

# DEPARTMENT OF STATISTICS “PAOLO FORTUNATI”



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA



- RESEARCH EXCELLENCE IN THEORETICAL AND APPLIED STATISTICS
- TWO DOCTORAL PROGRAMMES
- HIGH PERFORMANCE COMPUTING FACILITIES
- ACCESS TO INTERNATIONAL DATA-BASES

# OUR STRENGTHS

- EXPERTISE AND EXCELLENCE IN A WIDE RANGE OF APPLICATION AREAS, INCLUDING:
  - Biometrics
  - Demographics
  - Economics
  - Econometrics
  - Education
  - Environment
  - Finance
  - Marketing
  - Medicine
  - Policy evaluation
  - Quality control
- METHODOLOGICAL COMPETENCE WITH AN EMPHASIS TO STATISTICS FOR SCIENTIFIC RESEARCH
- COVERAGE OF THE DATA PRODUCTION AND ANALYSIS PROCESS THROUGH ALL STEPS, FROM SURVEY PLANNING TO FIELD WORK, DATA TRANSCRIPTION, DATA BANK MANAGEMENT, DATA PROCESSING AND INTERPRETATION
- EFFECTIVE ORGANIZATION & MANAGEMENT PROCEDURES (UNI EN ISO 9001:2000 CERTIFICATION)



## FACTS AND FIGURES

- THE DEPARTMENT OF STATISTICS "PAOLO FORTUNATI" WAS ESTABLISHED IN 1982, THE FIRST HEAD OF DEPARTMENT WAS ATHOS BELLETTINI, THE FOUNDER OF HISTORICAL DEMOGRAPHIC STUDIES IN ITALY. THE CURRENT HEAD OF DEPARTMENT IS IGNAZIO DRUDI.
- THE DEPARTMENT HAS 63 ACADEMIC STAFF MEMBERS AND 15 SUPPORT AND TECHNICAL STAFF, PLUS 11 RESEARCH FELLOWS AND ABOUT 30 DOCTORAL STUDENTS
- THE DEPARTMENT PUBLISHES THE INTERNATIONAL REVIEW *STATISTICA*, FIRST PUBLISHED IN 1941
- THE DEPARTMENT PROVIDES TWO DOCTORAL PROGRAMMES IN *STATISTICAL METHODOLOGY FOR SCIENTIFIC RESEARCH* AND *AGRI-FOOD ECONOMICS AND STATISTICS*, AND FOUR MASTER PROGRAMMES IN *ANALYSIS AND MANAGEMENT OF THE CAR SECTOR*, *BIOSTATISTICS*, *DEMOGRAPHIC SERVICES* AND *TOURIST SERVICES: CULTURE, MANAGEMENT AND DEVELOPMENT*.
- FROM 2007 THE DEPARTMENT CONTRIBUTES TO AN INTERNATIONAL MSc PROGRAMME ON *MARKET RESEARCH AND DATA MINING* AT THE BUENOS AIRES SITE OF THE UNIVERSITY OF BOLOGNA

# OUR RESEARCH

- FIVE MAIN AREAS
  - Statistical Methodology
  - Econometrics
  - Applied Economics
  - Demographics
  - Applied Statistics
    - Biomedical statistics
    - Education and social statistics
    - Environmental statistics
    - Quality control
    - Marketing research
    - Measurement and evaluation

# STATISTICAL METHODOLOGY

## RESEARCH THEMES

- ✦ Connections between chaos theory and Statistics;
- ✦ Design of Experiments (DoE), sequential experimentation and stochastic orderings;
- ✦ Dimension reduction methods for classification problems, Local Linear Embedding and Isomaps with microarray data;
- ✦ Expert opinion combining methods, density combining algorithms;
- ✦ Finite populations sampling: small area models, small area models for count data, model based optimal stratification;
- ✦ Hierarchical Bayesian modelling;
- ✦ Latent variable models, structural equation models (LISREL) and the generalized linear latent variable models;
- ✦ Markov chains and stochastic processes;
- ✦ Monte Carlo methods applied to atomic interactions;
- ✦ Multiple cluster structures within a data matrix;
- ✦ Non-parametric linear filtering, real time estimation, smoothing matrices and boundary conditions;
- ✦ Nonparametric methods for classification problems;
- ✦ Proximity-based approach to solve overfitting and unstableness problems in classification trees;
- ✦ Quantum statistical inference;
- ✦ Sample surveys, multiple frames sample designs;
- ✦ Spatial statistics;
- ✦ Statistical mechanics.

