Eleonora Arnone

Assistant Professor (RTD-B)
Università degli Studi di Torino, Italy

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Personal information

Nationality Italian
Date of Birth 25/07/1989

Research Field

Semiparametric and Nonparametric Regression, Functional Data Analysis, Robust Methods, Nonparametric Testing, Complex Data

Positions

2022.11 - now **Assistant professor (RTD-B) in Statistics**, *Dipartimento di Management, Università degli Studi di Torino, Italy.*

2021.12 - 2022.10 **Post-doc (Assegno B - tipo Senior)**, *Dipartimento di Scienze Statistiche, Università degli Studi di Padova, Italy.*

Topic: Robust methods for spatial and functional data over multidimensional complex domains

2017.12 - 2021.12 **Post-doc**, *MOX, Dipartimento di Matematica, Politecnico di Milano, Italy.*

Topic: Spatial regression with differential regularization

2014.09 - 2014.10 **Business Intelligence Developer Junior**, *System Evolution, Milan, Italy.*

2014.02 - 2014.08 **Internship**, *System Evolution, Milan, Italy.*

2014.01 **Teaching**, *High school IPC Carlo Verri, Busto Arsizio, Italy.*

Education

2014 - 2018 **Ph.D. in Mathematical Models and Methods in Engineering**, *Politecnico di Milano, Italy.*

Final Dissertation: *Regression with PDE penalization for modelling functional data with spatial and spatio-temporal dependence.* Supervisors: Prof. Laura M. Sangalli (Politecnico di Milano), Prof. Fabio Nobile (École Polytechnique Fédérale de Lausanne)

2011 - 2013 **Mathematics MSc**, *University of Milano-Bicocca, Italy.*

Final mark 110/110 cum laude

Final Dissertation: *Interpolation of arbitrary topology triangular mesh with Loop's subdivision surfaces.* Supervisor: Prof. Lucia Romani (University of Milano-Bicocca)

2010 - 2013 **Mathematics BSc**, *University of Milano-Bicocca, Italy.*

Final mark 110/110

Final Dissertation: *Periodic points and Sharkovsky's Theorem.* Supervisor: Prof. Davide L. Ferrario (University of Milano-Bicocca)

Visiting

2017.04 - 2017.07 **École Polytechnique Fédérale de Lausanne (EPFL), Switzerland**, *Supervised by prof. Fabio Nobile*, three months.

2016.10 - 2016.11 **University of Bonn, Germany**, *Supervised by prof. Alois Kneip*, one month.

2016.04 - 2016.07 **École Polytechnique Fédérale de Lausanne (EPFL), Switzerland**, *Supervised by prof. Fabio Nobile*, three months.

Publications

2022 **Eleonora Arnone**, Federico Ferraccioli, Clara Pigolotti, Laura M. Sangalli, A roughness penalty approach to estimate densities over two-dimensional manifolds. *Computational Statistics & Data Analysis*, DOI : 10.1016/j.csda.2022.107527.

2021 **Eleonora Arnone**, Laura M. Sangalli, Andrea Vicini, Smoothing spatio-temporal data with complex missing data patterns. *Statistical Modelling*, DOI: 10.1177/1471082X211057959.

2021 Federico Ferraccioli, **Eleonora Arnone**, Livio Finos, James O. Ramsay, Laura M. Sangalli, Nonparametric density estimation over complicated domains. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 2021, 83, 346-368.

2021 **Eleonora Arnone**, Alois Kneip, Fabio Nobile, Laura M. Sangalli, Some first results on the consistency of spatial regression with partial differential equation regularization. *Statistica Sinica*. DOI: 10.5705/ss.202019.0346

2021 **Eleonora Arnone**, Laura M. Sangalli, Spatio-temporal regression with differential penalization for the reconstruction of partially observed signals. *Book of short paper SIS 2021.* Pearson, 2021. p. 890-894.

2020 **Eleonora Arnone**, Alois Kneip, Fabio Nobile, Laura M. Sangalli, Some numerical test on the convergence rates of regression with differential regularization. In: *International Workshop on Functional and Operatorial Statistics*. Springer, Cham, 2020. p. 1-5.

