

CURRICULUM VITAE – CINZIA VIROLI

Updated on 06/08/21

PERSONAL DATA

SCOPUS authorID 23494158600
ORCID: 0000-0002-3278-5266
WOS Researcher ID: F-5786-2014

EDUCATION

- BSc, Statistical and Economic Sciences, University of Bologna, Academic Year 1997-1998
- Ph.D. in Statistics, University of Bologna, 2003

ACADEMIC POSITION AND INSTITUTIONAL RESPONSIBILITIES

- 2017 – Full Professor, academic discipline SECS/S01, Department of Statistical Sciences, University of Bologna
- 2016 – Programme Director of the international Master Degree in Statistical Sciences, University of Bologna
- 2021 – Vice-Director of the Department of Statistical Sciences
- 2019 – Vice-President of the Scientific and Organizational Council of CLADAG (Classification and Data Analysis group of the Italian Statistical Society)
- 2011 – Member of the Board, Ph.D. School in Statistical Sciences, University of Bologna

PH.D. SUPERVISION

- Edoardo Redivo (XXXVI cycle, Ph.D. in Statistics)
- Lorenzo Mancini (XXX cycle, Ph.D. in Statistics)
- Chiara Sacco (XXIX cycle, Ph.D. in Statistics)
- Saverio Ranciati (XXVIII cycle, Ph.D. in Statistics)
- Elisabetta Bonafede (XXVII cycle, Ph.D. in Statistics)

POST-PH.D. SUPERVISION

- 2020-2021 Marco Berrettini (title of the project: Dynamic and epidemiological models for predicting and controlling the parasite outbreaks in Mediterranean farms)
- 2019-2020 Elena Geminiani (title of the project: Latent variable models for the analysis of graduates' satisfaction)
- 2018-2019 Francesca Fortunato (title of the project: Classification and dimension reduction for high dimensional data)
- 2015-2018 Matteo Farné (title of the project: Large covariance matrix estimation via low rank plus sparse decomposition)
- 2014-2015 Elisabetta Bonafede (title of the project: Differential Expression Analysis of RNA-SEQ Data)

PH.D. COURSES TAUGHT

- 2017-2021 – “Asymptotic Statistics” Ph.D. course in Statistical Sciences, University of Bologna
- 2014 – 2015 “Probability” Ph.D. course in Statistical Sciences, University of Bologna
- 2006 – 2009 Seminars on “Mixture models” Ph.D. course in Statistical Sciences, University of Bologna
- 2001 – 2006 “Inference and multivariate statistical analysis” Ph.D. course in General and Clinical Psychology, University of Bologna

PREVIOUS ACADEMIC POSITION AND INSTITUTIONAL RESPONSIBILITIES

- 2018 – 2021 Research Delegate for the Department of Statistical Sciences
- 2015 – 2019 Member of the Scientific and Organizational Council of CLADAG (Classification and Data Analysis group of the Italian Statistical Society)
- 2014 – 2017 Associate Professor, academic discipline: SECS/S01, Department of Statistical Sciences, University of Bologna
- 2006 – 2014 Assistant Professor, academic discipline: SECS/S01, Department of Statistical Sciences, University of Bologna
- 2003 – 2006 Post-doc researcher at the Department of Statistical Sciences, University of Bologna
- 2009 – 2016 Member of the evaluation panel of the national projects PRIN 2009, PRIN 2012, SIR 2014, VQR 2016, strategic projects of University of Florence (2016)
- 2016 Member of the evaluation committee of the Ph.D. program of University of Padova
- 2011 – 2015 Member of the Research Committee of the Department of Statistical Sciences, University of Bologna
- 2013 Member of the Interdisciplinary Commission for the evaluation of the research projects FARB, University of Bologna

AWARDS

- 2017 Ethel Raybould Visiting Fellowship at the School of Mathematics and Physics, The University of Queensland
- 2004 ‘Marco Polo’ Visiting Fellowship for a visiting position as Postdoctoral Fellow at the Department of Statistics, University of Stanford

RESEARCH INTERESTS

The main lines of research are in the context of multivariate data analysis and they concern dimension reduction strategies, latent variable models, model based clustering with particular focus on mixture models for complex data, and more recently classification methods for high-dimensional data and deep learning. The methodological advances have been applied to different scientific fields, including medicine, genetics, tourism, textual data analysis and economics. Overall, the results of the research activity have been published in more than 80 original papers in top international journals and proceedings, including Statistical Science,

Bayesian Analysis, Biometrika, Biometrics, Annals of Applied Statistics, Journal of Multivariate Analysis, Statistics and Computing etc.