## SELECTED PUBLICATIONS

- Azzalini, A., Capitanio, A. (2003). Distributions generated by perturbations of symmetry with emphasis on a multivariate skew t-distribution, *J. of the Royal Statistical Society B*, 65: 367-389.
- Baldi Antognini A. (2005) On the speed of convergence of some urn designs for the balanced allocation of two treatments, *Metrika*, 62: 309-322.
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- Calò, D.G. (2006). On a Transvariation Based Measure of Group Separability, *Journal of Classification*, 23: 143-167
- Cocchi, D., Fabrizi, E., Trivisano, C. (2003). A Hierarchical Model for the Analysis of Local Census Undercount in Italy. *Survey Methodology*, 29: 167-175.
- Dagum, E.B., Luati, A. (2004). A linear transformation and its properties with special applications in time series filtering (2004), *Linear Algebra and its Applications*, 388: 107-117.
- Desalvo, A., Giannerini, S., Rosa, R. (2006). Chaotic phenomena of charged particles in crystal lattices, *Chaos*, 16: 023114.
- Eaton, M.L., Giovagnoli, A., Sebastiani P. (1996). A predictive approach to the Bayesian design problem with application to the normal regression models, *Biometrika* 83: 111-125
- Luati, A. (2004). Maximum Fisher information in mixed state quantum systems. *Annals of statistics*, 32: 1770-1779.
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- Mignani, S., Rosa, R. (2001). Markov Chain Monte Carlo in Statistical Mechanics: the Problem of Accuracy, *Technometrics*, 43: 347-355.
- Monari, P., Agati, P. (2001). Fiducial inference in combining expert judgements, *Statistical Methods and Applications*, 10: 81-97
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- Roverato, A. (2005). A unified approach to the characterisation of Markov equivalence classes of DAGs, chain graphs with no flags and chain graphs. *Scand. J. of Statistics*, 32: 295-312.
- Roverato, A., Consonni, G. (2004). Compatible prior distributions for DAG models. *Journal of the Royal Statistical Society B*, 66: 47-61.
- Vichi, M., Monari, P., Mignani, S., Montanari, A. (Eds., 2005). *New Developments in Classification and Data Analysis*. Berlin: Springer-Verlag.

# APPLIED STATISTICS

## RESEARCH THEMES

### Biomedical statistics

- ✦ Experimental designs in biomedical research;
- ✦ Hierarchical models applied to epidemiology and medicine;
- ✦ Large stochastic systems and networks applied to bio-medical data and genetic microarray data;
- ✦ Stochastic processes with applications in clinical trials and epidemiology.

### Environmental statistics

- ✦ Extreme value theory applications to environmental studies.
- ✦ Probabilistic weather forecasting and hurricane track prediction;
- ✦ Statistical models for environmental problems: development of hierarchical spatio-temporal models for air quality data;

### Consumer and Marketing research

- ✦ Customer satisfaction analysis;
- ✦ Modelling the effectiveness of marketing instruments;
- ✦ Statistical analysis of consumer behaviour;
- ✦ Statistical evaluation of efficacy and efficiency of marketing-mix strategies in fast moving consumer goods markets.

### Measurement and evaluation

- ✦ Effects of measurement errors on monitoring algorithms;
- ✦ Public system performance measurement;
- ✦ Statistical aspects of the use of remote sensing data;
- ✦ Statistical methods for quality improvement;
- ✦ Student ability evaluation.

