

# Eric SENN

## Curriculum Vitae

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Born on November 10, 1967, in Courbevoie, France.

## Employment

Since 1999 **Associate Professor (Maître de Conférences HDR), Research Supervisor, Lab-STICC Laboratory / University of South Brittany, Lorient.**

Member of the Lab-STICC Laboratory / University of South-Brittany, in charge of research and teaching activities at the South-Brittany National School for Engineers (ENSIBS).

1993–1999 **Research Professor (Professeur de la Défense), Geography Image and Perception Laboratory / French Army, Arcueil.**

Professor of the French Ministry of Defence, in charge of study and research in the Geography Image and Perception Laboratory for the DGA (Délégation Générale de l'Armement).

## Education

2008 **Accreditation to Supervise Research (Habilitation à Diriger des Recherches) (State PhD) in Electronics, University of South-Brittany, Lorient.**

"Methods and tools for managing consumption in electronic circuits and systems design"

1998 **PhD (Doctorat) in Electronics, Paris XI University, Orsay.**

"Asynchronous design methodology, application to the design of a communication processor for parallel computers"

1993 **Master in Electronics, speciality signal processing and electronic architectures, Paris XI University, Orsay.**

1992 **Agrégation (French National Contest) in Electrical Engineering, Ecole Normale Supérieure, Cachan.**

1991 **Honors Degree (Maîtrise) in Electronics, Electrotechnics and Automatics, Pierre & Marie Curie, Paris VI University, Paris.**

1990 **Bachelor Degree (Licence) in Electronics, Electrotechnics and Automatics, Pierre & Marie Curie, Paris VI University, Paris.**

## Research supervision

### Domain of expertise

My main field of research is the development of methods, tools and models for hardware and software design under constraints (for embedded systems, real-time and energy consumption constraints). Four application domains are targetted : autonomous robots, factory of the future, multi-media video streaming, and ambient assisted living. Several sub-topics are adressed :

- Software design : performance and energy consumption estimation and optimisation in embedded software on heterogeneous multi-cores architectures, digital signal processors, general purpose processors (tools SoftExplorer and CAT - Consumption Analysis Toolbox, OpenPEOPLE platform).

- Hardware design : memory constraints integration; reconfigurable architectures and energy consumption optimisation; low-power high-level synthesis (research on the high-level synthesis tool GAUT); asynchronous architectures and circuits.
- System design : system level performance and consumption estimation; high-level characterization and modeling of embedded applications on heterogeneous targets, domain specific languages (for consumption analysis) and associated model transformations.
- Operating systems : real-time operating systems study and modeling. ROS (Robot Operating System) framework modeling and optimization.
- Memory optimisation : data storage and transfer exploration ; data mapping optimisation, memory architecture and hierarchy optimisation; memory consumption modeling.
- Model based design approach : high-level methods and tools for specification, verification, validation and design of complex electronic embedded systems; developement of model-driven engineering approaches ; meta-models and associated model transformations (tool RDAL); AADL (Architecture Analysis & Design Language) modeling.

Former works:

- CMOS active pixel sensors : design of the vision sensors and embedded elementary processors network, VLSI integration, design methodology for vision sensors.
- Research on asynchronous circuits and systems design : design of an asynchronous communication processors, CMOS VLSI integration.
- Project PHENIX : building of an hyper-parallel computer.
- Project PVLARS : programmable artificial retinas (CMOS active pixel sensor).
- Project MOCASSIN : methodology for the design of parallel architectures specialized in digital image processing.

My research activity is sustained by my work inside different national and european projects, and thanks to many collaborations, that I was able to set up. Those fundings allowed to hire different research engineers and technicians, many master students under trial, and PhD students (19) that I have / had under supervision.

### Project leadership

2017–2020 **2 academic and 6 industrial partners, *EFIGI (EFFicient future and new Generation video coding)***.

Development of new video coding and decoding solutions adapted to newcoming video broadcasting standards and current market evolutions (use of generalist networks (IP, 3GPP, PMR), mobile terminals (smart phones, tablets), new format (UHD/HDR/HFR/360), and increasing need for autonomy).

2013–2016 **2 academic and 6 industrial partners, *GREENVIDEO***.

Development of mechanisms to lower the energy consumption at every steps in the image / video chain : creation, transformation, broadcasting and restitution. Results of the project allow to change the approach for optimizing parameters of the video flow coding and broadcasting thanks to the integration of energy consumption constraints in addition to the bandwidth / quality optimisations.

2009–2012 **6 partners, *Open-PEOPLE (Open Power and Energy Optimization PPlatform and Estimator)***.

Building of an open platform for estimating and optimizing the power and energy consumption of heterogeneous embedded systems. The platform is coupled to an automated test-bench that allows remote consumption measurements on different targeted boards, and to retrieve and process data for model building.

2010–2012 **3 partners, *GLASSES (Software Engineering for Embedded Systems)***.

