Sara Scaramuccia

Birth: Genova, Italy 08/02/1988

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Post-doc researcher at Politecnico di Torino [0] (Italy) in computational and foundational aspects in Topological Data Analysis over unstructured data of large size

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Work Experience

Employed by Université de la Côte d'Azur [1]

Feb., 2019 - Feb., 2020

Postdoc researcher at Université de la Côte d'Azur with fulltime commitment. My project consists in developing new clustering algorithms, designing multiple iterations guided by user feedbacks, to optimize clustering quality in the specific domain of flight recommendations. *Project leaders:*
- Doctor Florent Masseglia - at **Data Mining Zenith group - INRIA** [2] - Montpellier
- Doctor Nicolas Maillot - at **Amadeus** [3] - Sophia Antipolis

Employed by Alten Group [4]

Sep., 2018 - Feb., 2019

Data Scientist (consultant) for Alten Group. with fulltime commitment. I was hired to join a consulting project with Amadeus under the supervision of Nicolas Maillot. Unfortunately, the project never started. At that time, I enhanced my skills in C++ and Java by taking extra courses waiting for a new project.

Education

Nov. 2014 - May 2018

PhD, Computer Science; Università degli studi di Genova (Genova) (more details in Section 'Academic Experience')

Thesis title: Computational and Theoretical Aspects of Multidimensional Persistent Homology in Data Analysis

Supervisors:
- Professor Leila De Floriani - University of Maryland (MD, USA)
- Professor Claudia Landi - Università di Modena e Reggio nell'Emilia (Modena e Reggio Emilia)

Keywords: Information Visualization, Topology, Algorithm design, Algorithm evaluation, Persistent Homology, Discrete Morse Theory

2011-2013

MSc, Mathematics; Università degli studi di Genova (Genova)

Grade: 110/110 cum laude

Supervisors:
- Professor Bjørn Dundas - Universitetet i Bergen (Bergen, Norway)
- Professor Stefano Vigni - Università degli studi di Genova (Genova)

Keywords: Category Theory, Algebra, Witt vectors, p-adic numbers

2007-2011   **BSc, Mathematics**; Università degli studi di Genova (Genova)

Grade: 96/110

Supervisor:
- Professor Ettore Carletti - Università degli studi di Genova (Genova)

Keywords: Differential Geometry

Study Experience Abroad

Jan.-May, 2017   **Visiting Student at University of Maryland (MD) USA**; I worked as part of the research group of Professor Amitabh Varshney and the research group of Professor Hanan Samet on data structures in the fields of topology-based analysis and visualization of large-size multivalued data sets. During that period, I obtained the core experimental results of my PhD thesis

2012-2013   **LLP Erasmus Programme**; Department of Mathematics of the Universitetet i Bergen, Bergen, Norway
My Master Thesis is the result of my Erasmus experience

Work Experience During Studies

Employed by COLOUREE S.R.L. [5]

July, 2017
- July, 2018   **Data Scientist** for COLOUREE S.R.L. with part-time commitment. The start-up company provides visualization of data in the context of architectural environment. My role was that of combining finer techniques (such as Principal Component Analysis, Hierarchical Clustering, and Discrete Morse Theory) to enhance the analysis

Employed by the Università degli studi di Genova

AY 2016-2017   **Teaching Assistant** of the Elementi di Matematica e Logica Undergraduate course in Computer Science

AY 2015-2016   **Teaching Assistant** of the Geometria Undergraduate course in Computer Science

2014-2015-2016   **Co-author and Lecturer** at the Mathematics stage for high school students

Academic Experience

My PhD project I have been working on computational methods and data structures for Topological Data Analysis and Visual-analytics. In particular, I have worked on the multiparameter counterpart of *Persistent Homology*. My project included:

- designing new efficient algorithms for the retrieval of multiparameter persistent homology invariants
- proposing a new discrete Morse-based notion of "optimal reduction" for multiscalar domains
- based on the latter, investigating multivariate segmentation of domains via discrete Morse theory.

Pubblications

February 2020 :(1) S. Scaramuccia, F. Iuricich, L. De Floriani, C. Landi. *Computing multiparameter persistent homology through a discrete Morse-based approach*, in Comutational Geometry

November 2018 :(2) C. Landi, S. Scaramuccia. *Persistence-perfect discrete gradient vector fields and multi-parameter persistence*. ArXiv preprint **arXiv:1904.05081**

December 2016 :(3) F. Iuricich, S. Scaramuccia, C. Landi, L. De Floriani. *A Discrete Morse-based Approach to Multivariate Data Analysis*. 9th ACM SIGGRAPH in Asia. Macao, China.

October 2016 :(4) U. Fugacci, S. Scaramuccia, F. Iuricich, L. De Floriani. *Persistent Homology: a Step-by-step Introduction for Newcomers*. STAG, Italian Eurographics Chapter. Genova, Italy.

September 2016 :(5) F. Iuricich, S. Scaramuccia, C. Landi, L. De Floriani. *Computing Shape Descriptord Based on Vector-valued Functions*. In Proceedings of the 25th International Meshing Roundtable and User Forum. Washington (DC), USA.

