Europass Curriculum Vitae

Rucco, Matteo

Data Science

Personal information

Surname(s) / First name(s)

Address(es)

Email(s)

Nationality(-ies)

Date of birth

Gender

Desired employment/ Occupational field

Current Position

20 February 2017 -

ecvitemTitle of qualificationSenior Researcher

Main activities and responsibilities

Senior Researcher - Data scientist at United Technologies Research Center - Advanced Laboratory of Embedded Systems (Italy)

Currenlty I am the PI of several research projects. The general aim of the research activities is to provide innovative data science methods for solving Business Units needs. One research activity, among the others, focuses on leveraging machine learning and formal methods for engineering Reliable Machine Learning based systems. Other research areas focused on mining smart buildings occupants profiles and on Surrogate Modeling techniques for speeding up the V&V of complex systems. The tecniques I use for projects executions span among: data visualization, analytical & statistical modeling, NLP, ML, AI, etc.. ..

Name and address of employer

United Technologies Research Center - Advanced Laboratory of Embedded Systems, Trento - Italy

Skills awarded

Industrial Data Modeling, Machine Learning, Artificial Intelligence, Smart Buildings Occupant Profiling, Natural Language Processing,

Research experience

1 March 2016 - 28 February 2017

Main activities and responsibilities

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.

Name and address of employer

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

Skills awarded

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

November 2012 - February 2016

Title of qualification awarded

Collaborator of TOPDRIM EU Project.

Young researcher

Main activities and responsibilities	Development of new algorithms and methods for topological data analysis and data modelling.
Name and address of employer	Future and Emerging Technologies (FET) programme within the Seventh Framework Programme (FP7) for Research of the European Commission, under the FP7 FET-Proactive Call 8- DyMCS, Grant Agreement TOPDRIM, number FP7-ICT-318121.
Skills awarded	Topological data analysis
March 2013 - December 2016	Collaborator of A.D.A.M. - Start-up, Spin-off at University of Salento
Title of qualification awarded	Researcher collaborator
Main activities and responsibilities	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 disriminant analysis (Fisher-LDA) and artificial neuronal networks (back propagation, feed-forward, Levenberg-Marquardt) and are coded in MATLAB.
Name and address of employer	A.D.A.M. - spin-off at University of Salento
Skills awarded	Statistical data analysis and machine learning

Education and Training

13 January 2013 - 4 April 2016	Ph.D. in Information Science and Complex Systems - University of Camerino - Italy
Final grade	Ph.D. cum laude
Thesis	Topological Data Analysis for Modeling Complex Systems
Topic	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.
Supervisor	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., computarized), 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 distructive 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.
Supervisor	Prof. G. De Nunzio
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	**Introduction to Computer Science - Professional Course for wood makers** - AS-ESI Lecce - Italy.
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.

Supervising/Co-Supervising experience

Ph.D Thesis

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

M.Sc. Thesis

- 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. Giuliodori: 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.

B.Sc. Thesis

- 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. Senigagliesi: Graphical optimization of the infographics for the Leaf Farm web-portal. Joint with Loccioni Group.

Other Jobs

March 2015	Web-master
Title of qualification awarded	Web-site designer and developer.
Principal subjects/Occupational skills covered	Designing and development of the web-site http://www.tendapuzzle.it based on HTML5, PhP, MySql, Ajax, and CSS
Owner	TREND S.R.L. Street: Via W. Tobagi, Tolentino (Mc) - Italy.
January 2015	Web-master
Title of qualification awarded	Web-site designer and developer.
Principal subjects/Occupational skills covered	Designing and development of the web-site http://www.camerino2015.topdrim.eu based on HTML5, PhP, MySql, and CSS
Owner	Topdrim Summer School - Topdrim Eu Project.
January 2012	Web-master
Title of qualification awarded	Web-site designer and developer.
Principal subjects/Occupational skills covered	Designing and development of the web-site http://www.micarellisport.com based on HTML, PhP, MySql, and CSS
Owner	Micarelli Sport. Via D'Accorso, Camerino (Mc) - Italy.
From March 2012	Advanced Data Analysis in Medicine - A.D.A.M. Start Up, Spin-off at University of Salento
Title of qualification awarded	Co-founder
Principal subjects/Occupational skills covered	Development of a computer assisted detection (CAD) system for cancer detection in magnetic resonance images analysis.
Name and type of organization providing education and training	Advanced Data Analysis in Medicine - A.D.A.M. Spin-off at University of Salento. http://www.adamgroup.it

Scientific highlights

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

Technical skills and competences

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, comunicability, 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.

