Gianluca Sforza

Curriculum Vitæ et Studiorum

Contact information

Università degli Studi di Milano
Department of Computer Science
Via Bramante 65
I-26013 Crema (CR), Italy

Tel: +39 (02) 503 30088
Fax: +39 (02) 503 30010
Email: gianluca.sforza@unimi.it
Web: http://homes.di.unimi.it/sforza/

Personal details

Date and place of birth: September 2, 1983 in Bari, Italy. *Citizenship*: Italian

Current position

Postdoctoral research fellow at the Department of Computer Science of Università degli Studi di Milano

Education

- *Jan 08 - Mar 12*
  Ph.D. in *Computer Science*, at the Computer Science Department of Università degli Studi di Bari, Italy, 8 June 2012. Thesis title: "*Image content representation: using low-level and high-level descriptions*" [D-1]; Supervisor Prof. Giovanna Castellano, co-supervisor Prof. Laura Caponetti.

  Additional activities:

  – *Visiting scholar*, at the Electrical & Computer Engineering department of the Missouri University of Science and Technology, Rolla MO, USA, Jun 10 - Dec 10. Advisors: Dr. Joe Stanley, William Van Stoecker, MD. Supported by the PhD funding program of Università degli Studi di Bari.

- *Jan 05 - Oct 07*
  "Laurea Specialistica" in *Computer Science* (equiv. MSc), Università degli Studi di Bari, Italy. Thesis title: "*The eval command in bash and its applications*", advisor Prof. Salvatore Caporaso. Final grade 110/110 *cum laude*.

- *Oct 01 - Dec 04*
  "Laurea Triennale" in *Computer Science and Digital Communication* (equiv. BSc), Università degli Studi di Bari, Italy. Thesis title: "*Modelling 3-D objects using NURBS surfaces: an application to railway locomotives*", advisor Prof. Laura Caponetti. Final grade 110/110 *cum laude*.

- *Sep 97 - Jul 01*
  "Maturità Scientifica" (equiv. A-level) at Liceo Scientifico Statale "L. Pepe" - Ostuni (BR), Italy. Marks: 86/100.

Qualifications

- Qualified as teacher of computer science in secondary schools in 2013.
- Qualified as "ingegnere dell'informazione" in 2008 (needed to subscribe at the chartered engineered in Italy).

Academic experience

Positions

- *Jan 2014 – Present*
  Postdoctoral research fellow in the program "*Analysis of the functional and operational characteristics of less-constrained biometric systems*", at the Department of Computer Science, Università degli Studi di Milano. The research activity is conducted within the Industrial, Environmental and Biometric Informatics (IEBIL) lab under the supervision of Prof. Vincenzo Piuri and Prof. Fabio Scotti.

- *Apr 2012 – Apr 2013*
  Postdoctoral research fellow at the School of Systems Engineering, University of Reading, UK. Supervisor: Prof. Virginie Ruiz. Funded by Università degli Studi di Bari, Italy.
- *Jan 2008 – Jun 2012*
  Ph.D. student at the Department of Computer Science, Università degli Studi di Bari, Italy.

External Collaborations

Currently, collaborations with the following national and international institutes are actively supported:

- Department of Computer Science, Università degli Studi di Bari, Italy.
- Electrical & Computer Engineering department of the Missouri University of Science and Technology, Rolla - Missouri,USA.

Participation to research projects

- *ESCUDO-CLOUD - Enforceable Security in the Cloud to Uphold Data Ownership*, Horizon 2020 European research project, grant agreement No 644579, project and unit coordinator Prof. P. Samarati. The project is related to empowering owner's control of the data in cloud services (2015 – 2017).
- *ABC4EU - Automatic Border Control for Europe*, Seventh Framework European research project, grant agreement no 312797, coordinated by Indra Sistemas S.A., unit coordinator Prof. V. Piuri. The project is related to the study and implementation of novel automatic border control systems (2014 – 2017).
- *GenData 2020 - Data-driven genomic computing*, PRIN 2010-2011, contract no. 2010RT-FWBH sponsored by MIUR, coordinator Prof. S. Ceri, unit coordinator Prof. P. Samarati. The project is related to the study and design of advanced technology solutions for new generation medical systems (2013 -2016).
- *I-PAN - Innovative Poplar Low Density Structural Panel*, Seventh Framework European research project, contract 308630, coordinated by IMAL S.r.l., unit coordinator Dr. F. Scotti. The project is related to the study and implementation of techniques for the production of innovative low-density poplar strands boards (2012 – 2015).

