Curriculum Vitae

Simone Benatti

Personal Data

Date of birth **28/09/1974**.
Place of birth **Mirandola (MO)**.
Citizenship **Italian**.
Permanent address **Via Felice Cavallotti, 32 - 41037 Mirandola (MO)**.

Short Bio

Simone Benatti received a PhD. degree in Electronics, Telecommunications and Information Technologies (ETIT) from the University of Bologna, under the supervision of Prof. Luca Benini. During the PhD, he spent 7 months as a visiting fellow at BWRC - University of California, Berkeley (supervisor prof. Jan Rabaey). Currently, he serves as an Associate Professor at the University of Modena e Reggio Emilia while pursuing his collaboration with EEES lab in Bologna. In 2023 he was appointed as Visiting Professor at EFCL-ETHZ for six months. His research interests focus on energy-efficient embedded systems for HMIs. Prof. Benatti works on designing and optimizing systems for physiological signals acquisition and processing. In this field, he has published more than 100 papers in international peer-reviewed conferences and journals, with more than 3200 citations and an H-index of 28 [Google Scholar]. He has ongoing collaborations with several international research institutes, such as ETHZ, EPFL, TU Graz, FBK and Politecnico di Torino. Dr. Benatti is a recipient of the GHAIA grant (H2020-MSCA-RISE-2017, G.A. 777822). Previously, from 2006 to 2012, he was employed as a design and R&D engineer of electromedical devices at Lean srl, where he was involved in international industrial projects with companies such as Erydel, ST Microelectronics, Arthrocare, Medical Vision, Livanova, Baxter et *al.*

Current Position

Nov 2024 - Today **Associate Professor** *University of Modena e Reggio Emilia*
Embedded systems for energy-efficient signal processing
Simone Benatti's research focuses on the development of embedded systems for edge computing, with a particular emphasis on the acquisition and processing of physiological signals. His primary research applications are in wearable devices and sensing in the medical and automotive sectors.Over the past several years, Benatti has been actively exploring methods and solutions for designing interfaces used in real-time detection and analysis of neural diseases (epilepsy, ASD, PTSD), as well as for interaction and control of objects (prosthetics, intuitive HMIs). A key focus of his research lies in the development of innovative hardware platforms and the application of edge computing to biological signals. He is particularly interested in exploring hardware and firmware codesign to establish a reference computing platform for ultra-low power signal processing. Benatti also serves as a mentor to a small research group including four Ph.D. students and several master's students.

Record of Employment

Jul 2023 - Jan 2024 **Visiting Professor**
ETH Future Computing Lab - ETHZ, Zurich.

Nov 2021 - Oct 2024 **Assistant Professor - Tenure Track (RTD-B)**
University of Modena e Reggio Emilia

Mar 2021 - Oct 2021 **Assistant professor (RTD-A)**
University of Bologna

Jun 2019 - Sept 2019 **Visiting Researcher**
BWRC, University of California, Berkeley
Real time framework for hand gesture recognition
As part of the GHAIA project, I worked on the design of a low power platform for EMG pattern recogntion, based on a novel NMIC and a PULP-based multicore processor.

2016 - 2021 **Postdoctoral Researcher**
University of Bologna

Feb 2015 - Aug 2019 **Visiting Scholar (Advisor prof. Jan Rabaey)**
BWRC/SWARM LAB, University of California, Berkeley
Closed loop implantable neuromodulation system
As part of the SUBNETS project, I designed a digital control module for an implantable neuromodulator.

2013 - 2016 **PhD student in Electrical Engineering and Computer Science (Advisor prof. Luca Benini)**
Micrel Lab, DEI, University of Bologna
Body sensor networks for bio-medical applications and HMI
As part of a collaboration between INAIL prosthetic center and the University of Bologna, I worked on the design of the first fully-embedded and real time arm prosthetic controller based pattern recognition algorithms. On top of that, I started exploring novel approaches to design Human Machine Interfaces for biosignal edge processing.