2020 **Eleonora Arnone**, Mara S. Bernardi, Laura M. Sangalli, Piercesare Secchi, Analysis of Telecom Italia Mobile phone data by space-time regression with differential regularization. In: *International Workshop on Functional and Operatorial Statistics*. Springer, Cham, 2020. p. 5-10.

2020 Federico Ferraccioli, Laura M. Sangalli, **Eleonora Arnone**, Livio Finos, A functional data analysis approach to the estimation of densities over complex regions. In: *International Workshop on Functional and Operatorial Statistics*. Springer, Cham, 2020. p. 77-82.

2019 **Eleonora Arnone**, Laura Azzimonti, Fabio Nobile and Laura M. Sangalli, Modeling spatially dependent functional data via regression with differential regularization. *Journal of Multivariate Analysis*, 2019, 170: 275-295.

2019 **Eleonora Arnone**, Laura Azzimonti, Fabio Nobile and Laura M. Sangalli, Regression with time-dependent PDE regularization for the analysis of spatio-temporal data. In: *Smart statistics for smart applications*. Pearson, 2019. p. 649-652.

2018 **Eleonora Arnone**, Regression with PDE Penalization for Modelling Functional Data with Spatial and Spatio-Temporal Dependence, Politecnico di Milano, 2018. *Ph.D. thesis*.

2017 **Eleonora Arnone**, Laura Azzimonti, Fabio Nobile and Laura M. Sangalli, A time-dependent PDE regularization to model functional data defined over spatio-temporal domains. In: *Functional Statistics and Related Fields*. Springer, Cham, 2017. p. 41-44.

Articles under review and in preparation

2022+ **Eleonora Arnone**, Luca Negri, Ferruccio Panzica, Laura M. Sangalli, Analyzing data in complicated 3D domains: spatial regression and functional principal component analysis. *Under review.*

2022+ **Eleonora Arnone**, Carlo De Falco, Luca Formaggia, Giorgio Meretti, Laura M. Sangalli, Optimized computational techniques for spatial regression models with differential regularization. *Under review.*

2022+ **Eleonora Arnone**, Elia Cunial, Laura M. Sangalli, Generalized spatio-temporal regression with PDE penalization. *In preparation.*

2022+ **Eleonora Arnone**, Michelle Carey, Laura M. Sangalli, fdaPDE: An R Package for Spatial Regression with Differential Regularization. *In preparation.*

2022+ Cristian Castiglione, **Eleonora Arnone**, Mauro Bernardi, Alessio Farcomeni, Laura M. Sangalli, Spatial quantile regression with PDE regularization. *In preparation.*

2022+ Harold A. Hernández-Roig, M. Carmen Aguilera-Morillo, **Eleonora Arnone**, Rosa E. Lillo, Laura M. Sangalli, Penalized rank-one approximation to functional PLS regression. *In preparation.*

2022+ Letizia Clementi, **Eleonora Arnone**, Laura M. Sangalli, Understanding brain connectivity in schizophrenic patients via functional principal component analysis. *In preparation.*

Reviewer for

- Annals of Applied Statistics
- Biometrika
- Bulletin of Engineering Geology and the Environment
- Environmental and Ecological Statistics
- Journal of Agricultural, Biological, and Environmental Statistics
- Journal of Applied Statistics
- Journal of Computational and Graphical Statistics
- Numerical Algorithms
- Statistical Methods & Applications
- Spatial Statistics

Master thesis co-supervisor

April 2023* **Alessandro Melchionda**, *Mixed-effects models in spatial regression with PDE regularization*, Mathematical and Computer Science Engineering at Politecnico di Milano.

December 2022* **Alessandro Palummo**, *Efficient implementation of SR-PDE methods*, Mathematical and Computer Science Engineering at Politecnico di Milano.

September 2022 **Matteo Carbucicchio**, *Visualizing complex multidimensional data*, Mathematical Engineering at Politecnico di Milano.

September 2022 **Simone Panzeri**, *Nonparametric intensity estimation for spatio-temporal Poisson processes*, Mathematical Engineering at Politecnico di Milano.

July 2022 **Blerta Begu**, *Nonparametric intensity estimation for spatio-temporal Poisson processes*, Mathematical Engineering at Politecnico di Milano.

