

Personal information

Surname(s) / First name(s)

Telephone(s)

Email(s)

Nationality(-ies)

Date of birth

Website

Activity

Work Experience

Dates

Occupation or position held

Research Topics

Main activities and responsibilities

Name and address of employer

Dates

Occupation or position held

Main activities and responsibilities

Ruffaldi Emanuele

+393291610680

emanuele.ruffaldi@gmail.com

Italian

7th May, 1978

<http://www.eruffaldi.com>



Research and Development on high-end interaction systems between humans and robots in Augmented and Virtual Environments. Expertise in the underlying software infrastructure involving networking, system-level optimization and data analysis via machine learning.

May 2007 - Present

Assistant Professor

Virtual and Augmented Reality: software, systems and interaction (2003-); Haptic Rendering (2002-); Virtual Environments for Human Training (2006-); Machine Learning for industrial environment and robotics (2010-); Wearable Systems for Ergonomics (2011-); Human-Centered Robotics (2012-).

- Team manager as leader of the "Sensing, Modeling and Learning Group" comprising 3 PhDs, 1 postdoc and 1 engineer
- Software development and system design for research and industrial projects
- Principal Investigator of research grants with financial responsibility: currently 1 European projects, 1 national, 1 industrial ones (overall 300k€/ year)
- Effort estimation, break down and coordination of activities
- Grant writing at European, national and industrial level, both as PI or as contributor
- Scientific service to community: review for conference and journals, Co-Chair of IEEE Technical Committee on Haptics. Organization of international events (IEEE Program Chair, workshop organization)
- Tutoring of PhD and master students (3 PhDs and 15 master in the past)
- Lecturing at PhD and master level

Scuola Superiore Sant'Anna, Pisa, Italy - PERCRO laboratory

July 2006 - April 2007

Research Fellow

Contribution to the definition of the system architecture of a haptic simulation of interaction of textiles (**HAPTEX**). Development of a framework in C++/OpenGL/Chai3D for the design of haptic-enabled games and applications under supervision of Prof. Frisoli.

Name and address of employer	Scuola Superiore Sant'Anna, Pisa, Italy - PERCRO laboratory
Dates	August 2005 - June 2006
Occupation or position held	Visiting Student
Main activities and responsibilities	Research activity funded by grant AO 04-G66 "Virtual Reality Planning In Reconstructive Trauma Surgery" of MD. Sabine Girod, under the tutoring of Prof. Ken Salisbury and Federico Barbagli. Research on haptic collision detection for supporting the operation planning.
Name and address of employer	Stanford University, BioRobotics Laboratory
Dates	June 2003 - August 2003
Occupation or position held	Visiting Scholar
Main activities and responsibilities	Research period on evaluation of haptic experiments and CAVE
Name and address of employer	University College of London, Computer Science Department

Education and training

Dates	January 2003 - June 2006
Title of qualification	PhD
Principal subjects	PhD in Perceptual Robotics at PERCRO Laboratory with a Thesis entitled "Multirate and Perceptual Techniques for Haptic Rendering in Virtual Environments", tutor Prof. Massimo Bergamasco. Defended with Honors on 6th June 2006
Organization	Scuola Superiore Sant'Anna, Pisa, Italy
Dates	October 1997 - September 2003
Title of qualification	Diploma
Principal subjects	Five year grant with tight selection in parallel to Master studies. Thesis on "Haptic Scripting for setup of experiments". Defended with Honors on 10th September 2003.
Organization	Scuola Superiore Sant'Anna, Pisa, Italy
Dates	October 1997 - October 2002
Title of qualification	Master
Principal subjects	Master in Computer Engineering with a Thesis on "Integration of Database and interactivity in a visualization system based on the Information Landscape approach". Completed with Honors on 8th October 2002.
Organization	Università di Pisa, Italy

Experience

Research Results

This section presents specific activities performed in the context of the research activity

Publications in the areas of virtual reality, haptic rendering, haptic devices, human training in virtual environments, wearable sensing: 19 ISI Journal papers, 92 peer-reviewed conference papers (54 IEEE/ACM), 10 book chapters, 29 posters and workshops, 9 invited talks, 2 patents. H-Index: 14 ([Scholar](#)), 11 (Scopus), Erdos number 5. Best poster award at MMVR14. Visual listing of publications available [here](#)

