

Europass Curriculum Vitae

Personal information

Surname(s) / First name(s)

Desired employment/ Occupational field

Research experience

1 March 2016 - 28 February
2017

Main activities and
responsibilities

Name and address of employer

Skills awarded

November 2012 - February
2016

Title of qualification awarded

Main activities and
responsibilities

Name and address of employer

Skills awarded

March 2013 - December 2016

Title of qualification awarded

Main activities and
responsibilities

Name and address of employer

Skills awarded

Education and Training

13 January 2013 - 4 April 2016

Final grade

Thesis

Topic

Supervisor

Data driven modeling of complex systems

Research Fellow at Italian National Council of Research, Institute of Applied Mathematics and Computer Science

Development of a new computational solution for the subgraphs isomorphism problem by using graph databases: a pattern matching approach.

Italian National Council of Research, Institute of Applied Mathematics and Computer Science, Genova - Italy

Graph isomorphism, Data visualization, Computational geometry, Mesh analysis, Assembly models analysis

Collaborator of TOPDRIM EU Project.

Young researcher

Development of new algorithms and methods for topological data analysis and data modelling.

Future and Emerging Technologies (FET) programme within the Seventh Framework Programme (FP7) for Research of the European Commission, under the FP7 FETProactive Call 8- DyMCS, Grant Agreement TOPDRIM, number FP7-ICT-318121.

Topological data analysis

Collaborator of A.D.A.M. - Start-up, Spin-off at University of Salento

Researcher collaborator

Development of new Computer Assisted Detection (CAD) systems for cancer detection in magnetic resonance images analysis. The systems are based on statistical and machine learning approaches, e.g. principal component analysis (PCA), independent component analysis (ICA), linear discriminant analysis (Fisher-LDA) and artificial neuronal networks (back propagation, feed-forward, Levenberg-Marquardt) and are coded in MATLAB.

A.D.A.M. - spin-off at University of Salento

Statistical data analysis and machine learning

Ph.D. in Information Science and Complex Systems - University of Camerino - Italy

Ph.D. cum laude

Topological Data Analysis for Modeling Complex Systems

Design and application of a new data driven methodology for extracting models of (biological) complex systems. The methodology is based on the geometrical representation of the data by applying techniques based on algebraic topology and then it uses formal methods in computer sciences, i.e. automata theory, for modeling the behavior of such systems.

Prof. E. Merelli

October 2012	Master's degree in Computer Science at University of Camerino - Italy
Final grade	110 cum laude (out of 110)
Thesis	Data driven modeling of pulmonary embolism
Topic	I used techniques inspired by algebraic topology and machine learning for deriving a new score system (i.e., clinical prediction rules) for assigning a probability of occurrence of "pulmonary embolism". The innovations introduced by this system are: the system does not use imaging analysis (e.g., computerized), a patient is observed by 25 clinical variables and then geometrically represented by simplicial complexes. The analysis of simplicial complexes allows to extract the meaningful clinical variables that are used for training an artificial neuronal network for predicting the final diagnose.
Supervisor	Prof. E. Merelli
October 2009	Bachelor's degree in experimental Physics at University of Salento - Lecce - Italy
Final grade	98 (out of 110)
Thesis	A non destructive tomographic device (NDT)
Topic	I assembled a tomographic device of first generation (the sample moves and the x-ray beam is in a fixed position) to be used for checking the presence of explosive powder in small containers of common use. The main feature of the hardware is that it was built by using cheapest small step-by-step AC motors. The algorithms for the profile reconstruction and analysis was coded in Matlab. For the sake of clarity, the algorithm for the profile reconstruction was based on the Raydon transformation. Prof. G. De Nunzio
Supervisor	
October 2008	Summer student at Fermilab (Chicago, USA)
Occupation or position held	Collaborator of the ILC experiment - Group 4 - Italian team
Main activities and responsibilities	Development of new algorithms for the study of efficiency of tracking detectors in High Energy physics.
Supervisor	Corrado Gatto - Italian National Institute of Nuclear Physics (INFN)
July 2001	Written and Spoken English for Speakers of Other Languages
Grade	6 (out of 12)
Institution	Trinity College London (UK)
Teaching experience	
February 2015	Substitute teacher in a public high school - Professional Institute G. Antinori Civitanova Alta (Mc) - Italy.
From March 2013	Teaching at University of Camerino, School of Science and Technology, Computer Science Division
March 2015 - June 2015	Algorithms and Data Structure Laboratory of the B.Sc degree program in Computer Science (6 CFU)
November 2015 - March 2015	Software engineering exam committee member (cultore della materia)
March 2014 - June 2014	Algorithms and Data Structure Laboratory of the B.Sc degree program in Computer Science (6 CFU)
November 2014 - March 2014	Software engineering exam committee member (cultore della materia)
March 2013 - June 2013	Algorithms and Data Structure Laboratory of the B.Sc degree program in Computer Science (6 CFU)
March 2015 - May 2015	Lecturer of Distributed Calculus and Coordination Laboratory of the M.Sc degree program in Computer Science (6 CFU)
March 2014 - May 2014	Lecturer of Distributed Calculus and Coordination Laboratory of the M.Sc degree program in Computer Science (6 CFU)
March 2013 - May 2013	Lecturer of Distributed Calculus and Coordination Laboratory of the M.Sc degree program in Computer Science (6 CFU)
May - June 2011	Teacher for the professional training course: "Photographer in the digital age".
	- Discipline: optical physics. Organized by Ges.For. Bari - Italy.

