulov (Czech Republic), 16-20 August 2007 (invited presentation)
- Fourth Study Days on Numerical, Statistical and Computer Based Methods for Crops and Forests Protection, Viterbo (Italy), 27-29 March 2007

- SPATIAL Data Methods for Environmental and Ecological Processes (Foggia - Baia delle Zagare, 14–15 September 2006).
- 43th Scientific Meeting of Italian Statistical Society, Torino (Italy) 14-16 June 2006

### Other activities

- Member of the SIS–GRASPA group (Gruppo di Ricerca per le Applicazioni della Statistica ai Problemi Ambientali- Research Group for Statistical Applications to Environmental Problems).
- Member of the Italian Research Group Models Trees Preservation (Gruppo Italiano Ricerca Modelli Prevenzione Piante).
- Member of the Organizing Committee of the Workshop Bayesian Inference in Stochastic Processes (2005, 2009 and 2013).
- Reviewer activity for Bayesian Analysis, Journal of Computational and Graphical Statistics, Applied Stochastic Models in Business & Industry, Quality Technology & Quantitative Management, Ecological Modelling, Environmetrics, NHESS, Stochastic Environmental Research and Risk Assessment, Nonlinear Processes in Geophysics.
- Teaching activity.

### Mentioned papers

**Kárný M., Andryšek J., Bodini A., Guy T.V., Kracík J., Nedoma P., Ruggeri F.** (2014) Fully Probabilistic Knowledge Expression and Incorporation. *Statistics and Its Interface*, vol. 7, 503-515.

**G. Gilioli, A. Bodini, J. Baumgaertner** (2013) Metapopulation modelling and area-wide pest management strategies evaluation. An application to Pine processionary moth. *Ecological Modelling*, vol. 260, 1-10.

**Terranova O.G., Bodini A., Coscarelli R., Gariano S.L., Iaquina P.** (2013) Stima dell'erosività annua delle piogge in Calabria tramite analisi di frequenza regionale (2013). *Italian Journal of Agrometeorology*, vol XXIII(2), 13-24.

**A. Bodini, E. Entrade, Q.A. Cossu, P. Fiorucci, G. Biondi** (2012) – Analysis of climatic conditions influencing wildfire static risk in Sardinia and Liguria (Italy). In *Modelling Fire Behaviour and Risk* (D. Spano, V. Bacciu, M. Salis and C. Sirca Eds.), p. 63-69. Università di Sassari. Proceedings of the *International Conference on Fire Behaviour and Risk Modelling*, Alghero (Italy), 4th to 6th October, 2011.

**Loi A., Luciano P., Gilioli G., Bodini A.** (2012) – *Lasius Brunneus* (Formicidae Formicinae) and *Stomaphis Quercus* (Aphidoidea Aphididae): trophobionts harmful to cork oak forest in Sardinia (Italy). *Redia*, vol. XCV, 21-29.

**EFSA Panel on Plant Health (PLH)** (2011) – Guidance on the environmental risk assessment of plant pests. *EFSA Journal*, 9(12):2460. [121 pp.]. doi:10.2903/j.efsa.2011.2460.

**Bodini A., Entrade E., Cesaraccio C., Duce P., Zara fP., Dubrovsky M.** (2011) The CYCAS-MED project: analysis at regional and local scale of climate change impacts on cereals yield in Morocco. Proceedings of Workshop *Spatial Data Methods for Environmental and Ecological Processes*. (SPATIAL2), Foggia, 1–3 September 2011. Ed. B.

Cafarelli. Cdp Service Edizioni, CD ROM

**Bodini A., Q.A. Cossu Q.A.** (2010) – Vulnerability assessment of Central-East Sardinia (Italy) to extreme rainfall events. *NHESS*, 10, 61-72.

**Kárný M. , Guy T.V., Bodini A., Ruggeri F.** (2009) – Cooperation via sharing of probabilistic elements. *IJCISudies*, vol. 1, 139-162

**Betrò B., Bodini A., Cossu Q.A.** (2008) – Using a hidden Markov model to analyse extreme rainfall events in Central-East Sardinia. *Environmetrics*, vol. 19, 702–713

**G. Gilioli, A. Bodini, J. Baumgaertner, P. Weidmann, J. Hartman** (2008) – A novel approach based on Information Theory to rank conservation strategies: an application to amphibian metapopulations (with discussion). *Animal Conservation*, vol. 11, 453–462

**A. Bodini, J. Baumgaertner, G. Gilioli** (2008) – Conservation strategies evaluation in an adaptive management framework (commentary). *Animal Conservation*, vol. 11, 472–475