2005 - 2012 **R&D Engineer and System Designer of electromedical devices**
Lean srl, Medolla
Embedded system design
During my work at Lean srl I was involved in the design of several medical devices, with national and international partnerships where I was responsible for system and hardware design.

Education

Jul. 2016 **PhD degree in EECS**, *University of Bologna*,
Thesis: Advanced Interfaces for HMI in Hand Gesture Recognition,
Advisor: Prof. Luca Benini.

Oct. 2005 **II level Master in mathematical models for applications**, *University of Bologna*,
Stage: Lean srl.

Oct. 2004 **Violin Diploma**, *Conservatorio di Cesena*.

Mar. 2004 **Master degree in Electrical Engineering**, *University of Bologna*,
Thesis: Technical requirements of a Dialysis filter for artificial kidney therapy,
Advisor Prof. Silvio Cavalcanti.

Research Projects and Industrial Collaborations

2022-Ongoing **INTELLIMAN: AI-Powered Manipulation System for Advanced Robotic Service, Manufacturing and Prosthetics**
This project focuses on "How a robot can efficiently learn to manipulate in a purposeful and highly performant way." IntelliMan will range from learning individual manipulation skills from human demonstration to learning abstract descriptions of a manipulation task suitable for high-level planning to discovering an object's functionality by interacting with it, to guarantee performance and safety. IntelliMan aims at developing a novel AI-powered manipulation System with persistent learning capabilities, able to perceive the main characteristics and features of its surrounding by means of a heterogeneous set of sensors, able to decide how to execute a task in an autonomous way and able to detect failures in the task execution in order to request new knowledge through the interaction with humans and the environment. IntelliMan further investigates how the users perceive such AI-powered manipulation systems and what factors enhance human acceptability.)

2020-Ongoing **PEDESITE: Personalized Detection of Epileptic Seizure in the Internet of Things (IoT) Era**
To achieve breakthrough seizure detection and forecasting, this project proposes an ambitious multi-disciplinary solution that will rely on ultra-low-energy embedded systems connected to multi-parametric sensing wearables, and a central computing platform to tune the machine learning technology and lead to optimal personalized seizure detection and forecasting algorithms. The project will use an agile and adaptive organization to optimize the interaction between the data science and engineering groups enveloping these innovative IoH solutions and the clinical studies providing patients' data an testing the performance of these solutions in hospital and ambulatory environments. In the project I work on the design of a complete body area network (EEG patch, smart glasses and a multisensor wristband, as well as on the design of a distributed algorithm for multisensor epilepsy detection.)

2019-2021 **NeuroSoNew: Early autism detection on newborns with automated EEG analysis**
As part of a collaboration between the University of Bologna, the FBK (Fondazione Bruno Kessler) and the University of Trento, we are working on the design of a wearable low-cost device for EEG analysis to target early autism detection on newborns and children, targeting all the design levels, from analog acquisition and sensors design to the algorithm development. In this project, I have the scientific responsibility for the University of Bologna, where I am developing a wearable fully standalone EEG acquisition system and a CCA-based algorithm to monitor neural correlates on newborns.

2019-2022 **GHAIA-Geometric and Harmonic Analysis with Interdisciplinary Applications**
GHAIA will promote excellence in pure and applied mathematical research. European researchers from Italy, Spain and France will have the extraordinary opportunity to visit to the top worldwide Universities in US and Taipei as well as to receive some of the best researchers from South America. In this way, the project will be able to contribute to some paramount challenges, such as data analysis, models of brain functionality, and human and artificial vision. As part of the GHAIA project I am spending several months at UC Berkeley, doing research on novel embedded platforms for edge-computing.

2016-Ongoing **Design of efficient digital architecture for ultra low power devices**
As part of the collaboration between the University of Bologna and ETHZ, (and, from 2019, also with TU Graz) we are working on the multilevel approach in the definition and design of ultra low power digital architectures for biomedical wearable/ implantable applications, exploring systems, algorithms and tradeoffs in the design of such systems. I am also exploring the design of low power high-density EMG/EEG systems and the integration of EMG systems with ultrasounds to better map motoneuronal activity on the muscular response.