B.Sc. Thesis

Other Jobs

March 2015

Title of qualification awarded
Principal subjects/Occupational
skills covered
Owner

January 2015

- J. Binchi: A new isomorphism for graphs and simplicial complexes
- R. Palladino: A graph rewriting approach applied to the homological scaffold of biological complex networks and for modeling their behavior (in progress). Joint with Catamarca University (Argentina)
- A. Bocci: analysis of non-relational Database for the Leaf House. Joint with Loccioni Group.
- P. Giuliadori: Prediction of energy consumption. Joint with Loccioni Group.
- A. Peretti: Linear regression with Python-GPU.
- E. Ruffini: Energy consumption prediction with Markov-Chain and probabilistic automata. Joint with Loccioni Group.
- S. Belluccini: jPHEngine: A New Java High Performance Library For Computing Persistent Homology
- M. Vici: Topological analysis of embedded electrical signals. Joint with Loccioni Group.
- E. Rivosecchi: Arduino for improving the Human Machine Interface.
- L. Rossi: Application of persistent homology for finding minimum cycles in undirected graphs.
- J. De Berardinis: A semi-automatic tool for clustering.
- F. Svampa: A color based objects detection and recognition with Microsoft Kinect. Joint with Loccioni Group.
- J. Binchi: jHoles - a java high performance tool for computing Clique Weight Rank Persistent Homology. Joint with Loccioni Group.
- M. Mariani: Infographics: an innovative approach for data visualization. Joint with Loccioni Group.
- D. Senigagliaesi: Graphical optimization of the infographics for the Leaf Farm web-portal. Joint with Loccioni Group.

Web-master

Web-site designer and developer.

Designing and development of the web-site <http://www.tendapuzzle.it> based on HTML5, PHP, MySQL, Ajax, and CSS

TREND S.R.L. Street: Via W. Tobagi, Tolentino (Mc) - Italy.

Web-master

Supervising/Co- Supervising experience

Ph.D Thesis

- M. Piangerelli: A topological approach for fault detection in runtime system: the epileptic brain case study (ongoing)

Title of qualification awarded
Principal subjects/Occupational skills covered
Owner
January 2012
Title of qualification awarded
Principal subjects/Occupational skills covered
Computer skills and competences
From March 2012
Title of qualification awarded
Principal subjects/Occupational skills covered
Driving licence(s)
Name and type of organization providing the qualification
Additional information

Scientific highlights

Topics

Technical skills and competences

Personal skills and competences

Mother tongue(s)
Other language(s)

Self-assessment
European level^()*

Web-site designer and developer.

Designing and development of the web-site <http://www.camerino2015.topdrim.eu> based on HTML5, PHP, MySQL, and CSS Topdrim Summer School - Topdrim Eu Project.

Web-master	Understanding	Speaking		Writing
	Listening	Reading	Spoken interaction	Spoken production
Web-site designer and developer.				
Designing and development of the web-site http://www.micarellisport.com based on HTML, PHP, MySQL, and CSS		B2	B2	B2

^(*)Common European Framework of Reference (CEF) level
Micarelli Sport. Via D'Accorso, Camerino (Mc) - Italy.

Data acquisition and analysis: Matlab, R, Weka, Programming Languages/Scripting/Editing: Advanced Data Analysis in Medicine - A.D.A.M. Start-Up, Spin-off at University of Salento
Java, C++ LaTeX (several professional works), (X/H)TML, CSS, PHP, ASP. Databases: SQL.
Co-founder
Advanced knowledge of Microsoft Access and
Development of a computer assisted detection (CAD) system for cancer detection in
MySQL Operating systems: All Microsoft OS's and Linux-based systems. CAM and CAD.
Artem, Mach, ArchiCAD
magnetic resonance images analysis.

