
CURRICULUM VITAE

ILARIA RENNA

Personal details

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Date of birth : August 4, 1982

Place of birth : S. Pietro Vernotico (BR), Italy

Nationality : Italian



PAST POSITIONS

- 2015 **Parental Leave.**
- 2013 – 2014 **Research Associate**, Structure Formelle du Language (SFL) Laboratory, CNRS, Paris, France.
- 2011– 2012 **Temporary Research and Teaching Assistant (A.T.E.R.)**, Department of Engineering, University Pierre et Marie Curie, Paris, France.
- 2008 – 2012 **PhD student** in joint supervision between the ISIR, Institut des Systèmes Intelligents et de Robotique (Paris, France) and the IIT, Istituto Italiano di Tecnologia (Genova, Italy).
- 2008 – 2010 **Teaching Assistant**, Department of Engineering, University of Pierre et Marie Curie, Paris, France.
- 1/3/07 – 1/9/07 **Internship**, University Campus Bio-medico, Rome, Italie.

EDUCATION

- 11/05/12 **PhD** in *Mechanics, Acoustics, Electronics and Robotics*, University Pierre et Marie Curie (France) and **PhD** in *Robotics, Neuroscience and Nanotechnology*, University of Genova (Italy).
Final mark : Summa Cum Laude (mention très honorable).
Title : Upper Body Tracking and Gesture Recognition for Human-Machine Interaction.
Advisors : Catherine Achard, Ryad Chellali.
Reviewers : Thierry Chateau, Vittorio Murino.
Examinators : Philippe Bidaud, Anna Esposito.
Fundings : Research allowance (Allocation de recherche ministerielle), Grant VINCI Programm from the French-Italian University, Fellowship from IIT, Istituto Italiano di Tecnologia, Genova, Italy.
- 30/09/07 **Professional Engineering qualification**, University Campus Bio-medico, Roma, Italy.
- 22/02/07 **MSc** (equivalent to the Italian title of **Laurea specialistica**) in *Biomedical Engineering*, University Campus Bio-medico, Roma, Italy.
Final mark : 110/110 summa cum laude.
Degree dissertation title : Riconoscimento di pattern nei test di immunofluorescenza diretta (Pattern recognition for direct immunofluorescence tests).
Advisors : Giulio Iannello, Dario Malosti.
Co-Advisors : Antonella Afeltra, Paolo Soda.
- 25/2/05 **BSc** (equivalent to the Italian title of **Laurea triennale**) in *Biomedical Engineering*, University Campus Bio-medico – Roma, Italy.
Final mark : 110/110 summa cum laude.
Degree dissertation title : Caratterizzazione di un sensore di liquido per analisi di sieri biologici su strumenti automatici (Characterization of a liquid sensor for the analysis of biological serum on automatic tools).
Advisor : Dario Malosti.
- 15/7/01 **Baccalaureate** – Second Level College of Science Banzi-Bazoli, Lecce, Italy.
Final mark : 100/100.

COMPLEMENTARY ACTIVITIES

Summer Schools

- 26/7/10 – 30/7/10 Visual Recognition and Machine Learning Summer School, INRIA Grenoble, France.
Speakers : Francis Bach, Cordelia Schmid, Andrew Zisserman, David Forsyth, Ivan Laptev, Josef Sivic.
- 18/7/10 – 22/7/10 1ø PLUS - VIPS School : Advanced Courses on Computer Vision, Pattern Recognition and Image Processing titled “Social Signal Processing : State of the Art and Prospects”, IIT, Sestri Levante (Genova), Italy.
Speakers : Daniel Gatica-Perez, Alessandro Vinciarelli.

