



# Florenc Demrozi

PH.D. IN COMPUTER SCIENCE · POSTDOC

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*“Run towards the future without forgetting the past”*

## Summary

I am currently a postdoctoral researcher at the University of Verona, Italy, where I am member of the ESD (Electronic Systems Design) Research Group, working on Ambient Intelligence (Aml), Ambient Assisted Living (AAL), Internet of Things (IoT) and Virtual Coaching Systems (VCS). I obtained my Ph.D. in Computer Science in May 2020 supervised by Prof. Graziano Pravadelli. Previously, I received my Master's degree (M.Sc.) in Computer Science and Engineering at the University of Verona in 2016 with a thesis on Automatic generation of self-adaptive transactors from PSL assertions under the supervision of professor Graziano Pravadelli. I received my Bachelor's degree (B.Sc.) in Computer Science at the University of Verona in 2014. My work focuses on the development of Virtual Coaching System's whose primary purpose is to help people with special needs in carrying out Activities of Daily Life (ADL's).

## Education

### University of Verona, Italy

*Strada le Grazie 15, 37134, Verona,  
Italy*

PH.D. IN COMPUTER SCIENCE

*October 2016 - September 2019*

**Key research areas:** Design and Verification of Embedded System, Ambient Intelligence, IoT and Ambient Assisted Living (AAL)

**Title of the thesis:** An IoT based Virtual Coaching System for Assisting Activities of Daily Life

**Advisor:** Prof. Graziano Pravadelli

### University of Verona, Italy

*Strada le Grazie 15, 37134, Verona,  
Italy*

M.S. IN COMPUTER SCIENCE AND ENGINEERING

*October 2013 - March 2016*

**Degree:** LM-32 - Master Degree in Computer Science and Engineering

**Title of the thesis:** Automatic generation of self-adaptive TLM protocols from PSL assertions

**Supervisor:** Prof. Graziano Pravadelli

**Assistant Supervisor:** Dr. Francesco Stefanni

**Graduation date:** 17/03/2016

**Grade:** 110/110 cum laude

### University of Verona, Italy

*Strada le Grazie 15, 37134, Verona,  
Italy*

B.S. IN COMPUTER SCIENCE

*October 2010 - March 2014*

**Degree:** Degree: L-31 - Bachelor Degree in Computer Science

**Title of the thesis:** Graphical User Interface for TSL (TestBench Specification Language) Generators

**Supervisor:** Prof. Graziano Pravadelli

**Graduation date:** 19/03/2014

**Grade:** 95/110

## Experience

### Department of Computer Science, University of Verona, Italy

*Strada le Grazie 15, 37134, Verona,  
Italy*

POSTDOCTORAL RESEARCH FELLOW

*October 2019 - Present*

**Key research areas:** Internet of Things (IoT), Ambient Intelligence, Ambient Assisted Living (AAL), Wearable Devices and Parkinson Disease

### Department of Computer Science, University of Verona, Italy

*Strada le Grazie 15, 37134, Verona,  
Italy*

TEACHING ASSISTANT

*March 2019 - June 2019*

**Course Name:** Advanced Operating Systems

**Coordinator:** Prof. Graziano Pravadelli

**Disciplinary sector:** ING-INF/05 - Information Processing Systems

**Language of instruction:** Italian

**Department of Computer Science, University of Verona, Italy**

*Strada le Grazie 15, 37134, Verona,  
Italy*

TEACHING ASSISTANT

*October 2016 - June 2019*

**Course Name:** Operating Systems

**Coordinator:** Prof. Graziano Pravadelli

**Disciplinary sector:** ING-INF/05 - Information Processing Systems

**Language of instruction:** Italian

**Department of Computer Science, University of Verona**

*Strada le Grazie 15, 37134, Verona,  
Italy*

SCHOLARSHIP HOLDER

*April 2016 - September 2019*

**Supervisor:** Dr. Matteo Cristani

**Activity:** Design of an architecture based on IoT devices (e.g., Single Board Computer (SBC), Single Board Micro-controller (SBM)) aiming to facilitate the controllability and observability of industrial plants from a remote web-app application. Specifically, we defined an approach to implement the control strategy of industrial plants through Extended Finite State Machines (EFSMs).