She has been invited as keynote speaker at 7 international conferences and she participated to several scientific meetings and specialized research groups with invited presentations.

BIBLIOMETRIC INDEXES

- H-index Scopus: 12
- H-index WOS: 11
- H-index Google Scholar: 16

RESEARCH FUNDS (LAST 10 YEARS)

- 2020- Research Unit Coordinator of the European project “New Technologies, Tools and Strategies for a Sustainable, Resilient and Innovative European Aquaculture”, Horizon 2020.
- 2017-2020 Principal Investigator, Bologna University project “Analisi Statistica delle Anomalie”, Alma Idea 2017.
- 2017-2019 Principal Investigator of the Bologna University unit of the European research project “GRaduates Advancement and Development of University capacities in Albania (GRADUA)”, Key Action 2 - Capacity Building.
- 2017-18 Principal Investigator of the Bologna University unit of the reserch project “Big data For Multi-Agent Specialized System” funded by the Italian Ministry of Economic Development.
- 2015 Principal Investigator of the industrial project “ASK-Me” funded by Network Contact s.r.l.
- 2010-11 Investigator, National Research Project (PRIN), “Modelli Statistici multivariati per la valutazione dei Rischi”, Principal Investigator: Prof. Paolo Giudici

EDITORIAL ACTIVITY

- Associate Editor of Statistics and Computing (2011-2021)
- Associate Editor of Statistical Methods and Application (2020-)
- Associate Editor of the Journal of Classification (2020-)
- Reviewer for, among others, Annals of Applied Statistics (2011- 2021), Bayesian Analysis (2013), Bioinformatics (2009, 2011, 2019), Biometrics (2008, 2021), Computational Statistics & Data Analysis (2012-2021), Journal of the American Statistical Association (2017), Journal of Multivariate Analysis (2010, 2015, 2016), Journal of the Royal Statistical Society, Series B (2016-2018), Psychometrika (2008, 2013), Scandinavian Journal of Statistics (2011), Statistics and Computing (2010-2021), Statistics in Medicine (2016-2018)

MAJOR SCIENTIFIC COLLABORATIONS

- Prof. Geoffrey J. McLachlan, School of Mathematics and Physics, University of Queensland (Deep Gaussian Mixture Models)
- Prof. Ernst Wit, Dept. of Statistics and Probability, University of Groningen (Mixture models and statistical networks for genomic data)

- Dr Stéphane Robin, Senior researcher at the Institut National de la Recherche Agronomique, AgroParisTech, Paris (Differential expression analysis of NGS data)
- Dr. Claire Gormley, Associate Professor in the School of Mathematics and Statistics in University College Dublin (Infinite Mixtures of Infinite Factor Analyzers)
- In addition she collaborates with many members of the Dept. of Statistical Sciences in Bologna including prof. Silvia Cagnone, prof. Angela Montanari, prof. Giuliano Galimberti (Latent Variable Models, Mixture Models, Dimension Reduction)
- From 2010 she participates to the international summer working group on model based clustering organized by Prof. Adrian Raftery, University of Washington, USA, Prof. Gilles Celeux, Université Paris-Sud and Prof. Brendan Murphy, University College Dublin