Grants

- Co-author of the research project titled "Shape annotation for intelligent image retrieval", in reply to "I avviso 2013 - Bando A della Fondazione Cassa di Risparmio di Puglia", aimed at the financial support of a one-year research grant (€20K). Scientific coordinator: Prof. Giovanna Castellano. Funded.
- "Borsa di studio per attività di perfezionamento all'estero": one-year postdoctoral research fellowship at University of Reading, UK; €11K. Funded period: March 2012-13.
- 6-months Ph.D. scholarship top-up to visit MS&T, Rolla MO, USA; €3K. Funded period: June - December 2010.
- 3-years scholarship for PhD students, Università degli Studi di Bari, Italy; €36K. Funded period: January 2008-11.

Research activity

The research activity has been focused on signal and image analysis. The techniques designed have been implemented for the resolution of real-world problems, in the fields of biometric recognition, biomedical image analysis, artificial vision in industrial processes, and image retrieval.

- Biometric recognition.

  The research activity has included the study of algorithms and systems for the biometric recognition of individuals, particularly for security and continuous authentication applications, using physiological traits such as fingerprints and ECG signals [IC-5, IC-4, IC-1, IC-2]. Specifically, the study has been focused on less-constrained acquisition procedures with high usability, and on methods for identity comparison. In this context, new techniques of fingerprint image analysis for automated identity verification have been studied. In particular, original techniques have been developed for the analysis of fingerprint image quality, considering images acquired with less-constrained procedures, such as to increase the usability. Moreover, the software architecture of a new biometric system for automated border control applications was analysed, including security and privacy aspects.

- Biomedical image analysis.

  The research activity has included the study of innovative image analysis solutions for the medical diagnosis support. In particular, segmentation algorithms and techniques for the extraction of colour and texture information have been investigated. In this context, two different applications have been studied:

  - human oocyte selection, based on the degree of granularity, which is a parameter useful to evaluate the quality level of the oocyte for assisted fertilization. The proposed approach is based on the textural content description of light-microscope images, successively used for granularity classification [IC-8, IJ-3].
  - melanoma *in-situ* diagnosis, from the analysis of dermoscopy images of skin lesions. The segmentation algorithm proposed is based on colour information to identify gray areas in the image, which are fundamental elements to recognize melanomas [IC-6, IJ-2].

- Artificial vision in industrial processes.

  The research activity has included the study of systems and methods for measurement, classification and three-dimensional reconstruction in industrial applications, using multi-dimensional signal processing and Computational Intelligence techniques [IC-3]. Particular attention has been given to algorithms and systems for capturing images of particle-size material based on multiple views, and algorithms for feature extraction and classification. In this context, the area of wood panel production was taken as a case study, addressing the problem of panel quality control. Novel artificial vision techniques (both 2 and 3-D) of the particles have been developed, evaluating the effectiveness of different camera setups. The main visual characteristics analysed have been the orientation of the wood strands and their dimensions.

- Image Retrieval.

  The research activity has also involved the study of the cognitive aspects of human visual perception, in particular regarding shapes. In parallel, the study has addressed several aspects of computer-based image analysis, both from the physical and semantic perspectives. Focus has been given to algorithms for feature extraction, clustering, and automated image annotation. Final aim of this study is to create a new tool for image retrieval in specific and non-homogeneous domains. The research moves from the assumption that numerical descriptions of the physical characteristics of an image (e.g., the shape), adopted in the majority of current image retrieval tools, are actually distant from a human-oriented description. Thus, to fill in the so-called "semantic gap" and to link numerical features with human-understandable concepts, a novel visual ontology was proposed, which aims to recall the cognitive mechanism of analogy for grouping various objects by shape similarity [IC-7, IJ-1].