## Visiting Experiences

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**Department of Biomedical Engineering (BME) at University of Florida, United States**

*1275 Center Dr, Gainesville, FL 32611,  
USA*

VISITING SCHOLAR

*August 2019 - December 2019*

**Supervisor:** Dr. Parisa Rashidi

## Summer Schools

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**Participant**

*Lipari Island, Italy*

LIPARI SCHOOL ON COMPUTATIONAL COM-PLEX AND SOCIAL SYSTEMS - CITIES OF CITI-ZENS : BIOSENSORS, SOCIAL MODELING AND PARTICIPATORY COMPUTING

*July 16, 2017 - July 22, 2017*

**Participant**

*Verona, Italy*

SUMMER SCHOOL ON FORMAL METHODS FOR CYBER-PHYSICAL SYSTEMS EDITION 2017: AUTOMATIC SYNTHESIS OF CONTROLLERS FOR HYBRID SYSTEMS

*September 12, 2017 - September 17*

**Participant**

*Alghero, Italy*

DESIGNING CYBER-PHYSICAL SYSTEMS FROM CONCEPTS TO IMPLEMENTATION

*September 12, 2017 - September 17*

**Participant**

*Verona, Italy*

SCHOOL ON EMERGING TECHNOLOGIES FOR DESIGN AND ENGINEERING OF ELECTRONICS SYSTEMS

*October 5, 2017 - October 7, 2017*

**Participant**

*Verona, Italy*

SUMMER SCHOOL ON FORMAL METHODS FOR CYBER-PHYSICAL SYSTEMS

*June 3, 2019 - June 7, 2019*

## Published Articles

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JOURNAL

**Demrozi F, Bacchin R, Tamburin S, Cristani M, Pravadelli G**, Towards a wearable system for predicting the

2019 [J1] freezing of gait in people affected by Parkinson's disease. IEEE journal of biomedical and health informatics. 2019 Nov 11.

*Online*

CONFERENCE

- 2016 [C1] **Demrozi F, Pravadelli G and Stefanni F.**, 2016, September. Automatic generation of self-adaptive transactors from PSL assertions. In 2016 Forum on Specification and Design Languages (FDL) (pp. 1-7). IEEE. *Bremen, Germany*
- 2017 [C2] **Demrozi F, Zucchelli R and Pravadelli G.**, 2017, October. Exploiting sub-graph isomorphism and probabilistic neural networks for the detection of hardware Trojans at RTL. In 2017 IEEE International High Level Design Validation and Test Workshop (HLDVT) (pp. 67-73). IEEE. *Santa Cruz, CA, USA*
- 2018 [C3] **Cristani M, Demrozi F and Tomazzoli C.**, 2018. ONTO-PLC: An ontology-driven methodology for converting PLC industrial plants to IoT. *Procedia Computer Science*, 126, pp.527-536. *Belgrade, Serbia*
- 2018 [C4] **Demrozi F, Costa K, Tramarin F, Pravadelli G.** A graph-based approach for mobile localization exploiting real and virtual landmarks. In 2018 IFIP/IEEE International Conference on Very Large Scale Integration (VLSI-SoC) 2018 Oct 8 (pp. 249-254). IEEE. *Verona, Italy*
- 2019 [C5] **Demrozi F, Bragoi V, Tramarin F, Pravadelli G.** An indoor localization system to detect areas causing the freezing of gait in Parkinsonians. In 2019 Design, Automation & Test in Europe Conference & Exhibition (DATE) 2019 Mar 25 (pp. 952-955). IEEE. *Florence, Italy*
- 2019 [C6] **Demrozi F, Pravadelli G, Tighe P.J, Bihorac A and Rashidi P.**, 2020. Joint Distribution and Transitions of Pain and Activity in Critically Ill Patients, Accepted for publication at IEEE Engineering in Medicine and Biology Society (EMBC) *Montréal, Canada*

## Competitions

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### INTERNATIONAL

- 2014 **Finalist**, ACM Student Research Competition collocated with International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS) *New York, USA*

### DOMESTIC

- 2019 **First Place**, European Social Fund (ESF) – Veneto Region *Padua, Italy*
- 2017 **Special Prize**, Best Social Innovation Project in Italy at National Innovation Award competition *Naples, Italy*
- 2017 **Finalist**, Veneto Start-Cup *Verona, Italy*

## Presentations

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### IFIP/IEEE International Conference on Very Large Scale Integration-System on a Chip (VLSI-SoC)

*Verona, Italy*

#### PRESENTER

*October 2018*

**Article:** **Demrozi F.** Costa K, Tramarin F, Pravadelli G. A graph-based approach for mobile localization exploiting real and virtual landmarks. In 2018 IFIP/IEEE International Conference on Very Large Scale Integration (VLSI-SoC) 2018 Oct 8 (pp. 249-254). IEEE.