## SELECTED PUBLICATIONS

- Bonetto, C., Giannerini, S., Giovagnoli, A. (2006). The analysis of contingency tables with ordinal data: an application to monitoring antibiotic resistance, *Statistics in Medicine*, 25: 3560-3575 .
- Bordignon, S., Scagliarini, M. (2000). Monitoring algorithms for detecting change in the ozone concentrations. *Environmetrics*, 11: 125-137.
- Bortot, P., Coles, S. G., Tawn, J. A. (2000). The Multivariate Gaussian Tail Model: An Application to Oceanographic data. *Applied Statistics*, 49: 31-49.
- Bruno F., Cocchi D., Trivisano C. (2004). Forecasting daily high ozone concentrations by classification trees, *Environmetrics*, 15: 141 – 153.
- Carfagna, E., Gallego F.J. (2005). Using Remote Sensing for Agricultural Statistics, *International Statistical Review*, 73: 389-404.
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- Ferrante, M.R., Pacei, S. (2004). Small Area Estimation for Longitudinal Surveys. *Statistical Methods & Applications*, 13: 327 – 340.
- Freo, M. (2005). The impact of sales promotions on store performance: A structural vector autoregressive approach, *Statistical Methods & Applications*, 14: 271-281
- Gonzalez, D.L., Giannerini, S., Rosa, R. (2006). Detecting structure in parity binary sequences: Error Correction and Detection in DNA, *IEEE EMB*, 25: 69-81.
- Luati, A., Tassinari, G. (2005). Intervention analysis to identify significant exposures in pulsing advertising campaigns: an operative procedure, *Computational Management Science*, 4: 295-308
- Marzocchi, G.L., Brasini, S., Rimessi, M. (2003). New Product Development in the Software Industry: The Role of Conjoint Analysis, in A. Gustafsson, A. Herrmann, F. Huber (Eds.), *Conjoint Measurement. Methods and Applications*, 3rd Ed., 161-186, Berlin: Springer-Verlag.
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- Scagliarini, M. (2002). Estimation of Cp for autocorrelated data and measurement errors. *Communications in Statistics-Theory and Methods*, 31:1647-1664

# ECONOMETRICS

## RESEARCH THEMES

- ⊕ Time-series econometrics
- ⊕ Unit root and cointegration tests
- ⊕ Volatility modelling
- ⊕ Structural breaks
- ⊕ Continuous time finance
- ⊕ Financial time series modelling
- ⊕ Latent variables in financial markets (with special emphasis on risk measurement and household portfolio allocation)
- ⊕ Forward-looking behaviour in the context of dynamic adjustment models
- ⊕ New-keynesian dynamic stochastic general equilibrium models
- ⊕ International consumption risk-sharing
- ⊕ Purchasing Power Parity relationships

## SELECTED PUBLICATIONS

- Bacchiocchi, E., Fanelli, L. (2005). Testing the purchasing power parity through I(2) cointegration techniques, *Journal of Applied Econometrics*, 20: 749-770.
- Cavaliere, G. (2004). Testing stationarity under a permanent variance shift, *Economics Letters*, 82: 403-408
- Cavaliere, G. (2005). Limited time series with a unit root", *Econometric Theory*, 21: 907-945.
- Cavaliere, G., Fanelli, L., Gardini, A. (2008), International dynamic risk sharing, *Journal of Applied Econometrics*, forthcoming.
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- Costa, M., Gardini, A., Paruolo P. (1997). A reduced rank regression approach to tests of asset pricing, *Oxford Bulletin of Economics and Statistics*, 59: 163-181.
- Fanelli, L. (2002). A new approach for estimating and testing the Linear Quadratic Adjustment Cost model under rational expectations and I(1) variables, *Journal of Economic Dynamics and Control* 26: 117-13.
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- Fanelli, L. (2008). Present value relations Granger noncausality and VAR stability. *Econometric Theory*, forthcoming (published on-line in 2007).
- Gardini, A., Costa, M., Iezzi, S. (2005), Latent class models in financial data analysis, *Statistica*, 65: 41-60.

# APPLIED ECONOMICS

## RESEARCH THEMES

- ✦ Agricultural and Food Economics
- ✦ Analysis of international parity relations and risk sharing at both regional and international level;
- ✦ Demand analysis and consumer response to information;
- ✦ Economic analysis and statistical data processing of the agro-food sector;
- ✦ Firm cluster skills;
- ✦ Food chain management;
- ✦ Household decision making and demand systems;
- ✦ Income distribution models (Dagum's model);
- ✦ International macro, consumption dynamics ;
- ✦ International macroeconomics;
- ✦ Measurements of productivity and efficiency by means of the estimation of frontier functions;
- ✦ Portfolio allocation;
- ✦ Rural and regional development in the European area;
- ✦ Statistical analysis of poverty in Italy according to a multidimensional approach
- ✦ Structural change in consumer demand;
- ✦ The measurement and analysis of inequality, the Gini index and its decomposition;
- ✦ Tourism economics.