2018-2019 **Energy efficient IoT node for Industrial monitoring (Industrial collaboration)**
As part of a project that involved GD group and the University of Bologna, I'm working on the design of an ultra-low power IoT node for industrial monitoring. The project's goal is to have a WSN based on LoRa nodes, which can be used to monitor industrial assembly machine, by providing sensor data and information for self-awarness of the devices.

2015-2018 **SONIC**
Systems On Nanoscale Information fabriCs (SONIC) is a multi-University research project focusing on the design of robust, energy efficient, and intelligent computing platforms using emerging nanoscale devices, which are inspired by the information processing principles found in biological and communication scenarios. In this project, I collaborated with UC Berkeley to analyze and implement HDC (Hyper Dimensional Computing), a novel pattern recognition algorithm.

2015-2016 **SUBNETS**
The Systems-Based Neurotechnology for Emerging Therapies (SUBNETS) program was created in response to the need of cope with the effects of neuropsychological illness brought on by war, traumatic injuries, and other experiences. Current approaches—surgery, medications, and psychotherapy—can often help to alleviate the worst effects of illnesses such as major depression and post-traumatic stress, but they are imprecise and not universally effective SUBNETS is part of a broader portfolio of programs within DARPA that support President Obama's brain initiative for intractable neuropsychological illness. As part of this project during my PhD internship, I worked on digital system design for an implantable control module and on efficient low power algorithms for feature extraction in epilepsy detection applications.

2013-2015 **Design of an embedded prosthetic hand controller based on EMG pattern recognition**
As part of a 2 years project that involved the INAIL prosthetic center and the University of Bologna, I worked on the design and development of a embedded system for the control of a poliarticulated prosthetic hand. The goal of the project is to overcome the SoA approach in the prosthetic hand control. In fact the controllers of commercial prostheses are based on counter intuitive encoded sequences of muscular contraction and do not restore an intuitive control of the artificial limb. The challenge of this project was the the study and the implementation of pattern recognition algorithms on low power embedded microcontrollers, to obtain a real time classification (< 300ms) of the EMG activation pattern acquired during a muscular contraction, restoring an intuitive control of the artificial hand. After the collection of 2 benchmark datasets on healthy subjects and upper limb amputees, we tuned and implemented a SVM algorithm on a commercial microcontroller and we developed also the control strategy and the hand driver of the prosthesis to restore the natural control of the artificial hand.

Industrial R&D Projects

2012 **Drug Compounder**
The project aimed to design a microcomputer system for drug mixing and compounding. The system is intended for hospital deployment and was commissioned by BBRAUN Avitum. In this project, I designed the system architecture and the electronic boards (schematics and PCB) of the μCompounder system.

2011-2012 **System for pH and NH measurement in gastric juice during gastroscopy**
In the project commissioned from NiSo Biomed, we developed HW and FW of a medical device for gastric juice screening. I designed the mixed signal control board (Class 2 BF) that acquire the analog pH and NH signals and control the actuators. One major challenge is that the system is body invasive (gastroscopy) and requires careful electronic design of the insulation circuitry.

2009-2010 **System for RBC drug loading**
I designed the system architecture, and the electronic boards of a machine for a patented treatment in which a drug is delivered directly in the RBC(red blood cells). The electronic part of the system is composed by 3 boards connected via a CAN bus. This solution allows an intrinsically safe and simple communication protocol for a modular device. I designed the whole system composed by the control electronic for DC and stepper motor actuation, the sensing circuitry and the communication interfaces.

2006-2008 **PCR system based on a LAB-ON chip.**
For STM we developed a prototype of the PCR (Polymerase Chain Reaction) controller based on the ST Lab-On-Chip. In this project I worked on the control algorithm for the thermal management of the heating-cooling cycles (PID) and on the board debug.