**Ph.D Forum:** **Demrozi F.** An IoT based Virtual Coaching System (VSC) for Assisting Activities of Daily Life, In 2018 IFIP/IEEE International Conference on Very Large Scale Integration (VLSI-SoC)

### Design, Automation & Test in Europe Conference & Exhibition (DATE)

*Florence, Italy*

#### PRESENTER

*March 2019*

**Article:** **Demrozi F** Bragoi V, Tramarin F, Pravadelli G. An indoor localization system to detect areas causing the freezing of gait in Parkinsonians. In 2019 Design, Automation & Test in Europe Conference & Exhibition (DATE) 2019 Mar 25 (pp. 952-955). IEEE.

### International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS)

*New York, USA*

#### PRESENTER

*October 2019*

**Ph.D. Forum:** **Demrozi F.** An IoT based Virtual Coaching System (VSC) for Assisting Activities of Daily Life

**ACM Competition:** **Demrozi F.** An IoT based Virtual Coaching System (VSC) for Assisting Activities of Daily Life

## Reviewer

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### Reviewer

#### TPC MEMBER

2020

Forum on specification & Design Languages (FDL)

Transactions on Emerging Topics in Computing (TETC)

## Secondary Reviewer

October 2016 - Present

Forum on specification & Design Languages (FDL)  
Design, Automation & Test in Europe Conference & Exhibition (DATE)  
International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS)  
IFIP/IEEE International Conference on Very Large Scale Integration - System on a Chip (VLSI-SOC)  
International Conference on VLSI Design and Embedded Systems (VLSID & ES)

## Organizing Committee Member

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2018	<b>Web Chair</b> , IFIP/IEEE International Conference on Very Large Scale Integration-System on a Chip (VLSI-SoC), October 10, 2018 - October 10, 2018	Verona, Italy
2018	<b>VLSI-SoC Local Arrangement Committee</b> , IFIP/IEEE International Conference on Very Large Scale Integration-System on a Chip (VLSI-SoC), October 10, 2018 - October 10, 2018	Verona, Italy
2019	<b>Web Chair</b> , Forum on specification & Design Languages (FDL), September 2, 2019 - September 4, 2019	Southampton, United Kingdom
2020	<b>Web Chair</b> , Forum on specification & Design Languages (FDL), September 15, 2020 - September 17, 2020	Kiel, Germany

## Projects

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**ADA: Assisting Daily life Activities for people with special needs in a Ambient Assisted Living context.** FSE-Veneto Region

RESEARCH ACTIVITY

2017-2018

**Bip-Bip: Detection of Freezing Of Gait in Parkinson's disease through Wearable devices.** FSE-Veneto Region

RESEARCH ACTIVITY

2018-2019

**Smart-Pump: Intelligent assistive system to regulate the continuous administration of drugs in Parkinson's patients.** FSE-Veneto Region

RESEARCH ACTIVITY

2020-2021

## Extracurricular Activity

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**ICT for Families (IF's) Innovative Start-Up** Verona, Italy

PROJECT LEADER

July 2017 - PRESENT

Winner of the Best Social Innovation Project at PNI Italy 2017

**Wagoo Italia s.r.l.s** Verona, Italy

PROJECT MANAGER

July 2017 - PRESENT

Moramma Project (webpage)

## Mentoring activities

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**Co-Advised** Seven (7) M.S. Degree Students in Computer Science

**Co-Advised** Twenty Two (2) B.S. Degree Students in Computer Science and Engineering

**Co-Advised** Two (2) Scholarship Holder

## Communication Skills

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**Albanian** Bilingual

**Italian** Bilingual

**English** C1

**Spanish** B1

## Software Skills

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**Operating Systems** Linux (Debian/Ubuntu/RedHat) Distributions, Windows  
**Tools** Microsoft Office, Libre Office, Visual Studio  
**Programming** Python, C, C++, C#, JAVA, Matlab, HDL Languages, BASH, PHP, SQL, LaTeX  
**Markup Languages** HTML, XHTML, CSS