Dates	2015-Present
Activity	Research on Intention Recognition for Autonomous Driving
Details	As part of an industrial project for an automotive company aimed at estimating the behavior of vehicles in highway. Development of a C++ software framework based on probabilistic graphical models for intention prediction.
Dates	2015-2017
Activity	Research on Diagnostician User Interface for Haptic Remote Medicine

Details	Research and Development on a new Augmented Reality interface for interacting with a remote USG and palpation robot based on encountered haptic paradigm. Leading research on the interaction, component selection, core development in C++/OpenGL leading a new component framework for Mixed Reality interaction (CoCo). Papers: A , B .
Dates	November 2013 to December 2015
Activity	Transfer of Human Abilities through Robot
Details	Research on a Baxter robot based system for the transfer of human abilities through robotics. Multi-camera sensor fusion, trajectory learning and AR feedback. Paper at VRST .
Dates	March 2014 to November 2014
Activity	Pano-stereoscopic system for tele-presence
Details	System definition, component selection, core development (C++/OpenGL) and optimization for a system based on 5 pairs of cameras for real-time tele-presence and HMD.
Dates	October 2006 to December 2011
Activity	Platform for Sport Training in Virtual Environments
Details	Research, development and team coordination on a system for training Rowing in Virtual Environments (SPRINT) based on a multimodal platform. The system employed audio feedback, vibrotactile feedback, motion capture, integration of sensors such as VO2. Architecture design, interaction design, definition of feedback, 3D graphics development. Supervision of a PhD during the period and coordination of the team involving multiple partners for the development of the platform and execution of experiments.
Dates	2012-Present
Activity	Ergonomic Assessment using Wearable Systems
Details	Research, development and management of a system (project page) for the real-time assessment of workload based on a wearable system capable of precision reconstruction of arm motion and EMG workload. Reconstruction algorithm core development based on UKF in C++/Eigen, co-development and optimization of the firmware STM32 in C. Experiment design and component selection.
Dates	March 2009-2016
Activity	Mobile Haptic Platform for Rehabilitation
Details	Research and development of the MOTORE mobile rehabilitation device, currently being commercialized. Software platform design and development in C++/Qt, contribution to the design of the haptic rendering, co-development and optimization of the firmware in Simulink and C, communication protocol, project management. Papers: A , B .
Dates	2011-2015
Activity	Machine Learning Anomaly Detection for Industry
Details	Research and team management for the creation of new algorithms, development and plant integration of systems for the identification of anomalies in data. Applied in a C++ software for the Italian electric utility.
Dates	January 2010-March 2011
Activity	Haptic Rendering and Interaction for Virtual Textiles
Details	Development of an interaction system for the haptic interaction with virtual textiles simulated using a FEM model. Algorithm and interaction design, development in C++ and OpenCL.
Dates	January 2008-September 2008
Activity	Haptic Virtual Laboratory

Details	Design and development of a system for the execution of multi user experiments involving haptic rendering and physics based simulation. Implemented in C++, OpenGL and XVR.
Dates	2002-2010
Activity	Information Landscape Visualization System
Details	Research and development of a system for immersive data visualization. The system has been developed in C++/ OpenGL and designed to work in different types of Virtual Environments, from CAVE to HMDs.

Research Grants

	This section presents the research grants of which I have been Principal Investigator or Fund Manager ordered
Dates	2017-2019 (2 years)
Name	SailPORT
Sponsor	INAIL (BRIC 2016)
Grant Size	528k for the 10-partners project, 200k direct
Details	Scientific Coordinator of a project funded by the Italian National Institute for Insurance against Accidents at Work (INAIL) on safety of workers in sea ports. Dealing with computer vision for people flow and accident analysis, biomechanical analysis for safety at work. SSSA is the coordinator, complemented by other 9 local health entities (ASL).
Dates	2015-2017 (3 years)
Name	RAMCIP http://www.ramcip-project.eu/
Sponsor	EU H2020
Grant Size	335k, 8 partners
Details	PI and Task Leader in an European Research project coordinated by CERTH (GR) on Robotic Assisted Living for MCI people. Research on (1) estimation of biomechanical state of the user from the point of view of the robot, (2) quantification of users skills and their progress along time, (3) human-robot interaction based on innovative AR.
Dates	2014-2017 (3 years)
Name	PELARS http://www.pelars.eu
Sponsor	EU FP7 Technology Enhanced Learning
Grant Size	370k€, 12 partners
Details	PI, WP Leader, Technology Manager and Scientific Board member in an European project coordinated by CIID (DK) on Learning Analytics in Projectual-based learning. Research on (1) activity recognition based on vision (2) Learning Analytics methods for student profiling.
Dates	2015-2016 (2 years)
Name	MMRISK
Sponsor	Industrial
Grant Size	150k€
Details	PI of an Industrial research project on providing autonomous cars understanding of external vehicle and obstacle behavior. This activity is associated to the interest in general, probabilistic based, modeling of behavior.
Dates	2015 (1 year)
Name	SMOOTI
Sponsor	Industrial funded by Telecom Italia
Grant Size	35k€
Details	PI in an Industrial research project on prototyping a wearable system for real-time ergonomics during work activity. This activity continues and consolidates the previous ERGANE project.
Dates	2012-2015 (3 years)