ORGANIZATION OF INTERNATIONAL CONFERENCES

- Member of the Programme Committee, 12th Scientific Meeting of CLADAG, University of Cassino, 2019
- Head of the Programme and Organizing Committee of the summer school CLADAG on Clustering and Classification, 2017, Rimini
- Member of the Programme Committee, SIS 2017 (Meeting of the Italian Statistical Society), Firenze
- Member of the Organizing Committee, IFCS Conference of the International Federation of Classification Societies, 2015, Bologna
- Member of the Programme Committee, Pattern Recognition Applications and Methods, ICPRAM2014, France
- Head of the Organizing Committee, 20th Working Group on Model-Based Clustering, Bologna, 2013
- Member of the Programme Committee, 9th Scientific Meeting of CLADAG, University of Modena and Reggio Emilia, 2013
- Member of the Programme Committee, Pattern Recognition Applications and Methods, ICPRAM2013, Spain
- Member of the Programme Committee, Pattern Recognition Applications and Methods, ICPRAM2012, Portugal
- Member of the Organizing Committee, final meeting of the project PRIN 2006, "Multivariate methods and models for evaluating public services", 2009, Rimini
- Member of the Organizing Committee, summer school CLADAG on "Multivariate statistical methods for the analysis of clustered data", 2007, Bologna

INVITED PRESENTATIONS AS KEYNOTE SPEAKER

- Quantile-based classification, semi-plenary session at the 52th Journées de Statistique, Nice, France, 2021
- Recent advances on deep mixture models for the analysis of textual data, plenary session at the Workshop on Mixture Models, MIMO2021, Université de Rouen, France, 2021
- Deep Learning for Mixture Models, plenary session at the Workshop on Model-Based Clustering and Classification, MBC2, Catania, 2018
- Deep Gaussian Mixture Models, plenary session at XXV Journeys of Classification and Data Analysis, JOCLAD2018, Lisbona, Portugal
- Deep Mixtures, plenary session at the European Conference on Data Analysis, ECDA2017, University of Economics, Wrocław, Poland

- Classification by Quantiles, plenary session at the Conference of the International Federation of Classification Societies, IFCS2017, Tokyo, Japan
- Classification by Quantiles, plenary session at the Working Group on Model-Based Clustering Summer Session: Perugia, 2017
- Modeling overdispersion heterogeneity in differential expression analysis using mixtures, plenary session at the Twelfth international meeting on Computational Intelligence Methods for Bioinformatics and Biostatistics, Naples, 2015
- Mixtures of Negative Binomial distributions for modelling overdispersion in RNA-Seq data, plenary session Statlearn, Grenoble, France, 2015

MAIN INVITED PRESENTATIONS

- The importance of being clustered: Uncluttering the Trends of Statistics from 1970 to 2015, seminar held at the University of Queensland, School of Mathematics and Physics, Brisbane, Australia, 2017
- Looking skew from Antonella Capitanio's perspective, invited talk, EcoSta 2017
- Quantile-based supervised and unsupervised classification, seminar held at University College Dublin, UCD, Ireland, 2016
- A multivariate latent variable model for analyzing longitudinal mixed data, invited talk, ERCIM 2014, Pisa
- Quantile-based Classifiers, invited talk, ASC-IMS 2014 Conference, Sydney, Australia, 2014
- A Markov Switching regression model with non-Gaussian errors for investigating stock market behavior, invited talk, PLS 2014, Paris
- Quantile-based Classifiers, seminar held at the University of Queensland, School of Mathematics and Physics, Brisbane, Australia, 2014
- Modelling longitudinal data through matrix-variate normal mixtures, invited talk, SIS 2013, Brescia
- Model based clustering of multivariate spatio-temporal data: a matrix-variate approach, invited talk, COMPSTAT 2012, Cyprus
- On Matrix-variate Regression Analysis, seminar held at University Bocconi, Milano, 2012
- Model based clustering of multivariate spatio-temporal data, invited talk, SIS 2012, Rome
- Classifying three-way data through Matrix-Normal Mixtures, invited talk, SIS 2010, Padova
- A finite mixture model for multilevel data, invited talk, CLADAG 2009, Catania

MAIN PUBLICATIONS

Viroli, C., Anderlucci, L.

Deep Mixtures of Unigrams for uncovering Topics in Textual Data (2021) *Statistics and Computing*, 31, 22.

Anderlucci, L., Viroli, C.,

Mixtures of Dirichlet-Multinomial distributions for supervised and unsupervised classification of short text data (2020) *Advances in Data Analysis and Classification*, 14, pp. 759 - 770.