## SELECTED PUBLICATIONS

- Bernini, C., Freo, M., Gardini, A. (2004). Quantile Estimation of Frontier Production Function, *Empirical Economics*, 29: 373-381.
- Cavaliere, G., Fanelli, L., Gardini, A. (2006). Regional consumption dynamics and risk sharing in Italy. *International Review of Economics & Finance*, 15: 525-542.
- Cavaliere, G., Tassinari, G. (2001). Advertising effects on primary demand: a cointegration approach, *International Journal of Advertising*, 20: 319-339.
- Dagum, C., Costa, M. (2004). Analysis and measurement of poverty. Univariate and multivariate approaches and their policy implications. A case study: Italy, in Dagum, C. and Ferrari, G. (Eds.) *Household Behaviour, Equivalence Scales, Welfare and Poverty*, Berlin: Springer-Verlag, 221-271.
- Fabrizi, E., Ferrante, M.R., Pacei, S. (2005). Estimation of poverty indicators at sub-national level using multivariate small area models, *Statistics in Transition*, 7: 587-608.
- Fanelli, L., Mazzocchi, M. (2002). A cointegrated VECM demand system for meat in Italy. *Applied Economics*, 34: 1593-1605.
- Fanfani R., Brasili C. (2003). *Regional Differences in Chinese Agriculture: Results from the 1997 First National Agricultural Census*, *Journal of Peasant Studies*, 30: 18-44.
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- Filippucci, C., Ferrante, M.R. (1997). Individual Diaries and Expense Documents in the Italian Consumer Expenditure Survey, *Journal of Official Statistics*, 13: 113-121.
- Guizzardi, A. (2006). A methodological approach to the comparison of municipal balance-sheet figures. *Statistical Methods & Applications*, 15: 229 - 242.
- Henson, S.J., Mazzocchi, M. (2002). Impact of the BSE Crisis on UK Agribusiness: Results of an Event Study of Equity Prices, *American Journal of Agricultural Economics*, 84: 370-386.
- Mazzocchi, M. (2003). Time-varying parameters in the Almost Ideal Demand System: an empirical appraisal, *European Review of Agricultural Economics*, 30: 241-270.
- Mazzocchi, M. (2006). No News Is Good News: Stochastic Parameters versus Media Coverage Indices in Demand Models after Food Scares, *American Journal of Agricultural Economics*, 88: 727 - 741.
- Mazzocchi, M. (2006). Time patterns in UK demand for alcohol and tobacco: an application of the EM algorithm, *Computational statistics & data analysis*, 50: 2191 - 2205.
- Mazzocchi, M., Delle Monache, D., Lobb, A.E. (2006). A structural time series approach to modelling multiple and resurgent meat scares in Italy, *Applied Economics*, 38: 1677-1688.
- Pujol, J., Raggi, M., Viaggi, D. (2006). The potential impact of markets for irrigation water in Italy and Spain: a comparison of two study areas, *Australian Journal of Agricultural and Resource Economics*, 50: 361 - 380.

# DEMOGRAPHICS

## RESEARCH THEMES

- ✦ Analysis of bio-demographic and social phenomena;
- ✦ Causes and consequences of the long demographic cycles;
- ✦ Demographic incidence of the great epidemic diseases;
- ✦ Family, marriage and social mobility in Italy in past centuries;
- ✦ Gender and demographic behaviours in the Developing countries with emphasis on Northern and sub-Saharan Africa;
- ✦ Historical demography and the relationships among population, resources and environment;
- ✦ Sexual behaviour;
- ✦ The family in Italy: living arrangement, union disruption and dynamics following the break-up of a union;
- ✦ Characteristics of births out of wedlock in Italy in the European context;
- ✦ The participation in schooling and in vocational training of immigrants for social integration process.