2006-2008 **System for control of pressure and flow of saline solution during arthroscopic surgery.**
I started to work on this project, commissioned by Medical Vision and Arthrocare Corporation, during my master's internship studying the fluidodinamical model of a intra-corporeal cavity and developing an algorithm to measure the internal pressure of the cavity indirectly, without *in-loco* sensor placement. I continued working as part of the R&D team in the followings 2 years designing the sensor electronics, working on the CAN bus communication FW and on the system bootloader. I also worked on the design of a patented system on closed loop control of pressure-flow based on the optical recognition of hemoglobin vs bone-debris via IR-UV sensors.

Research Interests

My research interests are related to embedded systems for IoT applications, wearable electronics and biosignal edge-computing for low power devices, with particular emphasis on HMI applications. I am interested in embedded pattern recognition, human-centric closed-loop systems, and algorithm optimization tailored to real-time resource-constrained systems, ranging from commercial microcontrollers to novel low-power multicore platforms like the PULP platform. I am interested in exploring solutions to optimize the sensor interfaces and applying machine learning and deep learning techniques on PPG, EMG, EEG, and ECoG signals to cope with the biosignals' high variability. All these activities are finalized to the design optimization for low power digital processing in medical applications and, more generally, for developing embedded wearable systems in a reduced form factor at extreme energy efficiency. The activities carried out last year span over the following research lines.

Pattern Recognition Based Controls for HMIs
This research started in 2013, focuses on the design of a natural control framework for a prosthesis. On top of this project, I started exploring the use of Machine Learning algorithms to enable next-generation interfaces for biosignal processing. Machine learning, and more recently, deep learning, can tackle biosignal processing's fundamental challenges related to the high signal variability and several subject-dependent features. A major advantage of the deep learning approach consists of removing manually-extracted signal features since a deep network automatically learns a good representation of the signal during the training step. As a result, it will be possible to generalize over the high variability of the biopotentials to design novel computational frameworks for advanced Human Machine Interfaces. In this field, I am actively working on embedded solutions for HMI, ranging from epilepsy and autism detection to prosthesis control. Exploring how to process the neural signals to obtain information with a low computational effort, I am interested in strategies to execute PCA, CNN, TCN and other algorithms on embedded low power platforms.

Low Cost ExG Sensor Interface
High-quality signal acquisition is crucial in the design of reliable wearable systems. Medical-grade ExG sensors are typically based on high-performance analog circuitry for signal amplification and filtering. As a result, embedded design suffers from higher costs and lower system scalability. My research in this field focuses on exploring novel sensor interfaces and on combining heterogeneous signals to improve the system performance. By combining feature extraction and filtering with pattern recognition strategies, I am exploring techniques to enable automated processing and limit human intervention, especially in "time-critical" scenarios. These solutions could be used in applications where a minimally intrusive interface is required, such as smart patches, in-ear plug, consumer BMI or implantable devices.

Applications on Low power Digital Architecture for IoT Applications
Finally, I am trying to draw knowledge and inspiration from my previous research interests to understand how to implement the solutions mentioned above on energy-efficient embedded systems. The limited computational power and the reduced memory footprint hamper the deployment of computationally intensive tasks on conventional microcontrollers, hence I am exploring how to adapt and optimize algorithms on resource-constrained platforms, searching for the most efficient architectural approach and for an effective HW/SW codesign.

Grants

2020 Marie Curie Action travel grant for visiting research period (3 months) : 2020-MSCA-RISE-2017,G.A. 777822

2019 Marie Curie Action travel grant for visiting research period (3 months) : 2020-MSCA-RISE-2017,G.A. 777822

Awards

2014 Best paper award in BioCAS conference [3]

2014 Best paper award candidate in BIOSIGNALS conference

2015 Best paper award candidate in BIOSIGNALS conference

Abilitations

ING-INF01 Abilitazione Scientifica Nazionale alle funzioni di Professore Universitario di seconda fascia, settore concorsuale 09/E3- ELETTRONICA (2020-2029)

ING-INF05 Abilitazione Scientifica Nazionale alle funzioni di Professore Universitario di seconda fascia, settore concorsuale: 09/H1- SISTEMI DI ELABORAZIONE DELLE INFORMAZIONI (2021-2030)