July 2022 **Aldo Clemente**, *Spatial regression with differential regularization on planar linear networks*, Mathematical Engineering at Politecnico di Milano.

April 2022 **Michele Cavazzutti**, *Sign-Flip tests for spatial regression with differential regularization*, Mathematical Engineering at Politecnico di Milano.

April 2022 **Cristina Galimberti**, *Sign-flip inference for the nonparametric component in regularized spatial regression*, Mathematical Engineering at Politecnico di Milano.

April 2022 **Giovanni Pigani**, *Semiparametric mixed-effects models in spatial regression with differential regularization*, Mathematical Engineering at Politecnico di Milano.

July 2021 **Martina Massardi**, *Efficient solution of spatio-temporal regression with PDE penalization*, Mathematical Engineering at Politecnico di Milano.

July 2021 **Federica Mattina**, *SR-PDE on networks: denstity estimation and regression*, Mathematical Engineering at Politecnico di Milano.

April 2021 **Elia Cunial**, *Generalized semi-parametric linear models penalized with Partial Differential Equations*, Mathematical Engineering at Politecnico di Milano.

April 2021 **Gianmatteo Rinaldi**, *Handling Anisotropy in Spatial Regression with PDE Regularization*, Mathematical Engineering at Politecnico di Milano.

April 2021 **Giorgio Meretti**, *Optimized Computational Techniques for Spatial Regression Models with Differential Regularization*, Mathematical Engineering at Politecnico di Milano.

October 2020 **Jiyoung Kim**, *Mixed-Effect Models in Spatial Regression with Partial Differential Equation Regularization*, Mathematical Engineering at Politecnico di Milano.

June 2020 **Andrea Vicini**, *Space-time regression with differential regularization for partially observed spatially dependent functional data*, Mathematical Engineering at Politecnico di Milano.

April 2020 **Clara Pigolotti**, *Density estimation with differential regularization*, Mathematical Engineering at Politecnico di Milano.

April 2018 **Luca Negri**, *Functional principal component analysis over volumetric domains with neuroimaging applications*, Mathematical Engineering at Politecnico di Milano.

* ongoing thesis, expected date

Master projects co-supervisor

COURSES: **APSC**, *Advanced Programming for Scientific Computing*, Mathematical Engineering at Politecnico di Milano.

NAPDE, *Numerical Analysis for Partial Differential Equations*, Mathematical Engineering at Politecnico di Milano.

AppStat, *Applied Statistics*, Mathematical Engineering at Politecnico di Milano.

CompStat, *Computational Statistics*, Mathematical Engineering at Politecnico di Milano.

December 2022* **Simone Piazza - Davide Serra**, *Iterative solution of spatio-temporal regression with PDE penalization*, NAPDE + APSC.

December 2022* **Alessandro Melchionda**, *Semiparametric mixed-effects models in fdaPDE*, APSC.

September 2022 **Matteo Tomasetto**, *Parameter cascading for the estimation of anisotropy in SR-PDE*, APSC.

June 2022 **Lorenzo Ferrara - Erica Bistacchia - Scott Pesenti - Costanza Cantalini**, *Understanding human brain connectivity*, AppStat.

June 2022 **Chiara Zelioli - Simone Piazza - Giorgio Romano - Eugenio Varetti**, *Understanding human brain connectivity*, AppStat.

June 2022 **Sabrina Negroni - Luca Muscarnera - Flavia Petruso - Camilla Santi**, *Understanding human brain connectivity*, AppStat.

June 2022 **Thomas Mandato - Roberto Sala - Roberto Valendino - Jacopo Invernizzi**, *Understanding human brain connectivity*, AppStat.

June 2022 **Michela Ceoloni - Edoardo Conchetto**, *Depth measures for functional data over two-dimensional spatial domains*, APSC.

February 2022 **Aldo Clemente**, *Regression and density estimation over planar networks*, APSC.

February 2022 **Blerta Begu - Simone Panzeri**, *Density estimation over spatio-temporal domains*, APSC.

February 2022 **Davide Rinaldoni - Francesca Venturi**, *Parameter estimation for spatio-temporal regression with PDE penalization*, CompStat.