## SELECTED PUBLICATIONS

- Angeli, A., Salvini, S., Ahmed J., Biru, A. (2001). *Gender issues, population and Development in Ethiopia*. Institute for Population Research, Italian National Council for Research (IRP-CNR) and Central Statistical Authority-Addis Ababa, Addis Ababa-Ethiopia, 1-78
- Bottini, A., Calcoli, F.C.F., Blanco-Villegas, M.J., Gueresi, P., Franceschi, M. G., Paoli, G., Cavicchi, S., Pettener, D. (2006). Migration matrices and surnames in populations with different isolation patterns: Val di Lima (Italian Apennines), Val di Sole (Italian Alps), and La Cabrera (Spain), *American Journal of Human Biology*, 18: 676-690
- Del Panta, L., Livi Bacci, M. (1977). Chronologie, intensité et diffusion des crises de mortalité en Italie: 1600-1850, *Population*, numéro spécial: 401-446
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- Di Bacco, M., Del Panta, L., Frederic, P., D'Amore, G., Lynnerup, N. (2006). The effect of unbalanced demographic structure on marriage and fertility patterns in isolated populations: the case of Norse settlements in Greenland, *Genus*, 62: 97-119
- Gueresi, P., Pettener, D., Veronesi, F. (2001). Marriage behaviour in the Alpine Non Valley from 1825 to 1923. *Annals of Human Biology*, 28: 157-171.
- Mazzuco, S., Mencarini, L., Rettaroli, R. (2005). Similarities and differences between two cohorts of young adults in Italy: Results of a CATI survey on transition to adulthood, *Demographic research*, 15: 105-146.
- Pinelli, A., Racioppi, F., Rettaroli, R. (Eds., 2007). *Genders in the Life Course*. Berlin: Springer.

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## MAIN RESEARCH AREA

Statistical Methodology  
 Demographics  
 Statistical Methodology  
 Applied Statistics & Economics  
 Applied Statistics & Economics  
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 Pillati Marilena  
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 Roverato Alberto  
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 Scagliarini Michele  
 Scardovi Italo  
 Soffritti Gabriele  
 Stracqualursi Luisa  
 Tassinari Franco  
 Tassinari Giorgio  
 Trivisano Carlo  
 Viroli Cinzia

## MAIN RESEARCH AREA

Statistical Methodology  
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# RESEARCH FUNDING AND PROJECTS

## NATIONAL FUNDING – NATIONAL INTEREST PROGRAMMES (PRIN)

- ❖ STATISTICAL METHODS AND MODELS FOR EVALUATING EDUCATION PROCESSES  
National co-ordinator: Paola Monari (paola.monari@unibo.it)
- ❖ FLEXIBLE CLASSES FOR DISTRIBUTIONS OBTAINED THROUGH SYMMETRY PERTURBATION: PROBABILISTIC, STATISTICAL AND APPLIED ISSUES  
Local co-ordinator: Antonella Capitanio (antonella.capitanio@unibo.it)
- ❖ METHODS FOR COLLECTION AND ANALYSIS OF ENVIRONMENTAL DATA  
Local co-ordinator: Daniela Cocchi (daniela.cocchi@unibo.it)
- ❖ FINANCIAL MARKETS AND ECONOMIC FLUCTUATIONS  
Local co-ordinator: Attilio Gardini (attilio.gardini@unibo.it)
- ❖ MULTIVARIATE STATISTICAL METHODS FOR AN INTEGRATED QUALITY ASSESSMENT OF PUBLIC SERVICES: EFFECTIVENESS-EFFICIENCY, SUPPLIER RISK, USER SATISFACTION  
Local co-ordinator: Angela Montanari (angela.montanari@unibo.it)
- ❖ THE ITALIAN DEMOGRAPHIC TRANSITION UNDER A MICRO-ANALYTIC PERSPECTIVE: FROM FERTILITY ANALYSIS TO THE STUDY OF REPRODUCTIVE BEHAVIOURS  
Local co-ordinator: Rosella Rettaroli (rosella.rettaroli@unibo.it)
- ❖ INDEX NUMBERS IN FINANCIAL MARKETS: PRICE AND QUALITY EFFECTS FOR SECTORAL AND INTERNATIONAL COMPARISONS  
Local co-ordinator: Michele Costa (michele.costa@unibo.it)
- ❖ MEASUREMENT AND ANALYSIS OF DELOCALIZATION EFFECTS ON THE PRODUCTION PROCESSES OF ITALIAN DISTRICT FIRMS.  
National co-ordinator: Carlo Filippucci (carlo.filippucci@unibo.it)
- ❖ STATISTICAL METHODS FOR PLANNING, CONTROL AND OPTIMIZATION OF TECHNOLOGICAL PROCESSES  
Local co-ordinator: Alessandra Giovagnoli (alessandr.giovagnoli@unibo.it)
- ❖ CLASSIFICATION AND REGRESSION TREES FOR ASYMMETRIC RESPONSE VARIABLES AND UNBALANCED CLASSES  
Local co-ordinator: Marilena Pillati (marilena.pillati@unibo.it)