Invited Speaker at:

- April, 2018. "Computational and Theoretical Issues in Multiparameter Persistent Homology for Data Analsysis", invited speaker at Geometry Seminars - Tecnhische Universisтät Graz, Graz, Austria
- April, 2017. "A Discrete Morse-based Approach to Multivariate Data Analysis", speaker at SCGP - Spring School on Discrete and Computational Geometry, Stony Brook (NY), USA
- December, 2016. "A Discrete Morse-based Approach to Multivariate Data Analysis", speaker at Siggraph Asia - Symposium on Visualization, Macao, China
- August, 2016. "Towards the Analysis of Multivariate Data via Discrete Morse Theory", poster presentation at Applications and Statistics of Multidimensional Persistence Workshop, École Polythecnique fédérale de Lausanne (EPFL), Switzerland
- July, 2016. "Towards the Analysis of Multivariate Data via Discrete Morse Theory", poster presentation at ATMCS7 - Applied Topology: Methods, Computations and Science, Politecnico di Torino, Italy
- May, 2016. "Multidimensional Persistent Homology: the Algebraic Setting", invited speaker at Algebra & Geometry Seminars, Università degli studi di Genova (DIMA), Italy

Teaching Activity

- AY 2015-2016. Co-author of the Geometric Modeling Graduate course notes, Computer Science, at Università degli studi di Genova
- AY 2015-2016. Examinator Assistant to the Algoritmi e Strutture Dati Undergraduate course, Computer Science, at Università degli studi di Genova
- AY 2014-2015. Co-author of the Mathematical Logics Graduate course notes, Computer Science, at Università degli studi di Genova
- AY 2014-2015. Guest Lecturer in the Geometric Modeling Graduate course, Computer Science, at Università degli studi di Genova

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Attended International Academic Events

2017 :

- SCGP - Spring School on Discrete Computational Geometry - Stony Brook (NY), USA

2016 :

- ACM SIGGRAPH Asia - Conference and Exhition on Computer Graphics and Inteeractive Techniques in Asia, Symposium on Visualization - Macao, China
- STAG - Conference on Smart Tools and Apps in Computer Graphics, Italian Eurographics Chapter - Genova, Italy
- Workshop on Applications and Statistics of Multidimensional Persistent Homology - Lausanne, Switzerland
- ATMCS7 - Conference in Applied Topology: Methods, Computations and Science - Turin, Italy

2015 :

- CAT - School on Computational Algebraic Topology - Oxford, UK
- HTCA - School on Homology: Theoretical and Computational Aspects - Genova, Italy
- BISS - Bertinoro International Spring School - Bertinoro, Italy

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Awards

2014   three-years Phd Scholarship from the Università degli studi di Genova, from 01/11/2014 to 01/11/2017

Memberships

from 2018 Professional member of the Association for Computing Machinery (ACM)

from 2017 Student member of the Association for Computing Machinery (ACM)

from 2015 Associate member of the London Mathematical Society

Technical Skills

Operating Systems Good knowledge of **Windows**, **OSX** and **Linux**

Software	Good knowledge of **Paraview** for scientific visualization

Programming	Optimal knowledge of **Latex Editor** necessary for producing scientific documents
	Good knowledge of **Python**, especially Scikit-learn for developing and visualizing new methods
	Good knowledge of **Git** for version handling
	Good knowledge of **Matlab** for the plotting of scientific results;
	Basic knowledge of **C**, **C++**, **Java** necessary for performing experiments and customizing the open source libraries **Topcat**, **PHAT**, **JPlex**, **RIVET**
	Design of simple **html** pages such as **6**

Personal Skills

Human Languages

Certifications:

- Italian (native speaker)
- English (B2) FCE - 2007
- French (A2) DELF - 2002
- Norwegian (A1) Course at Universitetet i Bergen - 2012

	Listening	Reading	Speaking	Writing
English	C1 Proficient	C2 Proficient	C1 Proficient	C1 Proficient
French	C1 Proficient	C1 Proficient	B2 Independent	B1 Independent
Norwegian	A1 Basic	A1 Basic	A1 Basic	A1 Basic

Cooperative Skills Optimal communication skills enhanced during my PhD programme due to the interaction with supervisors, collegues and graduate students as part of the **Computer Graphics, Vision, and Multimodal Systems Group** [7] - at DIBRIS, Università degli studi di Genova.
Outstanding attitude to collaborating with people with different backgrounds in the accomplishment of a common task.
Deep enthusiasm towards new challenging tasks and sharing/learning new skills which strongly motivated my choice of a PhD programme in Computer Science.

Management Skills Optimal scheduling skills enhanced as part of the above mentioned research group and derived from the necessary coordination in perfoming experiments and in managing the teaching activity.
Particular skills in the remote cooperation (via Skype) among far apart-living collaborators: part of the research group works in Maryland (USA) and one of my supervisors works in Modena (Italy).

Licences

2010	driving licence A (motorbikes)
2007	FIN Lifeguard licence
2006	driving licence B (cars)

Personal Interests

2018-now	*Soccer* at competitive level (Division d'Honneur - Ligue de la Mediterranée), team member of F.C. Golfe Juan, and A.S. Cannes
2007-2012	*Soccer* at competitive level (Serie C), team member of Molassana Boero Calcio
1991-2007	*Swimming* at competitive level, team member of R.N. San Fruttuoso, and A.S. Genova Nuoto
	Guitar player as a personal hobby

External Links

[0]: `https://www.polito.it/`

[1]: `http://univ-cotedazur.fr/fr`

[2]: `https://www.inria.fr/equipes/zenith`

[3]: `https://amadeus.com/en`

[4]: `http://www.alten.fr`

[5]: `www.colouree.com`

[6]: `http://htmlpreview.github.io/?https://github.com/IuricichF/ICT/blob/master/index.html`

[7]: `http://www.dibris.unige.it/en/research/programs?view=prdetail&prog=3`

Publications

(1): `https://www.sciencedirect.com/science/article/abs/pii/S0925772120300171`

(2): `https://arxiv.org/abs/1904.05081`

(3): `http://dl.acm.org/citation.cfm?id=3002166`

(4): `http://diglib.eg.org/handle/10.2312/stag20161358`

(5): `https://pdfs.semanticscholar.org/9875/e6c5b5e8c7af21db1649104de4a14ba0100c.pdf`

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