Application of model-driven approaches to develop models and tools (Domain Specific Languages and associated tool chains) fitted to the design of embedded systems in specific application domains.

- 2008–2010 **3 partners, *BASIS : Beacon Application Specific Integrated Solutions.***  
Development of a low-cost offshore personal location beacon targeting leisure boat market.
- 2006–2009 **14 partners, *SPICES (Support for Predictable Integration of mission Critical Embedded Systems).***  
The objective of the European project SPICES was to develop, following a model-driven approach centered on AADL (Architecture Analysis & Design Language), a set of tools for the design, verification, and development of real-time embedded systems in aerospace engineering.

### Scientific outreach

- I am the **author or co-author** of 138 publications: 18 articles in international journals, 4 in national journals, 90 in international conferences proceedings, 22 in national conferences proceedings, and 4 book chapters. I am also a reviewer for many national and international conferences and journals, and an expert project proposal reviewer for the French National Research Agency. I am involved in several national research networks and regularly part of conferences program committees. I had in these different contexts the opportunity to lead specific actions.
- **Thematic action leader "Consumption and Energy"** for the SoC-SiP Research Group from 2013 to 2015. Member of the steering committee. Organizer of the "Thermal and consumption" specific day and the ECOFAC 2014 summer school on low-power design.
- **Thematic action leader "Consumption for information, image, signal, and vision"** for the Information Signal Image and vision Systems Research Group from 2003 to 2005. Organizer of two specific days : "Consumption for information, image, signal, vision systems" and "Special consumption day".
- **Chairman, Program committee member, for national and international conferences**
- **Reviewer for several national and international conferences and journals**

### PhD Supervision

- 2018–2021 **Walid Touzout.**  
"Optimization of Energy Models and Behaviors in the Development of Mobile Robotics Applications in the Robot Operating System Infrastructure"
- 2017–2020 **Mohammed Bey Ahmed Khernache.**  
"Performance and energy efficiency for newcoming video standards on low-power multi-cores architectures"
- 2016–2019 **Yohann Rioual.**  
"Automatic model generation for energy optimisation of cyber-physical systems"
- 2011–2014 **Pierre Olivier.**  
"Unified methodology for performance and consumption estimation in memory hierarchies for embedded systems"
- 2010–2013 **Yahia Benmoussa.**  
"Design of global consumption models for mobile terminals and multimedia applications"
- 2013–2016 **Hugo Kerhascouet.**  
"Optimisation and denoising for true-wind measurements in offshore racing"
- 2012–2015 **Molham Darwish.**  
"Deployment and architecture of ambient assisted living services"
- 2012–2015 **Jean-Philippe Schneider.**  
"MoC based simulator for sea-bed observatories"
- 2010–2013 **Dominique Blouin.**  
"Domain specific languages for quantity estimation and analysis, and requirements engineering, and application to model-based embedded systems design"
- 2009–2012 **Bassem Ouni.**  
"Operating system power modelling and optimization"

- 2009–2012 **Santhosh Rethinagiri.**  
"Heterogeneous Power Models for Heterogeneous System-Level Design"
- 2006–2009 **Saadia Douhib.**  
"Operating systems power and energy consumption characterization for critical embedded systems described in AADL"
- 2004–2007 **Yannig Savary.**  
"Study of reconfigurable architectures to optimise consumption in embedded applications"
- 2004–2007 **Florian Marteil.**  
"Methodology to optimize memory hierarchy for System On Chip"
- 2003–2006 **David Elleouet.**  
"Methods for consumption modeling, estimation and optimisation for image and signal processing applications in FPGA reconfigurable systems design"
- 2002–2005 **Gwéno   Corre.**  
"Memory units management in high-level synthesis"
- 1999–2002 **S  bastien Pignolo.**  
"Energy consumption optimisation in real-time embedded applications"
- 1999–2002 **Johann Laurent.**  
"Consumption estimation in system level design of real-time embedded applications"
- 1999–2000 **Delphine Emzivat.**  
"Study and design of a smart pixel sensor for vision in industrial quality control"

## Teaching

### Engineering school @ Master level

- o Robotic Embedded Systems / Robot Operating System
- o Video, Image Processing, and Machine Perception
- o Digital Signal Processing
- o Signal Processing
- o Signals and Systems
- o Industrial Automation
- o Control and regulation

### University @ Master level

- o Logistics and Supply Chain
- o Micro-Electronics
- o Control and regulation
- o Analogic Electronics
- o Industrial Automation

## Technical skills

- o **Programming:** C/C++ & dedicated libraries for machine vision and signal processing (OpenCV, Cimg, STK, RtAudio ...), Robot Operating System ROS, Matlab/Octave.
- o **Modeling:** UML/SysML, AADL, SystemC, Verilog/VHDL.
- o **Publication/Web:** Office suite, LaTeX, HTML, PHP/Css, WordPress CMS.

## Extra

- o **Sport:** Running, Cycling.
- o **Art:** Guitar and Piano.