Personal skills and competences

Mother tongue(s) **Italian**

Other language(s)

Self-assessment
European level(*)

Understanding		Speaking		Writing
Listening	Reading	Spoken interaction	Spoken production	
B2	B2	B2	B2	B2

English

(*) *Common European Framework of Reference (CEF) level*

Computer skills and competences

Data acquisition and analysis: Matlab, R, Weka. Programming Languages/Scripting/Editing: Java, C++ LaTeX (several professional works), (X/H)TML, CSS, PHP, ASP. Databases: SQL. Advanced knowledge of Microsoft Access and MySQL. Operating systems: All Microsoft OS's and Linux based systems. CAM and CAD: ArtCam, Mach, ArchiCad

Driving licence(s)

European driving license - class B.

Additional information

Publications

2018

Matteo Rucco, Katia Lupinetti, Franca Giannini, Marina Monti, and Jean-Philippe Pernot.
A methodology for part classification with supervised machine learning.
Artificial Intelligence for Engineering Design, Analysis and Manufacturing, TBD, 2018

Marco Piangerelli, Matteo Rucco, Luca Tesei, and Emanuela Merelli.
Topological classifier for detecting the emergence of epileptic seizures.
BMC Research Notes, 11, 2018

2017

Matteo Rucco, Katia Lupinetti, Franca Giannini, Marina Monti, and Jean-Philippe Pernot.
Cad assembly retrieval and browsing.
In *IFIP Advances in Information and Communication Technology*. Springer, 2017

Katia Lupinetti, Franca Giannini, Marina Monti, Matteo Rucco, and Jean-Philippe Pernot.
Identification of functional sets in mechanical assembly models.
IEEE conference paper TBA, 2017

MJ Jimenez, M Rucco, P Vicente-Munuera, P Gómez-Gálvez, and LM Escudero.
Topological data analysis for self-organization of biological tissues.
In *International Workshop on Combinatorial Image Analysis*, pages 229–242.
Springer, 2017

Nieves Atienza, Rocio Gonzalez-Diaz, and Matteo Rucco.
Persistent entropy for separating topological features from noise in vietoris-rips complexes.
Journal of Intelligent Information Systems, 2017

Matteo Rucco, Rocio Gonzalez-Diaz, Maria-Jose Jimenez, Nieves Atienza, Cristina Cristalli, Enrico Concettoni, Andrea Ferrante, and Emanuela Merelli.
A new topological entropy-based approach for measuring similarities among piecewise linear functions.
Signal Processing, 134:130 – 138, 2017

2016

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, Luca Tesei, Marco Piangerelli, Michela Quadrini, and Emanuela Merelli.
Survey of topdrim applications of topological data analysis.
In Giuliano Armano, Alessandro Bozzon, Matteo Cristani, and Alessandro Giuliani, editors, *2nd International Workshop on Knowledge Discovery on the WEB (KDWEB)*, number 1748, 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, *Software Technologies: Applications and Foundations: STAF 2016 Collocated Workshops: DataMod, GCM, HOFM, MELO, SEMS, VeryComp, Vienna Austria, July 4-8, 2016, Revised Selected Papers*, volume 9946. Springer, 2016

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

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)

2015

Emanuela Merelli, Matteo Rucco, Peter Sloot, 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, 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

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, 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

2014

Emanuela Merelli, Matteo Rucco, Peter Sloot, and Luca Tesei.
Topdrim deliverable 3.2 september 2014 a topological characterization of s [b] systems.
science, 49:30, 2014

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

2013 and previous

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

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 Ladanza, 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 - techincal report, 2008

Patents

2018:

- 8 Patent Applications submitted for patenting

2017:

- 25 Innovation Disclosures

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-Mathemacs 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
- Applied Mathematics Group - Seville - Spain, 9/11/2015 - 15/11/2015. 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 Perugina. I practice sports, e.g., hiking, biking and kayaking. Numerical controlled systems, such as automatic engraving machine.