Other professional activities

Editorial Boards

2020 Guest editor for the IEEE Transactions on Computers : Special Issue of Smart Edge Computing and IoT

2020 Editorial Board of Wearable Electronics (specialty section of Frontiers in Electronics)

Technical Program Committes

2020 TPC member of Design, Automation and Test in Europe (DATE) conference, track A-Sustainable Computing

2018 TPC member of IEEE International Conference on E-health Networking, Application and Services (Healthcom) 2018

Reviewer for international Conference and Journal

Reviewer for:

- Design, Automation and Test in Europe (DATE) conference
- Human activity sensing corpus and its applications (HASCA) Workshop (hosted by Ubicomp-ISWC)
- IEEE International Conference on Biomedical Circuits and Systems (BioCAS)
- IEEE Transactions of Biomedical Ciruits and Systems (TBCAS)
- IEEE Sensors Conference
- MDPI Applied Science Journal

Invited Talks

2020 Invited speaker: Department of Electronic Systems, School of Engineering, Newcastle University, Newcastle 20/6/2020. Title: "Energy efficient edge acquisition and processing for biosignals"

2019 Invited speaker: 2nd International Congress on Mobile Devices and Seizure Detection in Epilepsy- Lausanne 6/9/2019. Title: "Novel technologies for chronic EEG recordings"

Teaching Activities

Bachelor and Master Courses

2020 **Professore a Contratto** for the course of *ELETTRONICA I e LABORATORIO (80h)* University of Modena e Reggio Emilia

2015-2020 **Tutor Didattico (teaching assistant)** for the course of *ARCHITETTURE E PROGRAMMAZIONE DEI SISTEMI ELETTRONICI T-A (30h)* University of Bologna

PhD Courses

2019 **Lecturer for the PhD Course** of *EMBEDDED SYSTEM DESIGN FOR WEARABLE APPLICATIONS (20h)* University of Trento

Seminars

2016-2017 **Seminary lessons** of *Hardware-Software Design of Embedded Systems*

Students' Supervision

PhD students co-advising

2024 **Andrea Helga Bernardi (MUNER PhD program. University of Bologna and Modena)**
Embedded applications for HMIs in automotive and healthcare

2023 **Massimo Micolitti(MUNER PhD program. University of Bologna and Modena)**
Embedded applications for HMIs in automotive and healthcare

2022 **Pierangelo Rapa (MUNER PhD program. University of Bologna and Modena)**
Embedded applications for HMIs in automotive and healthcare

2022 **Mattia Orlandi (University of Bologna)**
Advanced techniques for neural processing

2019 **Alessio Burrello (University of Bologna)**
Machine Learning and Deep Learning for Embedded Systems

2019 **Marcello Zanghieri (University of Bologna)**
Deep Learning approaches for Temporal Signal Analysis in embedded applications

2019 **Velu Kumaravel (University of Trento)**
Embedded systems design for investigating the neural substrates of core perceptual and cognitive functions in infants

2017 **Mattia Salvaro (University of Bologna)**
A fully-wearable non-invasive SSVEP-based BCI system enabled by AR techniques for daily use in real environment

2016 **Fabio Montagna (uiniversity of Bologna)**
Energy-efficient parallel architectures for ultra-low power biosignal processing

2016 **Victor Javier Kartsch Morinigo (University of Bologna)**
Embedded Body Area Network for Advanced Human Machine Interaction

Master students

2019 **Marcello Zanghieri**
CNN based analysis for EMG gesture recongition on embedded systems

2018 **Velu Kumaravel**
Real time Embedded System for Analysis of a Galvanic Skin Response

2016 **Fabio Montagna**
Scalability of Neuromodulation Algorithms for Ultra Low Power Brain Machine Interfaces

2016 **Victor Javier Kartsch Morinigo**
Online Alpha Wave detector: an Embedded hardware-software implementation

2015 **Alberto Girolami**
Embedded implementation and characterization of a pattern recognition system for an hand gesture based controller