## EU FUNDING - 6<sup>TH</sup> FRAMEWORK PROGRAMME

- ❖ MONIQA NETWORK OF EXCELLENCE: TOWARDS THE HARMONISATION OF ANALYTICAL METHODS FOR MONITORING QUALITY AND SAFETY IN THE FOOD SUPPLY CHAIN ([WWW.MONIQA.ORG](http://WWW.MONIQA.ORG))  
Local co-ordinator: Mario Mazzocchi (mario.mazzocchi@unibo.it)

# DOCTORAL PROGRAMMES

## STATISTICAL METHODOLOGY FOR SCIENTIFIC RESEARCH

This doctoral programme emphasizes the study and applications of the most advanced and innovative statistical techniques for scientific research. After a common introductory training, doctoral students choose one of the following specializations:

- Statistical Methodology
- Biostatistics
- Demographics and Social Statistics
- Applied Economics & Statistics, Econometrics

**Programme Director: Daniela Cocchi ([daniela.cocchi@unibo.it](mailto:daniela.cocchi@unibo.it))**

## AGRI-FOOD ECONOMICS & STATISTICS

This doctoral programme trains researchers and analysts of the Italian and international agricultural and food sector, by providing advanced statistical and econometric skills. The following research themes are emphasized after a common introductory training:

- Economic analysis of the agri-food sector and the food chain
- Agri-food policy analysis and impact assessment at national and international level
- Regional economics and econometric methods for trend-cycle analysis
- Quantitative methods for consumer research

**Programme Director: Roberto Fanfani ([roberto.fanfani@unibo.it](mailto:roberto.fanfani@unibo.it))**

# MASTER COURSES

## ANALYSIS AND MANAGEMENT OF THE CAR SECTOR

This MsC provides the skills for future firm operators, executives and managers in the Marketing, Sales, Post-sales, Customer, Communication, Management and Information Systems, within production and commercial firms of the car sector, with a focus on new distribution models and the variety of economic actors.

**Course director:** Sergio Brasini ([sergio.brasini@unibo.it](mailto:sergio.brasini@unibo.it))

## BIOSTATISTICS

The objective of this MsC is the training of experts in experimental design and observational studies, in statistical analysis of epidemiologic data, in statistical methods for pharmaceutical validation and the evaluation of therapy effectiveness, in statistical methods for human genetics, systems for ecological and bio-health monitoring, health impact assessment for environmental risks

**Course director:** Angela Montanari ([angela.montanari@unibo.it](mailto:angela.montanari@unibo.it))

## DEMOGRAPHIC SERVICES

This master aims to develop theoretical and applied skills for demographic and electoral services. More specifically, the objective is to train professionals in management and executive areas for planning and managing demographic and electoral services.

**Course director:** Lucia Pasquini ([lucia.pasquini@unibo.it](mailto:lucia.pasquini@unibo.it))

## TOURIST SERVICES: CULTURE, MANAGEMENT AND DEVELOPMENT

This MSc trains professional in management and organization of tourist development process, sustainable management of tourist firms and systems, with a focus on economic, law, management and geographical issues.

**Course director:** Marcella Gola ([marcella.gola@unibo.it](mailto:marcella.gola@unibo.it))

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  - Data from FAO (FaoSTAT)
  - Data from OECD (Source OECD)
  - Data from the Italian National Institute of Statistics (Istat)

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