January 2022 **Enrico Dall'Acqua - Giulia Ferla**, *fdaPDE: Smoothing parameter optimization through generalized cross validation for space-time problems*, APSC.

September 2021 **Michele Cavazzutti - Cristina Galimberti**, *Some first uncertainty quantification tool for fdaPDE - UQ4fdaPDE*, APSC.

September 2021 **Francesca Paola Josefina Anfossy Araneda - Tommaso Barbieri - Alessandro Melchionda**, *An application of SR-PDE to the study of Covid mortality in Italy*, NAPDE.

July 2021 **Beatrice Crippa**, *Efficient preconditioners in fdaPDE*, APSC.

February 2021 **Martina Massardi - Stefano Spaziani**, *fdaPDE: an efficient iterative method for spatio-temporal regression with PDE regularization*, NAPDE + APSC.

September 2020 **Giorgio Meretti - Andrea Poiatti**, *fdaPDE: Smoothing parameter optimization through generalized cross validation*, APSC.

September 2020 **Gian Matteo Rinaldi**, *A Deep Dive into fdaPDE*, APSC.

June 2020 **Alberto Colombo - Giulio Perin**, *Generalized spatial regression with PDE penalization*, APSC.

February 2020 **Giovanni Ardenghi - Andrea Vicini**, *Space-time regression models with differential regularization: fdaPDE package*, APSC.

February 2020 **Lorenzo Ghilotti - Clara Pigolotti**, *Density estimation with differential regularization*, APSC.

February 2020 **Jiyoung Kim**, *fdaPDE: Tree Search Algorithm*, APSC.

January 2020 **Alessandra Colli - Luca Colombo**, *fdaPDE 1.0*, APSC.

September 2019 **Matteo Gianella**, *Geostatistics meet PDEs*, NAPDE.

June 2019 **Stefano Balzan - Federica Filippini - Lorenzo Fiorentini - Virginie Marchionni - Marco Teodori**, *MYCONNECTOME: Bad moods may affect the main structure of brain connectivity*, AppStat.

* ongoing project, expected date

Talks at academic conferences and lectures

December 2022* **[invited] 15th International Conference of the ERCIM WG on Computational and Methodological Statistics**, *Penalized regression over 2D planar networks*, London, United Kingdom.

September 2022 **[invited] RSS International Conference 2022**, *Density estimation over complicated domains*, Aberdeen, Scotland.

July 2022 **[invited] IFCS 2022 Classification and Data Science in the Digital Age 17th conference of the International Federation of Classification Societies**, *Generalized spatio-temporal regression with PDE penalization*, Porto, Portugal.

June 2022 **Seminar for the course "Tools for scientific research software development and distribution"**, *Binding C++ and R: Rcpp*, Politecnico di Milano, Italy.

November 2021 **Seminar**, *Density estimation over complicated domains*, Politecnico di Milano, Italy.

June 2021 **5th International Workshop on Functional and Operatorial Statistics**, *A Functional Data Analysis Approach to the Estimation of Densities over Complex Regions*, Virtual conference.

June 2021 **SIS 2021 50th meeting of the Italian statistical society**, *Oral presentation: Spatio-temporal regression with differential penalization for the reconstruction of partially observed signals*, Virtual conference.

December 2020 **[invited] 13th International Conference of the ERCIM WG on Computational and Methodological Statistics**, *Oral presentation: Modeling partially observed data with spatio-temporal dependence via regression with PDE penalization*, Virtual conference.

June 2019 **SIS 2019 Smart Statistics for Smart Applications**, *Oral presentation: Regression with time-dependent PDE regularization for the analysis of spatio-temporal data*, Milan, Italy.

April 2019 **[invited] Final CRoNoS meetings & Workshop on Multivariate Data Analysis**, *Oral presentation: Consistency of the estimator in Spatial Regression with PDE penalization*, Limassol, Cyprus.

September 2018 **[invited] 2nd Satellite CRoNoS Workshop on Functional Data Analysis**, *Oral presentation: Modelling spatio-temporal dependent functional data via regression with differential regularization*, Iasi, Romania.