Name	ERGANE
Sponsor	Italian CCM Ministry of Health - final workshop
Grant Size	105k€
Details	PI in a Research project aimed at designing a wearable system based on inertial and EMG sensors for the ergonomic assessment in selected working activity. Leading the design on the motion reconstruction algorithms
Dates	2011-2013,2014,2016
Name	Anomaly Detection in Industrial Plants
Sponsor	Italian Electric Utility
Grant Size	110k€
Details	PI on two research projects funded by the Italian electric utility on the identification of anomalies in power plants. The most recent is related to the anomaly detection on a coal miller based on Machine Learning applied to large amount of historical data. The older was based on leakage detection based on the data recorded in an array of microphones.
Dates	2015-2016 (15 months)
Name	Future Challenges website
Sponsor	H2020 CSA
Grant Size	25k€, 3 partners
Details	PI in an European project for selection of research Inducement Prizes coordinated by NESTA (UK). Consulting on the selection of the technologies to be investigated for the preparation of the challenges.

Personal skills and competences

Mother tongue(s)

Other language(s)

Self-assessment European level^()*

English

Management skills and competences

Italian

Understanding		Speaking		Writing
Listening	Reading	Spoken interaction	Spoken production	
C1	C1	C1	C1	C1

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

- Activity coordination in the team, and at the level of consortium as Workpackage leader
- Presentation of results at Review meeting
- Effort estimation, break down, reporting
- Financial accounting rules for projects funded by national or European calls

Computer skills and competences

Listing of Open Source contributions: [here](#)

- Main Programming Language: C++ and cross-platform programming. Use of C++ since 1995 in networked, multi-threaded applications ranging from robotics, virtual reality and machine learning. Library and tools development.
- Component-based, concurrent and soft real-time programming
- Secondary Languages: Python and Matlab used for tooling and data analysis. Talk at EuroPython 2006
- Languages used in the past: x86 assembler, PHP, Java, C#, Delphi
- C++ Libraries: Qt, Eigen, boost, OpenCV, Aruco, PCL
- Parallel and GPU computing: OpenMP ([Paper](#)) and CUDA
- Programming Tools: cmake, Doxygen, graphviz
- Unit Testing tools: catch
- Version control systems: git, previously subversion and mercurial
- Software Management Tools: Jenkins, rhodecode
- Use of Web technologies (HTML5, REST and Javascript) mainly for exposing software functionalities
- Daily usage of LaTeX for reporting and documentation, automatic report generation
- Architecture Tools: interest in SysML

3D and Virtual Reality Technologies

- OpenGL API: 2.x and 3.3, experiments with WebGL
- Display with Oculus HMD and HTC Vive, experience in CAVE
- Motion Capture with Vicon
- Application development with custom framework (XVR, CoCo) and Unity
- Research and development experience with haptic interfaces: worked with Phantom, custom Exoskeleton, custom desktop devices
- Disciplined approach in Transformation Graphs for telepresence systems

Data Processing

- Mainly Matlab/Simulink with C++ adaptation, machine learning methods with interest in probabilistic graphical models for static and dynamic models.
- Sensor fusion based on non-linear Kalman filtering
- Interest in data management software with provenance for traceable research

Platforms

- Operating Systems: OSX (main), Linux (development) and in the past Windows (low level), with some exposure to OpenVMS
- Multiplatform and cross-platform development with C++
- Knowledge of internal structure of operating systems (Windows and Linux) and the system stack
- Use of Virtualization technologies for improving software development: Vagrant and Docker
- Embedded systems: some experience with ARM solutions in particular STM32, and in the past use of TI C2000
- Network programming using sockets or higher libraries such as ZeroMQ
- Robotic development using ROS

Torre del Lago Puccini, June 19, 2017

Emanuele Ruffaldi