Teaching activity

- Teaching seminar series of *"Android OS elements"* for 16 hours in the course of "Operating Systems" held by Prof. V. Piuri, B.Sc. degree in Computer Science at the Università degli Studi di Milano, academic years 2014-15 and 2015-16.
- Teaching lectures on specific topics for 6 hours in the course of "Operating Systems" held by Prof. V. Piuri, B.Sc. degree in Computer Science at the Università degli Studi di Milano, academic year 2015-16.
- Teaching support for 140 hours of lessons at the high school, during a training course for qualifying as a Computer Science teacher. The course called *"Tirocinio Formativo Attivo"* was delivered by Università degli Studi di Bari.
- As a PhD student, an average of 30 hours of teaching support per subject was convened; the courses were attended by a number of students ranging form 30 to 50.
  - Undergraduate level:
    tutorials, develop lab scripts, student programming support and exams for
    C Programming (Prof. L. Caponetti, academic years 2009-10) and
    Networking (Prof. S. Pizzutilo, 2009).
  - Master level:
    lecture assistant and exams for Formal methods in Computer science (Prof. S. Caporaso, 2008);
    Contributed to the supervision of seven final years' projects in image analysis with Prof. G. Castellano.

Other activities

Paper presentation

Presentations to the following papers were performed in international conferences context: [IC-6, IC-7, IC-8, IC-4]

Seminars and talks

- December 2015: "Biometric techniques in Automated Border Control (ABC) gates", for the annual year reporting of the research activity at the Università degli Studi di Milano, Italy.
- August 2013: "Nonlinear Otsu and Automatic Skew Correction", at the 3rd Quadrennial Automatic Skin Cancer Detection Symposium, Missouri S&T, Rolla MO, USA.
- October 2012: "Ontologies for automatic annotation of shapes resembling a human-like way", to the Neuroscience group at the School of Systems Engineering, University of Reading, UK.
- December 2009: "Introduction to image retrieval and design of a new semantic system", to students attending the Image Processing course, Università degli Studi di Bari, Italy.

Review

Paper review activity was delivered for the following journals:

- IEEE Transactions on Systems Man & Cybernetics
- IEEE Transactions on Instrumentation & Measurements
- Information Sciences
- Adaptive Behaviour
- Computers & Security

Professional Memberships

- IEEE Signal Processing Society, *since 2015*.
- IEEE Member, *since 2014*.

Technical skills

- *Operating systems*: GNU-Linux, Windows and Mac OS.
- *Programming and modelling languages*: Matlab, C/C++, Java, Prolog, Clips, Haskell, Bash, RDF, UML and LaTeX.
- *Image analysis*: algorithms for segmentation and clustering, statistical techniques for feature extraction from image cues (i.e. color, texture and shape); macro programming in the ImageJ imaging environment; visual ontologies.

Publications

Refereed international journals articles

[IJ-1] G. Castellano, AM. Fanelli, G. Sforza, M. A. Torsello,"Shape Annotation for Intelligent Image Retrieval", *Applied Intelligence*, Springer, pp. 1-17, online, 2015. Online ISSN: 1573-7497.

[IJ-2] G. Sforza, G. Castellano, R.J. Stanley, W.V. Stoecker, J. Hagerty, B. LeAnder and S. Arika. "Using adaptive thresholding and skewness correction to detect gray areas in melanoma *in situ* images", in *IEEE Transactions on Instrumentation and Measurement*, vol. 61, no. 7, pp. 1839-1847, 2012. ISSN: 0018-9456

[IJ-3] MT. Basile, L. Caponetti, G. Castellano and G. Sforza: "A Texture-Based Image Processing Approach for the Description of Human Oocyte Cytoplasm", *IEEE Transactions on Instrumentation and Measurement*, vol. 59, no. 10, pp. 2591-2601, 2010. ISSN: 0018-9456.