Advanced Data Analysis in Medicine - A.D.A.M. Spin-off at University of Salento.
European driving license, class B.
<http://www.adamgroup.it>

Physics. Computer Science. Statistics. Network analysis. Applied topology. Machine learning.
Computer Science

Advanced statistics: principal component analysis (PCA), independent component analysis (ICA), linear discriminant analysis (Fisher-LDA), advanced plotting, similarity systems (Jaccard, Dice). Network analysis: communities detection (cliques, communicability, spectral analysis, etc. . .), Networks statistics: degree, centrality, etc. . . . Simplicial complexes construction: Vietoris-Rips, Witness, Clique-Weight-Complexes. Simplicial complexes analysis: persistent homology. Automatic learning systems: artificial neural networks (supervised and unsupervised, e.g., SOM, feed-forward, etc. . .). True concurrency modeling: higher dimensional automata and Chu space representation, CCS algebra for interleaving and true-concurrent description of computational processes.

Italian

Publications

Matteo Rucco, Katia Lupinetti, Marina Monti, and Franca Giannini.
Part classification with supervised machine learning.
Submitted to Journal of Machine Learning - Springer., 2016

Adane Mamuye, Matteo Rucco, Luca Tesei, and Emanuela Merelli.
Persistent homology analysis of rna.
Accepted for publication by Molecular Based Mathematical Biology: Special Issue on Topological modeling and analysis of big data in biomolecules, 4(1), 2016

Matteo Rucco, Rocio Gonzalez-Diaz, and Nieves Atienza.
Separating topological noise from features using persistent entropy.
In Paolo Milazzo, Dániel Várro, and Manuel Wimmer, editors, *DataMod : From Data to Model 2016*, volume 9946. Springer, 2016

Matteo Rucco, Rocio Gonzalez-Diaz, Maria-Jose Jimenez, Nieves Atienza, Enrico Concettoni, Cristina Cristalli, Andrea Ferrante, and Emanuela Merelli.
A new topological entropy-based approach for measuring similarities among piecewise linear functions.
Accepted for publication by Elsevier Signal Processing, 2016

Marco Piangerelli, Matteo Rucco, and Emanuela Merelli.
Topological classifier for detecting the emergence of epileptic seizures. *Submitted to Frontiers Neuroscience, 2016*

Emanuela Merelli, Matteo Rucco, Peter Sloom, and Luca Tesei.
Topological characterization of complex systems: Using persistent entropy. *Entropy, 17(10):6872–6892, 2015*

Matteo Rucco, Enrico Concettoni, Cristina Cristalli, Andrea Ferrante, and Emanuela Merelli.
Topological classification of small dc motors.
In Research and Technologies for Society and Industry Leveraging a better tomorrow (RTSI), 2015 IEEE 1st International Forum on, pages 192–197. IEEE, 2015

Matteo Rucco, Filippo Castiglione, Emanuela Merelli, and Marco Pettini.
Characterisation of the idiotypic immune network through persistent entropy. In *Proceedings of ECCS 2014*, pages 117–128. Springer, 2016

Adane Mamuye, Emanuela Merelli, and Matteo Rucco.
Persistent homology analysis of the rna folding space.
In Junichi Suzuki, Tadashi Nakano, and Henry Hess, editors, *BICT'15: Proceedings of the 9th EAI International Conference on Bio-inspired Information and Communications Technologies (Formerly BIONETICS)*, ICST, Brussels, Belgium, Belgium, 2016. ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering)

Emanuela Merelli, Matteo Rucco, Marco Piangerelli, and Daniele Toller.
A topological approach for multivariate time series characterization: the epilepsy case study.
In Junichi Suzuki, Tadashi Nakano, and Henry Hess, editors, *BICT'15: Proceedings of the 9th EAI International Conference on Bio-inspired Information and Communications Technologies (Formerly BIONETICS)*, ICST, Brussels, Belgium, Belgium, 2016. ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering)

Jacopo Binchi, Emanuela Merelli, Matteo Rucco, Giovanni Petri, and Francesco Vaccarino.
jHoles: A tool for understanding biological complex networks via clique weight rank persistent homology.
Electronic Notes in Theoretical Computer Science, 306:5–18, 2014

Matteo Rucco, David Rodrigues, Emanuela Merelli, Jeffrey H Johnson, Lorenzo Falsetti, Cinzia Nitti, and Aldo Salvi.
Neural hypernetwork approach for pulmonary embolism diagnosis. *BMC Research Notes*, 8:617, 2015

Matteo Rucco, Emanuela Merelli, Damir Herman, Devi Ramanan, Tanya Petrossian, Lorenzo Falsetti, Cinzia Nitti, and Aldo Salvi.
Using topological data analysis for diagnosis pulmonary embolism. *Journal of Theoretical and Applied Computer Science*, 9:41–55, 2015

Lorenzo Falsetti, Emanuela Merelli, Matteo Rucco, Cinzia Nitti, Milena Pennacchioni, and Aldo Salvi.
A data-driven clinical prediction rule for pulmonary embolism. *European Heart Journal*, 34(suppl 1):P243, 2013