## Personal Skills

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Motivated, Organized, Responsible, Accurate, Adaptable, Ambitious, Confident, Cooperative, Determined, Energetic, Independent, Versatile

## Personal Interests

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Music, Chess, Sport(Soccer), Swimming, History, Geography

## Research Resume

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My research interests concern system-level design of embedded systems and Ambient Assisted Living (AAL) area. Regarding the first context, during my master and Ph.D where published works related to Virtual Platform Design [C1],[C3] and Hardware Security [C2], instead, with regard to the second context, which at present covers almost all my activities, my research aims to extend current approaches and solutions for AAL by defining a ubiquitous and non-invasive Virtual Coaching System (VCS) that allows people with cognitive and/or physical impairments learning new behaviors and avoid unwanted ones. VCS makes possible the interaction between daily life objects and wearable smart devices. Furthermore, it defines the basis for the creation of a smart environment [C4] which allows us to collect data concerning the interaction between objects and the people present in the environment and react accordingly to support elderly in daily life activities. While the general architecture of VCS can be exploited in different contexts, an application scenario where I have started to decline VCS is represented by the Freezing of Gait (FoG) in Parkinson Disease (PD) [J1] and at the moment i am working on the pattern recognition of the FoG pattern based on wearable devices. Most of the activities related to the use of embedded systems for virtual coaching are carried on as part of the **ADA**, **BipBip** and **Smart-Pump** projects, which involve the cooperation between computer scientists, medical doctors and psychologists.

## Doctoral Thesis Resume

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Nowadays aging of the population is becoming one of the main concerns of the world. It is estimated that the number of people aged over 65 will increase from 461 million to 2 billion in 2050. This substantial increment in the elderly population will have significant consequences in the social and health care system. Therefore, in the context of Ambient Intelligence (AmI), the Ambient Assisted Living (AAL) has been emerging as a new research area to address problems related to the aging of the population. AAL technologies based on embedded devices have demonstrated to be effective in alleviating the social- and health-care issues related to the continuous growing of the average age of the population. Many smart applications, devices and systems have been developed to monitor the health status of elderly, substitute them in the accomplishment of activities of the daily life (especially in presence of some impairment or disability), alert their caregivers in case of necessity and help them in recognizing risky situations. Such assistive technologies basically rely on the communication and interaction between body sensors, smart environments and smart devices. However, in such context less effort has been spent in designing smart solutions for empowering and supporting the self-efficacy of people with neurodegenerative diseases and elderly in general. This thesis fills in the gap by presenting a low-cost, non intrusive, and ubiquitous Virtual Coaching System (VCS) to support people in the acquisition of new behaviors (e.g., taking pills, drinking water, finding the right key, avoiding motor blocks) necessary to cope with needs derived from a change in their health status and a degradation of their cognitive capabilities as they age. VCS is based on the concept of extended mind introduced by Clark and Chalmers in 1998. They proposed the idea that objects within the environment function as a part of the mind. In my revisiting of the concept of extended mind, the VCS is composed of a set of smart objects that exploit the Internet of Things (IoT) technology and machine learning-based algorithms, in order to identify the needs of the users and react accordingly. In particular, the system exploits smart tags to transform objects commonly used by people (e.g., pillbox, bottle of water, keys) into smart objects, it monitors their usage according to their needs, and it incrementally guides them in the acquisition of new behaviors related to their needs. To implement VCS, this thesis explores different research directions and challenges. First of all, it addresses the definition of a ubiquitous, non-invasive and low-cost indoor monitoring architecture by exploiting the IoT paradigm. Secondly, it deals with the necessity of developing solutions for implementing coaching actions and consequently monitoring human activities by analyzing the interaction between people and smart objects. Finally, it focuses on the design of low-cost localization systems for indoor environment, since knowing the position of a person provides VCS with essential information to acquire information on performed activities and to prevent risky situations. In the end, the outcomes of these research directions have been integrated into a healthcare application scenario to implement a wearable system that prevents freezing of gait in people affected by Parkinson's Disease.

Approved: Florenc Demrozi, Ph.D  
Computer Science Department  
University of Verona, Italy  
May 4, 2020