2015 **Marco Tomasini**
Design and implementation of a wearable device for acquisition and processing of biomedical signals

2014 **Matteo Rossi**
Analysis of the CANBUS applied to prosthetic systems

Relevant Technical Skills

- Very good knowledge of C language and of embedded microcontroller systems and tools.
- Very Good knowledge of architectural level design of medical devices.
- Very Good experience in mixed signal electronic design (schematics and PCB) with CAD design tools (Mentor PADS and Altium Designer)
- Good experience with Matlab for offline data analysis, signal processing and machine learning algorithms.
- Very Good electronic lab experience (oscilloscope, tester, soldering, PCB debug, etc).
- Wide experience with sensors and actuators (DC and Stepper motors, quad encoders, current sensing, analog sensors for biosignal monitoring, H-bridge conditioning circuitry, etc).
- Basic knowledge of Python language.
- Basic experience in digital design with Verilog/SystemVerilog and Modelsim.

Publications

2024 **J:** Marcello Zanghieri, Pierangelo Maria Rapa, Mattia Orlandi, Elisa Donati, Luca Benini, and Simone Benatti. semg-driven hand dynamics estimation with incremental online learning on a parallel ultra-low-power microcontroller. *IEEE Transactions on Biomedical Circuits and Systems*, 2024.

J: Marcello Zanghieri, Pierangelo Maria Rapa, Mattia Orlandi, Elisa Donati, Luca Benini, and Simone Benatti. Event-based estimation of hand forces from high-density surface emg on a parallel ultra-low-power microcontroller. *IEEE Sensors Journal*, 2024.

C: Marcello Zanghieri, Pierangelo M Rapa, Mattia Orlandi, Étienne Buteau, Félix Chamberland, Benoit Gosselin, Luca Benini, and Simone Benatti. Wearable high-density semg processing with class activation maps with an embedded temporal convolutional network. In *2024 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pages 1–5. IEEE, 2024.

J: Luca Valente, Alessandro Nadalini, Asif Hussain Chiralil Veeran, Mattia Sinigaglia, Bruno Sá, Nils Wistoff, Yvan Tortorella, Simone Benatti, Rafail Psiakis, Ari Kulmala, et al. A heterogeneous risc-v based soc for secure nano-uav navigation. *IEEE Transactions on Circuits and Systems I: Regular Papers*, 2024.

J: G Spacone, Sergei Vostrikov, V Kartsch, Simone Benatti, Luca Benini, and Andrea Cossettini. Tracking of wrist and hand kinematics with ultra low power wearable a-mode ultrasound. *IEEE Transactions on Biomedical Circuits and Systems*, 2024.

C: Pierangelo Maria Rapa, Mattia Orlandi, Andrea Amidei, Alessio Burrello, Roberto Rabbeni, Paolo Pavan, Luca Benini, and Simone Benatti. Driving towards safety: Online ppg-based drowsiness detection with tcns. In *2024 IEEE 6th International Conference on AI Circuits and Systems (AICAS)*, pages 124–128. IEEE, 2024.

C: Pierangelo M Rapa, Mattia Orlandi, Marcello Zanghieri, Luca Benini, and Simone Benatti. Embedded multi-sensor smartwatch for computationally intensive biosignal processing. In *2024 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pages 1–5. IEEE, 2024.

J: Mattia Orlandi, Pierangelo Maria Rapa, Marcello Zanghieri, Sebastian Frey, Victor Kartsch, Luca Benini, and Simone Benatti. Real-time motor unit tracking from semg signals with adaptive ica on a parallel ultra-low power processor. *IEEE Transactions on Biomedical Circuits and Systems*, 2024.

C: Benedetta Mazzoni, Luca Bompani, Mattia Orlandi, Simone Benatti, and Giuseppe Tagliavini. Balancing accuracy and energy efficiency on ultra-law-power platforms for ecg analysis. In *2024 IEEE International Conference on Omni-layer Intelligent Systems (COINS)*, pages 1–6. IEEE, 2024.