Conferences

- 2/7/12 Working day organized by GdR ISIS (Groupement de Recherche Information, Signal, Images et ViSion) on Videos Analysis of Humans, Paris, France¹.
- 24/1/12–27/1/12 Reconnaissance des Formes et Intelligence Artificielle Conference (RFIA 2012), Lyon, France¹.
- 19/1/10–22/1/10 Reconnaissance des Formes et Intelligence Artificielle Conference (RFIA 2010), Caen, France¹.
- 14/6/09 Working day organized by GdR ISIS (Groupement de Recherche Information, Signal, Images et ViSion) on Human-Robot Interaction, Paris, France.
- 16/12/09–18/12/09 International Conference on Intelligent Robotics and Applications (ICIRA09), Singapore¹.
- 8/12/09 Working day organized by GdR ISIS (Groupement de Recherche Information, Signal, Images et ViSion) on Face, Gestures and Action Recognition, Paris, France.
- 25/3/08 Workshop organized by GdR ISIS (Groupement de Recherche Information, Signal, Images et ViSion) Working day on Gestures and Face Recognition, Paris, France.
- 19/3/07–20/3/07 International Workshop Motor Learning in Stroke Recovery, Rome, Italy.
- 20/11/05–25/11/05 3rd European Medical & Biological Engineering Conference, Regional IFMBE European Conference on Bio-medical Engineering (EMBEC 05), Prague, Czech Republic.

Certificates

- 1/1/11–30/6/11 ”IT Essentials II : network operating systems companion guide” de ”Cisco networking academy program”, Rome, Italy.
- 2000 *First Certificate in English (FCE)* University of Cambridge.

Professional affiliation

- 2007 Passed the government exam, licensed as a professional engineer, and enrolled as a Member of the Rome Engineering Register

AWARDS AND GRANTS

- 31/1/13 Qualification aux fonctions de Maître de Conférences CNU 61 (suitable to apply to faculty position at any French Universities in computer engineering, control engineering and signal processing).
- 17/12/09 Best Paper in “Robotic Theory”, ICIRA09 International Conference on Intelligent Robotics and Applications, Singapore.
- 1/1/08–31/12/10 Grant VINCI from the French-Italian University.
- 1/3/07 – 30/9/07 Grant of Lazio Region for a research internship at the University Campus Bio-Medico, Rome, Italy

KEYWORDS

Research	Teaching
<i>Machine Learning</i>	<i>Image Processing</i>
<i>Human-Machine Interaction</i>	<i>Electromagnetic compatibility</i>
<i>Computer vision</i>	<i>Biomechanics</i>
<i>Pattern recognition</i>	<i>Automation</i>
<i>Mathematical modes</i>	<i>Signal processing</i>
<i>Statistical classification</i>	<i>Information technology</i>
<i>Bio-Robotics</i>	<i>Electronics</i>

1. Intervention.

INFORMATICS KNOWLEDGE

<i>Operating Systems</i>	MS Windows, Mac OS X, UNIX, Linux.
<i>Programming Languages</i>	Matlab, C/C++, PHP, Maple, LaTeX, Python.
<i>Libraries</i>	OpenCV, OpenGL, BTK.
<i>Software</i>	MS Office, OpenSim, Mokka, Autocad.

LANGUAGE PROFICIENCY

Italian (Mother tongue)

Language	Understanding		Speaking		Writing
	Listening	Reading	Spoken interaction	Spoken production	
English	B2	C1	C1	C1	C1
French	C2	C2	C1	C1	B1
Spanish	A2	A2	A1	A1	A1
Portuguese	A2	A2	A1	A1	A1

(Self-assessment based on the Common European Framework of Reference for Languages)

ORGANIZATIONAL SKILLS AND COMPETENCES

Enterprising and capable of working in team and organizing projects in a precise and organic way. Dependable in supporting and enabling team effort. Natural bent for planning and problem solving. Results oriented. Experience in managing projects. Ability to lead, reach consensus, establish goals and attain results.

SOCIAL SKILLS AND COMPETENCE

Loyal. Determined. Open-minded. Friendly. Able to relate. Diligent and reliable. Excellent inter-personal and communications skills.

ARTISTIC SKILLS AND COMPETENCES

I attended classical dance school for 10 years. I have been attending belly-dance courses since 2009. I like listening to music, going to cinema and museums, watching football, cooking, traveling and knowing different cultures. I am actually the president of a cultural association as well as the human resource manager of a family nursery.

RESEARCH TOPICS

My research takes place in the areas of *signal* and *image processing*, *pattern recognition* and *machine learning*.