- Murphy, K., Viroli, C., Gormley, I.C.,
Infinite mixtures of infinite factor analysers (2020) *Bayesian Analysis*, 15(3), pp. 937–963
- Ranciati S.; Wit E.C.; Viroli C.,
Bayesian smooth-and-match inference for ordinary differential equations models linear in the parameters (2020) *Statistica Neerlandica*, 74(2), pp. 125-144.
- Ofelio, C., Guarniero, I., Cariani, A., Viroli, C., Bonaldo, A., Gatta, P.P., Parma, L.
Monitoring of common sole *Solea Solea* (L) captive broodstock from Northern Adriatic Sea over consecutive spawning seasons (2020) *Aquaculture Reports*, 18, 100495
- Anderlucci, L., Montanari, A., Viroli, C.
The Importance of Being Clustered: Uncluttering the Trends of Statistics from 1970 to 2015 (2019) *Statistical Science*, 34, pp. 280 - 300.
- Viroli, C., McLachlan, G.J.
Deep Gaussian mixture models (2019) *Statistics and Computing*, Volume 29, Issue 1, pp 43–51.
- Boattini A.; Sarno S.; Mazzarisi A.M.; Viroli C.; De Fanti S.; Bini C.; Larmuseau M.H.D.; Pelotti S.; Luiselli D., Estimating Y-Str Mutation Rates and Tmrca Through Deep-Rooting Italian Pedigrees (2019) *Scientific Reports*, 9(1),9032.
- Hennig, Christian; Viroli, Cinzia; Anderlucci, Laura,
Quantile-based clustering (2019), *Electronic Journal of Statistics*, 13, pp. 4849 – 4883.
- Parma, L., Badiani, A., Bonaldo, A., Viroli, C., Farabegoli, F., Silvi, M., Bonvini, E., Pirini, M., Gatta, P.P. Farmed and wild common sole (*Solea solea* L.): Comparative assessment of morphometric parameters, processing yields, selected nutritional traits and sensory profile (2019) *Aquaculture*, 502, pp. 63-71.
- Cagnone, S., Viroli, C.
Multivariate latent variable transition models of longitudinal mixed data: an analysis on alcohol use disorder (2018) *Journal of the Royal Statistical Society. Series C: Applied Statistics*, 67 (5), pp. 1399-1418.
- Bonvini, E., Bonaldo, A., Parma, L., Mandrioli, L., Sirri, R., Grandi, M., Fontanillas, R., Viroli, C., Gatta, P.P. Feeding European sea bass with increasing dietary fibre levels: Impact on growth, blood biochemistry, gut histology, gut evacuation (2018) *Aquaculture*, 494, pp. 1-9.
- Bernini, C., Cracolici, M.F., Viroli, C.
Does Tourism Consumption Behaviour Mirror Differences in Living Standards? (2017) *Social Indicators Research*, 134 (3), pp. 1157-1171.
- Ranciati, S., Viroli, C., Wit, E.C.
Mixture model with multiple allocations for clustering spatially correlated observations in the analysis of ChIP-Seq data (2017) *Biometrical Journal*, 59 (6), pp. 1301-1316.
- Sacco, C., Viroli, C., Falchi, M.
A statistical test for detecting parent-of-origin effects when parental information is missing

(2017) *Statistical Applications in Genetics and Molecular Biology*, 16 (4), pp. 275-289.

De Angelis, L., Viroli, C.

A Markov-switching regression model with non-Gaussian innovations: Estimation and testing (2017) *Studies in Nonlinear Dynamics and Econometrics*, 21 (2), art. no. 20150118.

Scirè, C.A., Carrara, G., Viroli, C., Cimmino, M.A., Taylor, W.J., Manara, M., Govoni, M., Salaffi, F., Punzi, L., Montecucco, C., Matucci-Cerinic, M., Minisola, G., and the Study Group for the Kick-Off of the Italian Network for Gout Study, Development and First Validation of a Disease Activity Score for Gout (2016) *Arthritis Care and Research*, 68 (10), pp. 1530-1537.

Bonafede, E., Picard, F., Robin, S., Viroli, C.

Modeling overdispersion heterogeneity in differential expression analysis using mixtures (2016) *Biometrics*, 72 (3), pp. 804-814.

Hennig, C., Viroli, C.

Quantile-based classifiers (2016) *Biometrika*, 103 (2), pp. 435-446.

Anderlucci, L., Viroli, C.