J: Thorir Mar Ingolfsson, Xiaying Wang, Upasana Chakraborty, Simone Benatti, Adriano Bernini, Pauline Ducouret, Philippe Ryvlin, Sandor Beniczky, Luca Benini, and Andrea Cossettini. Brainfusenet: Enhancing wearable seizure detection through eeg-ppg-accelerometer sensor fusion and efficient edge deployment. *IEEE Transactions on Biomedical Circuits and Systems*, 2024.

J: Thorir Mar Ingolfsson, Simone Benatti, Xiaying Wang, Adriano Bernini, Pauline Ducouret, Philippe Ryvlin, Sandor Beniczky, Luca Benini, and Andrea Cossettini. Minimizing artifact-induced false-alarms for seizure detection in wearable eeg devices with gradient-boosted tree classifiers. *Scientific Reports*, 14(1):2980, 2024.

J: Marco Guermandi, Simone Benatti, and Luca Benini. A non-contact ecg sensing system with a micro-power, ultra-high impedance front-end and ble connectivity. *IEEE Sensors Journal*, 2024.

C: Sebastian Frey, Pierangelo Maria Rapa, Andrea Amidei, Simone Benatti, Marco Guermandi, Victor Kartsch, Andrea Cossettini, and Luca Benini. Wearable, real-time drowsiness detection based on eeg-ppg sensor fusion at the edge. In *2024 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pages 1–5. IEEE, 2024.

J: Sebastian Frey, Mattia Alberto Lucchini, Victor Kartsch, Thorir Mar Ingolfsson, Andrea Helga Bernardi, Michael Segessenmann, Jakub Osieleniec, Simone Benatti, Luca Benini, and Andrea Cossettini. Gapses: Versatile smart glasses for comfortable and fully-dry acquisition and parallel ultra-low-power processing of eeg and eog. *arXiv preprint arXiv:2406.07903*, 2024.

J: Paola Busia, Andrea Cossettini, Thorir M Ingolfsson, Simone Benatti, Alessio Burrello, Victor JB Jung, Moritz Scherer, Matteo A Scrugli, Adriano Bernini, Pauline Ducouret, et al. Reducing false alarms in wearable seizure detection with eegformer: A compact transformer model for mcus. *IEEE Transactions on Biomedical Circuits and Systems*, 2024.

C: Farah Baracat, Marcello Zanghier, Luca Benin, Dario Farina, Giacomo Indiveri, Simone Benatti, and Elisa Donati. Leveraging motor unit spatial activation patterns for channel selection in finger force regression. In *2024 46th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pages 1–4. IEEE, 2024.

J: Andrea Amidei, Pierangelo Maria Rapa, Giuseppe Tagliavini, Roberto Rabbeni, Luca Benini, Paolo Pavan, and Simone Benatti. Unobtrusive multimodal monitoring of physiological signals for driver state analysis. *IEEE Sensors Journal*, 2024.

2023 **C:** Marcello Zanghieri, Mattia Orlandi, Elisa Donati, Emanuele Gruppioni, Luca Benini, and Simone Benatti. Online unsupervised arm posture adaptation for semg-based gesture recognition on a parallel ultra-low-power microcontroller. In *2023 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pages 1–5. IEEE, 2023.

C: Marcello Zanghieri, Simone Benatti, Luca Benini, and Elisa Donati. Event-based low-power and low-latency regression method for hand kinematics from surface emg. In *2023 9th International Workshop on Advances in Sensors and Interfaces (IWASI)*, pages 293–298. IEEE, 2023.

C: Mattia Sinigaglia, Luca Bertaccini, Luca Valente, Angelo Garofalo, Simone Benatti, Luca Benini, Francesco Conti, and Davide Rossi. Echoes: a 200 gops/w frequency domain soc with fft processor and i 2 s dsp for flexible data acquisition from microphone arrays. In *2023 IEEE International Symposium on Circuits and Systems (ISCAS)*, pages 1–5. IEEE, 2023.