In particular, these studies fall into two different application contexts :

- **biomedical engineering**
- **human-robot interaction.**

University studies

During my BSc thesis I investigated the problem of design a sensor level, based on the proprieties of sound waves propagating in a cavity, for the dispensing systems of automatic devices for *Enzyme-Linked-ImmunoSorbent Assay* (ELISA), a benchmark for detection of pathological antigens or antibodies of interest in a wide variety biological samples. The principal aim was to minimize carry-over risk by utilizing interchangeable (plastic) pipette tips. An *electronic circuit* has been designed, which allows finding automatically wave modifications caused by different tip-liquid configurations. The realized system allows to discriminate with a good sensibility the various threshold values, corresponding to different system configurations. This work was made at *DAS srl* company (Palombara Sabina, Italy).

During my MSc thesis, my research was focused on designing a specific system for automatized classification of *HEp-2* fluorescent patterns in diagnosis of systemic autoimmune diseases *indirect immunofluorescence* (IIF). This led to a pattern recognition

problem, where a supervised learning was applied. After validating the feature selection method I adopted for the classification a *Multiple Expert System architecture* (MES) obtaining reliable results. This research work was made in collaboration with a doctors' team to validate the effectiveness of digital images use in IFF diagnosis.

PhD

My PhD research has been focused on the design and the development of a gesture recognition system that can be exploited in a human-robot interaction context.

Robots companion are designed to share with humans the same physical and communication spaces in performing daily life collaborative tasks and aids. In such a context, interactions between humans and robots are expected to be as natural and as intuitive as possible. One of the most natural ways is based on gestures and reactive body motions. To make this friendly interaction possible, a robot companion has to be endowed with one or more capabilities allowing him to perceive, to recognize and to react to human gestures.

The aim of my research was so to investigate human gestures starting from the detections of human movements in communicating tasks. This problem can be stated as tracking articulated human motion in images, from one side, and on codifying gesture movements in order to classify properly the selected classes of gestures.

The first part of my work was focused on tracking human arms movements using a single camera. To obtain a robust tracking I decided to describe the 3D human body as a *graphical model* in which the relationships between the body parts are represented by conditional probability distributions. Each limb is tracked with an *Annealed Particle Filter* and the different filters interact through *Belief Propagation algorithm*. In a second part another algorithm was developed to recognize a kind of gestures, the emblematic ones. I proposed a new arm's kinematics normalization scheme reflecting both the muscular activity and arm's appearance when a gesture is performed. With the aim of recognizing 5 classes of gestures I compared two classification methods, the *Hidden Markov Models* and the *Support Vector Machines*. Both systems have shown good performances with a minimalistic training database regardless to performer's anthropometry, gender, age or pose with regard to the sensing system.

Other researches

During my internship at the University Campus Bio-medico, my scientific activity was applied to the study and design of robotic advanced diagnostic systems, and to the study and design of biomedical devices devoted to image diagnosis. The aim of such studies was to develop theoretical and algorithmic methods, by which useful information about world can be automatically extracted and analyzed from an image. This work took place in the context of the *European project TACT* (Thought in Action) aiming at developing non-obtrusive, user-friendly technological aids and methods allowing the extraction of information from movements made by infants with autism.

During my university studies I greatly appreciated and studied mathematics and *complex* (physiological) *system dynamics* modeling. I had the opportunity to participate in epidemic models research with the University of Salento. Within the framework of studies on the incidence of infectious diseases, we introduced a discrete time version of the classic *SIRS*, where the population is divided into susceptible, infected but not yet infectious (exposed), infectious, and recovered individuals. Seasonal effects (due to increased viral production in winter, or due to the strong recovery of the pathogen due to mutations) are obtained by introducing discontinuities in the parameters that describe (1) the infection probability among contacts exposed-infectious and (2) the length of permanence in the removed class. The comparison with the data collected in the Ile-de-France by the Réseau Sentinelles (INSERM, UPMC), shows that the simulations obtained fit very well with the time series of real diseases flu.

As Research Associate I participated to two multidisciplinary projects financed by the French National Agency (ANR), namely CIGALE and TYPANNOT. The CIGALE project (Capture and Interaction with Artistic, Linguistic and Expressive Gestures) intended to develop an artistic device that focuses on the gestural interaction between a human being and an avatar whose gestures are the result of an hybridization of the considered types of interactions : the symbolic ones (coverbal gestures and choral conducting), the poetic ones (French Sign Language poems) and the artistic ones (pantomime). The TYPANNOT (Typographie annotation) project proposes to provide for sign language a form of writing, transcription and annotation simple and with low-cost devices. In this context, my efforts were focused on developing experimental set-ups, analyzing data and characterizing signals to cover varied necessities coming from different research fields of the projects partners. My capabilities of interacting with people from different background as well as the expertise I acquired during my studies were fully exploited in this work.