Covariance pattern mixture models for the analysis of multivariate heterogeneous longitudinal data (2015) *Annals of Applied Statistics*, 9 (2), pp. 777-800.

Ranciati, S., Viroli, C., Wit, E.

Spatio-temporal model for multiple ChIP-seq experiments (2015) *Statistical Applications in Genetics and Molecular Biology*, 14 (2), pp. 211-219.

Parma, L., Bonaldo, A., Pirini, M., Viroli, C., Parmeggiani, A., Bonvini, E., Gatta, P.P.

Fatty Acid Composition of Eggs and its Relationships to Egg and Larval Viability from Domesticated Common Sole (*Solea solea*) Breeders (2015) *Reproduction in Domestic Animals*, 50 (2), pp. 186-194.

Cagnone, S., Viroli, C.

A factor mixture model for analyzing heterogeneity and cognitive structure of dementia (2014) *AStA Advances in Statistical Analysis*, 98 (1), pp. 1-20.

Calò, D.G., Montanari, A., Viroli, C.

A hierarchical modeling approach for clustering probability density functions (2014) *Computational Statistics and Data Analysis*, 71, pp. 79-91.

Viroli, C.

On matrix-variate regression analysis (2012) *Journal of Multivariate Analysis*, 111, pp. 296-309.

Viroli, C.

Using factor mixture analysis to model heterogeneity, cognitive structure, and determinants of dementia: An application to the Aging, Demographics, and Memory Study (2012) *Statistics in Medicine*, 31 (19), pp. 2110-2122.

Picardi, A., Viroli, C., Tarsitani, L., Miglio, R., de Girolamo, G., Dell'Acqua, G., Biondi, M.

Heterogeneity and symptom structure of schizophrenia (2012) *Psychiatry Research*, 198 (3), pp. 386-394.

Cagnone, S., Viroli, C.

A factor mixture analysis model for multivariate binary data (2012) *Statistical Modelling*, 12 (3), pp. 257-277.

Viroli, C.

Model based clustering for three-way data structures (2011) *Bayesian Analysis*, 6 (4), pp. 573-602.

Viroli, C.

Finite mixtures of matrix normal distributions for classifying three-way data (2011) *Statistics and Computing*, 21 (4), pp. 511-522.

Montanari, A., Viroli, C.

Maximum likelihood estimation of mixtures of factor analyzers (2011) *Computational Statistics and Data Analysis*, 55 (9), pp. 2712-2723.

Montanari, A., Viroli, C.

Dimensionally reduced mixtures of regression models (2011) *Journal of Statistical Planning and Inference*, 141 (5), pp. 1744-1752.

Montanari, A., Viroli, C.

Heteroscedastic factor mixture analysis (2010) *Statistical Modelling*, 10 (4), pp. 441-460.

Viroli, C.

Dimensionally reduced model-based clustering through Mixtures of Factor Mixture Analyzers (2010) *Journal of Classification*, 27 (3), pp. 363-388.

Calò, D.G., Viroli, C.

A dimensionally reduced finite mixture model for multilevel data (2010) *Journal of Multivariate Analysis*, 101 (10), pp. 2543-2553.

Montanari, A., Viroli, C.

The independent factor analysis approach to latent variable modelling (2010) *Statistics*, 44 (4), pp. 397-416.

Montanari, A., Viroli, C.

A skew-normal factor model for the analysis of student satisfaction towards university courses (2010) *Journal of Applied Statistics*, 37 (3), pp. 473-487.

Galimberti, G., Montanari, A., Viroli, C.

Penalized factor mixture analysis for variable selection in clustered data (2009) *Computational Statistics and Data Analysis*, 53 (12), pp. 4301-4310.

Viroli, C.

Bayesian inference in non-Gaussian factor analysis (2009) *Statistics and Computing*, 19 (4), pp. 451-463.

Montanari, A., Calò, D.G., Viroli, C.

Independent factor discriminant analysis (2008) *Computational Statistics and Data Analysis*, 52 (6), pp. 3246-3254.

Caló, D.G., Viroli, C.

Finding relevant linear manifolds in classification by Gaussian mixtures (2008) *Communications in Statistics - Theory and Methods*, 37 (19), pp. 3040-3053.