Refereed papers in proceedings of international conferences and workshops

[IC-1] R. Donida Labati, A. Genovese, Enrique Muñoz, V. Piuri, F. Scotti, G. Sforza, "Automatic classification of acquisition problems affecting fingerprint images in automated border controls", Proceedings of the IEEE Symposium on Computational Intelligence in Biometrics and Identity Management, S. Jajodia, C. Mazumdar (eds.), Cape Town (South Africa), December 2015

[IC-2] R. Donida Labati, A. Genovese, Enrique Muñoz, V. Piuri, F. Scotti, G. Sforza, "Automated border control systems: biometric challenges and research trends", Proceedings of the International Conference on Information Systems Security, Kolkata (India), pp. 11-20, December 2015. ISBN: 978-3-319-26960-3. (Invited paper)

[IC-3] R. Donida Labati, A. Genovese, Enrique Muñoz, V. Piuri, F. Scotti, G. Sforza,"Improving OSB wood panel production by vision-based systems for granulometric estimation", Proceedings of the IEEE International Forum on Research and Technologies for Society and Industry, Torino (Italy), pp. 557-562, September 2015. ISBN: 978-1-4673-8166-6.

[IC-4] R. Donida Labati, A. Genovese, Enrique Muñoz, V. Piuri, F. Scotti, G. Sforza, "Advanced design of Automated Border Control gates: biometric system techniques and research trends", Proceedings of the IEEE International Symposium on Systems Engineering, Roma (Italy), pp. 412-419, September 2015. ISBN: 978-1-4799-1920-8.

[IC-5] R. Donida Labati, V. Piuri, R. Sassi, F. Scotti, G. Sforza, "Adaptive ECG Biometric Recognition: a Study on Re-Enrollment Methods for QRS Signals", *IEEE Symposium on Computational Intelligence in Biometrics and Identity Management*, Orlando, FL (USA), pp. 30-37, December 2014. ISBN: 978-1-4799-4533-7/14.

[IC-6] G. Sforza, G. Castellano, R.J. Stanley, W.V. Stoecker and J. Hagerty, "Adaptive segmentation of gray areas in dermoscopy images", *Proceedings of the IEEE International Workshop on Medical Measurements and Applications*. Bari (Italy), pp. 628-631, May 2011. ISBN: 978-1-4244-9336-4.

[IC-7] G. Castellano, G. Sforza and A.M. Torsello, "Thinking of a system for image retrieval". *Proceedings of the first Italian Information Retrieval Workshop*, Padova (Italy), January 2010. CEUR-WS.org, Vol. 560, pp. 77-81, urn:nbn:de:0074-560-7. ISSN 1613-0073.

[IC-8] L. Caponetti, G. Castellano,V. Corsini and G. Sforza. "Multiresolution Texture Analysis for Human Oocyte Cytoplasm Description", *Proceedings of the IEEE International Workshop on Medical Measurements and Applications*. Cosenza (Italy), pp. 150-155, May 2009. ISBN: 978-1-4244-3598-2.

Ph.D. dissertation

[D-1] Gianluca Sforza, "Image content representation: using low-level and high-level descriptions", Università degli Studi di Bari "Aldo Moro", Italy, 2012.

Submitted papers

[SP-1] R. Donida Labati, A. Genovese, Enrique Muñoz, V. Piuri, F. Scotti, G. Sforza, "Biometric Recognition in Automated Border Control: A Survey", submitted to an international journal, December 2015

Le dichiarazioni rese nel presente curriculum sono da ritenersi rilasciate ai sensi degli artt. 46 e 47 del DPR n. 445/2000.
Il presente curriculum, non contiene dati sensibili e dati giudiziari di cui all'art. 4, comma 1, lettere d) ed e) del D.Lgs. 30.6.2003 n. 196.

Carovigno (BR), 31/12/2015 Gianluca Sforza