PUBLICATIONS

Journal Papers

- [2015] [Renna I.](#), Delacroix S., Catteau F., Vincent C., Boutet D. "Characterisation of gestural units in light of human-avatar interaction", Multimodal Interfaces for Natural Interactions, Special Issue on EAI Endorsed Transactions on Creative Technologies, <https://hal.archives-ouvertes.fr/hal-01162801>.
- [2012] Paladini F., [Renna I.](#), Renna L. "A Kicked Epidemic SIRS Model", International Journal of Bifurcation and Chaos, Vol. 22, No 10, doi : [10.1142/S0218127412502513](https://doi.org/10.1142/S0218127412502513).
- [2011] Paladini F., [Renna I.](#), Renna L. "A Discrete SIRS Model with Kicked Loss of Immunity and Infection Probability", Journal of Physics : Conference Series , Vol. 285, No 1, doi : [10.1088/1742-6596/285/1/012018](https://doi.org/10.1088/1742-6596/285/1/012018).

- [2011] Renna I., Achard C., Chellali R. “*3D upper body pose estimation for human-robots communication : Combination of annealing particle filter and belief propagation*”, Applied Bionics and Biomechanics Journal, doi : 10.3233/ABB-2011-0015.
- [2010] Renna I., Achard C., Chellali R. “*Real and Simulated Upper Body Tracking with Annealing Particle Filter and Belief Propagation for Human-Robot Interaction*”, International Journal of Humanoid Robotics, doi : 10.1142/S0219843611002368.

International Conferences

- [2015] Boutet D., Doan P., Renna I.C. Danet, Bianchini C.S., Rébulard M., Goguely T., “*Typannot : a project for sign language annotation using an ad-hoc glyph system*”, 2nd International Conference on Sign Language Acquisition ICSLA (Amsterdam, 1-3/07/2015).
- [2014] Boutet D., Doan P., Renna I.C. Danet, Bianchini C.S., Rébulard M., Goguely T., “*Annotating sign language using a dedicated glyph system*”, 4th Australasian Deaf Studies Research Symposium (Renwick NSW Australia, 25-26/10/2014).
- [2012] Chellali R., Renna I. “*Emblematic gesture recognition*”, 11th Biennial Conference on Engineering Systems Design and Analysis ESDA 2012.
- [2010] Paladini F. Renna I. Renna L. “*A Discrete SIRS Model with Kicked Loss of Immunity and Infection Probability*”, International Conference on Chaos and Nonlinear Dynamics, Dynamics Day South America 2010, São José dos Campos, Brazil. (available on <http://www.urlib.net/8JMKD3MGP7W/382LNBE>).
- [2009] Renna I., Achard C., Chellali R. “*Combination of annealing particle filter and belief propagation for 3D upper body trackings*”, International Conference on Intelligent Robotics and Applications– ICIRA, Vol. 5928 Springer (2009), p. 824-833. **Best Paper Award “Theory in Robotics”**.
- [2009] Renna I., Achard C., Chellali R. “*Tracking of upper body with annealed particle filter and belief propagation*”, Proceedings International Conference on Multimodal Interfaces for Skills Transfer - SKILLS 2009, p. 67-72, ISBN : 978-84-613-5456-5.

National Conferences

- [2014] Renna I., Delacroix S., Catteau F., Vincent C., Boutet D., “*Caractérisation d’unités gestuelles en vue d’une interaction humain-avatar*”, Workshop Affects, Compagnons Artificiels, Interaction (WACAI 2014), 107-113.
- [2012] Chellali R., Renna I., Bernier E. “*Détection et Reconnaissance des Gestes Emblematiques*”, Interaction Homme-Machine pour l’Apprentissage Humain -IHMA -RFIA 2012, HAL : hal-00660986, version 1.
- [2010] Renna I., Achard C., Chellali R. “*Suivi du haut du corps humain combinant filtrage particulière à recuit simulé et propagation de croyance*”, Vidéo-surveillance Intelligente : Systèmes et AlGorithmEs - VISAGE-RFIA 2010.