June 2018 **[invited] 4th Conference of the International Society for Nonparametric Statistics**, *Oral presentation: Consistency of the estimator in Spatial Regression with PDE penalization*, Salerno, Italy.

December 2017 **[invited] 10th International Conference of the ERCIM WG on Computational and Methodological Statistics**, *Oral presentation: A time-dependent PDE regularization to model functional data defined over spatio-temporal domains*, University of London, United Kingdom.

September 2017 **[invited] CMO Workshop, Distributed Data for Dynamics and Manifolds**, *Oral presentation: A time-dependent PDE regularization to model functional data defined over spatio-temporal domains*, Oaxaca, Mexico.

July 2017 **27th Annual Conference of The International Environmetrics Society joint with GRASPA 2017 on Climate and Environment**, *Oral presentation: A time-dependent PDE regularization to model functional data defined over spatio-temporal domains*, Bergamo, Italy.

June 2017 **Fourth International Workshop on Functional and Operatorial Statistics**, *Poster presentation: A time-dependent PDE regularization to model functional data defined over spatio-temporal domains*, A Coruña, Spain.

October 2015 **Seminar**, *Application of Functional Data Analysis to the study of the aerodynamic interaction between a helicopter and a ground obstacle*, Politecnico di Milano, Italy.

* future conference

Other scientific activities

2022 - now **Maintainer of CRAN Task View on Functional Data Analysis.** https://CRAN.R-project.org/view=FunctionalData

2020 - now **Maintainer of the R package fdaPDE.** Eleonora Arnone, Laura M. Sangalli, Eardi Lila, Jim Ramsay, Luca Formaggia (2022), *fdaPDE: functional data analysis and Partial Differential Equations; statistical analysis of functional and spatial data, based on regression with partial differential regularizations*, R package version 1.1-4, http://CRAN.R-project.org/package=fdaPDE

May 2018 **Co-organizer** of StaTalk - *Complex data and real world applications.* Politecnico di Milano, https://statalk2018polimi.github.io/

Member of Istituto Nazionale di Alta Matematica (INdAM)

Teaching Activity

2021 - 2022 **Teaching assistant**, Applied Statistics, Master Program in Mathematical Engineering, Politecnico di Milano ∼*150 students* (course held in english)

2020 - 2021 **Teaching assistant**, Statistics, Bachelor Program in Biomedical Engineering, Politecnico di Milano ∼*150 students*

Tutor, class: Statistics and Proability, Bachelor Programs of Politecnico di Milano ∼*25 students*

2019 - 2020 **Teaching assistant**, Statistics, Bachelor Program in Mathematical Engineering, Politecnico di Milano ∼*250 students*

Tutor, class: Statistics and Proability, Bachelor Programs of Politecnico di Milano ∼*25 students*

2018 - 2019 **Teaching assistant**, Statistics, Bachelor Program in Biomedical Engineering, Politecnico di Milano ∼*150 students*

Teaching assistant, class: Statistics, Bachelor Program in Energy Engineering, Politecnico di Milano ∼*250 students*

2017 - 2018 **Teaching assistant**, Statistics, Bachelor Program in Biomedical Engineering, Politecnico di Milano ∼*150 students*

Teaching assistant, class: Statistics, Bachelor Program in Energy Engineering, Politecnico di Milano ∼*250 students*

2016 - 2017 **Teaching assistant**, Statistics, Bachelor Program in Biomedical Engineering, Politecnico di Milano ∼*150 students*

Teaching assistant, class: Statistics, Bachelor Program in Energy Engineering, Politecnico di Milano ∼*250 students*

2015 - 2016 **Teaching assistant**, Statistics, Bachelor Program in Energy Engineering, Politecnico di Milano ∼*250 students*

IT Skills

Systems	Windows, Linux
Languages	C ++
Software	R, Matlab, FreeFem++, SAS, Office tools pack

Language Skills

Italian	Mother tongue	
English	Fluent	*TOEFL – mark: 100/120 - C1 level*
French	Intermediate	

Autorizzo al trattamento dati ai sensi del GDPR 2016/679 del 27 aprile 2016 (Regolamento Europeo relativo alla protezione delle persone fisiche per quanto riguarda il trattamento dei dati personali).