Antonella Castellano, Marina Donativi, Roberta Rudà, Giorgio De Nunzio, Marco Riva, Antonella Iadanza, Luca Bertero, Matteo Rucco, Lorenzo Bello, Riccardo Soffietti, et al.
Evaluation of low-grade glioma structural changes after chemotherapy using dti-based histogram analysis and functional diffusion maps. *European radiology*, pages 1–11, 2015

Matteo Rucco, Mariagiovanna Gianfreda, Luca Tesei, Emanuela Merelli, and Alessandro Salvucci.
Advanced methods for data reconstruction: interpolation methods applied to a set of radiation data.
Submitted, 2013

Antonella Castellano, Marina Donativi, Giorgio De Nunzio, Antonella Iadanza, Matteo Rucco, and Andrea Falini.
Machine learning methods for recognition and segmentation of cerebral gliomas. *Submitted*

D Barbareschi, V Di Benedetto, C Gatto, F Grancagnolo, F Ignatov, A Mazzacane, M Rucco, G Tassielli, and G Terracciano.
High precision tracking in ilc experiments.
ILC experiment - technical report, 2008

Conferences, congresses and seminars

- Applied Algebraic Topology (University of Southampton) - 21/November/2016 Jacek Brodzki - Invited, Talk: Topological data analysis and formal methods in computer science for modeling complex systems.
- INRIA (Paris) - 28-30/June/2016 - Frederic Chazall - Invited, Talk: Topological Data Analysis and Information Theory towards a new approach for model selection
- Ghent University - 27/June/2016 - Tijl De Bie - Invited, Talk: New frontiers in Data Analysis
- KU Leuven - 02/June/2016 - Stein Aerts Lab - Invited, Talk: Topological Data Analysis for Gene Regulatory Networks
- Bioninformatics - BICT 2015 Special Track - 5/12/2015, New York
- Topdrim4Bio - BICT 2015 Special Track - 4/12/2015, New York (Co-Chair and Speaker)
- RTSI2015 - IEEE Conference - Torino, 17/09/2015
- TOPDRIM Workshop - Invited Speaker: TOPDRIM FP7, Camerino, 22/07/2015 – PizzaSeminar @ Computer Science: Unicam, Camerino, 01/07/2015
- WebValley15 - Invited Speaker: Fondazione Bruno Kessler, San Lorenzo in Banale, 22-27/06/2015
- TOPONETS: Satellite of NETSCI, Saragoza, 02/06/2015
- Colloquia: IAC - Istituto Calcolo Applicato – CNR, Rome, 5/2/2015
- European Conference on Complex System, Lucca, 09/2014
- TOPDRIM Meeting, VU University Amsterdam, 09/2014
- IV scientific day – Camerino, June 2014
- CS2BIO'14, Berlin, 6-7 June 2014
- ISMRM Magnetic Resonance in Medicine, Perugia, 2013
- Topdrim-Mathemac joint workshop, Bielefeld, 10/2013
- Topdrim First Year Review Meeting, Bruxelles European Community, 10/2013
- Embolia polmonare acuta old & new – Porto Novo, Ancona - Italy. July 2013
- III scientific day – Camerino - Italy. June 2013
- CS2BIO'13 4th International Workshop on Interactions between Computer Science and Biology, Florence, 05/2013
- Ayasdi researcher meeting, Ayasdi Inc., Palo Alto (Ca), 03/2013
- II scientific day – Camerino - Italy. June 2012

Period Abroad

- Applied Mathematics Group - Seville - Spain, 23/11/2016 - 03/12/2016. Collaboration with Prof. Rocio Gonzalez-Diaz
- IGH/IMGT Group- Montpellier - France, 5/10/2015 - 7/11/2015. Collaboration with Prof. Marie-Paule Lefranc and Prof. Sofia Kossida
- Saint Louis University, Saint Louis (MO) USA, 01/03/2014 - 01/04/2014. Collaboration with Prof. David Letscher
- Ayasdi Inc. Paolo Alto (CA) - USA, 01/03/2013 - 30/03/2013. Collaboration with Dr. Damir Herman

Advanced Courses

- The (strange) world of Intellectual/Industrial property: how to make use of IP within scientific research. Held by Luisa Currado. School of Advanced Studies, University of Camerino. June-8,9-2015.
- Bibliometrics and research evaluation. Held by Chiara Faggiolani. School of Advanced Studies, University of Camerino. June-9-2015
- Business plan: how to handle the dream with numbers. Held by Cristiano Venturini. School of Advanced Studies, University of Camerino. June-10-2015
- SME and Internationalization: Strategies, mode of entry and new challenges. Held by Cristiano Venturini. School of Advanced Studies, University of Camerino. June-11-2015.

Personal interests

I attended several courses at School of Chocolate organized by Perugia. I practice sports, e.g., hiking, biking and kayaking. Numerical controlled systems, such as automatic engraving machine.