C: Mattia Orlandi, Pierangelo Maria Rapa, Marcello Zanghieri, Sebastian Frey, Victor Kartsch, Luca Benini, and Simone Benatti. An adaptive dynamic mixing model for semg real-time ica on an ultra-low power processor. In *2023 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pages 1–5. IEEE, 2023.

C: Thorir Mar Ingolfsson, Upasana Chakraborty, Xiaying Wang, Sandor Beniczky, Pauline Ducouret, Simone Benatti, Philippe Ryvlin, Andrea Cossettini, and Luca Benini. Epidenet: An energy-efficient approach to seizure detection for embedded systems. In *2023 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pages 1–5. IEEE, 2023.

C: Sebastian Frey, Victor Kartsch, Christoph Leitner, Andrea Cossettini, Sergei Vostrikov, Simone Benatti, and Luca Benini. A wearable ultra-low-power semg-triggered ultrasound system for long-term muscle activity monitoring. In *2023 IEEE International Ultrasonics Symposium (IUS)*, pages 1–4. IEEE, 2023.

C: Sebastian Frey, Marco Guermandi, Simone Benatti, Victor Kartsch, Andrea Cossettini, and Luca Benini. Biogap: A 10-core fp-capable ultra-low power iot processor, with medical-grade afe and ble connectivity for wearable biosignal processing. In *2023 IEEE International Conference on Omni-layer Intelligent Systems (COINS)*, pages 1–7. IEEE, 2023.

C: Elisa Donati, Simone Benatti, Enea Ceolini, and Giacomo Indiveri. Long-term stable electromyography classification using canonical correlation analysis. In *2023 11th International IEEE/EMBS Conference on Neural Engineering (NER)*, pages 1–4. IEEE, 2023.

J: Andrea Amidei, Susanna Spinsante, Grazia Iadarola, Simone Benatti, Federico Tramarin, Paolo Pavan, and Luigi Rovati. Driver drowsiness detection: a machine learning approach on skin conductance. *Sensors*, 23(8):4004, 2023.

C: Andrea Amidei, Pierangelo Maria Rapa, Giuseppe Tagliavini, Roberto Rabbeni, Paolo Pavan, and Simone Benatti. Angels-smart steering wheel for driver safety. In *2023 9th International Workshop on Advances in Sensors and Interfaces (IWASI)*, pages 15–20. IEEE, 2023.

2022 **C:** Xiaying Wang, Sergei Vostrikov, Victor Kartsch, Simone Benatti, Andrea Cossettini, and Luca Benini. Near-sensor analytics and machine learning for long-term wearable biomedical systems. In *AI+ X Summit 2022*. ETH Zurich, Integrated Systems Laboratory, 2022.

C: Angelica Poli, Andrea Amidei, Simone Benatti, Grazia Iadarola, Federico Tramarin, Luigi Rovati, Paolo Pavan, and Susanna Spinsante. Exploiting blood volume pulse and skin conductance for driver drowsiness detection. In *EAI International Conference on IoT Technologies for HealthCare*, pages 50–61. Springer Nature Switzerland Cham, 2022.

C: Alessandro Ottaviano, Robert Balas, Giovanni Bambini, Corrado Bonfanti, Simone Benatti, Davide Rossi, Luca Benini, and Andrea Bartolini. Controlpulp: a risc-v power controller for hpc processors with parallel control-law computation acceleration. In *International Conference on Embedded Computer Systems*, pages 120–135. Springer International Publishing Cham, 2022.

C: Mattia Orlandi, Marcello Zanghieri, Davide Schiavone, Elisa Donati, Francesco Conti, and Simone Benatti. Motor-unit ordering of blindly-separated surface-emg signals for gesture recognition. In *International Conference on System-Integrated Intelligence*, pages 518–529. Springer International Publishing Cham, 2022.

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Languages

Italian **Native**

English **Fluent**

Extended abstracts and presentations

[1] **Towards Versatile Fast Training for Wearable Interfaces in Prosthetics**
Benatti S., Montagna F., Kartsch V., Rahimi A. Benini L. ICNR 2018

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