Gabriele Ara

Computer Engineer and PhD

Always fascinated with computers, I am now a dedicated and passionate computer engineer. So far, I have accumulated over 12 years of experience in system programming and a solid theoretical background. My expertise spans multiple areas related to Computer and Software Engineering, including embedded systems, real-time systems, task scheduling, computer architectures, software design and implementation, system programming, networking, and research.

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WORK EXPERIENCE

Postdoctoral Researcher

Scuola Superiore Sant'Anna

01/2023 — Present

Pisa, Italy

Main Research Areas

My research topics include various aspects of computer engineering, spanning from **cloud technologies** to **embedded systems**. The focus is always on the **Operating System** and its role in regulating the timing and power behavior of several concurrent tasks, often with **real-time constraints**. In particular, I worked on the following topics:

- **Energy-aware scheduling** of real-time systems on heterogeneous embedded platforms running Linux;
- **Energy consumption estimation** through CPU Performance Monitoring Counters (PMCs) on embedded systems;
- **Deterministic execution** of time-sensitive high-performance applications;
- **Simulation** of the timing and energy behavior of DVFS-capable heterogeneous multi-core real-time systems;
- **High-performance network communications** in HPC and cloud environments, with a special focus on NFV.

European Projects

During my Ph.D. and later as a Postdoctoral Researcher, I have collaborated with other European universities and industrial partners on the realization of the following **European Project**:

- AMPERE: A Model-driven development framework for highly Parallel and EneRgy-Efficient computation supporting multi-criteria optimisation (HORIZON 2020 No. 871669).

Textbook Author

Zanichelli Editore S.p.A.

10/2013 — 12/2021

Bologna, Italy

Over several years, I authored over a handful chapters for educational textbooks and manuals.

- The chapters focus on teaching high-school students in IT classes how to program applications for Android OS, from basic concepts to advanced and complex systems;
- In total, I worked on three different editions of a high school textbook and two manuals for IT students and professionals;
- Refer to my website for the complete list of book chapters, books, and technical manuals I authored.

High School Teacher of IT and IT Laboratory

Istituto Superiore "Vespucci-Colombo"

10/2018 — 06/2019

Livorno, Italy

While working on my Ms.C. thesis, I also worked as a part-time IT teacher to high-school students in my hometown.

- I managed two classes of high school children aged 15-16 during this time.

TECHNICAL SKILLS

I have lots of experience developing personal and work projects in different programming languages, from low-level level languages, like Assembly, to complex Object-Oriented languages, like Java or C++. I can apply software engineering techniques to **creatively**, **reliably**, and **efficiently** solve complex sets of problems, considering both functional and non-functional aspects of the resulting software. I have extensive knowledge of **data structures**, **algorithms**, and **software design patterns**. I can program **multithread** and **multiprocess** applications and understand the pitfalls of synchronization between concurrent program flows. I am an experienced **debugger** and **tester**. I can perform **root-cause analysis**, delving deep into complex code bases if necessary, even ones authored by several others (e.g., Linux kernel). I have experience in most aspects related to the software development lifecycle. Although I have never directly managed clients requirements, I have experience working with **build systems**, **version control systems**, **IDEs**, and **packaging tools** for distributing and installing software.

EDUCATION

Ph.D. in Emerging Digital Technologies (Embedded Computing Systems Curriculum) *10/2019 — 12/2022*
Scuola Superiore Sant'Anna *Pisa, Italy*

Final Evaluation: Graduated With Honors
Thesis Title: OS Mechanisms for Energy-Efficient Real-Time and High-Performance Networking Applications.

Research Visiting Ph.D. Student *01/2021 — 07/2021*
ETH Zürich - Integrated Systems Laboratory *Zürich, Switzerland*

M.Sc. in Embedded Computing Systems *10/2016 — 10/2019*
University of Pisa and *Pisa, Italy*
Scuola Superiore Sant'Anna

Final Evaluation: 110/110 Cum Laude

B.Sc. in Computer Engineering *10/2013 — 10/2016*
University of Pisa *Pisa, Italy*

Final Evaluation: 110/110 Cum Laude

PUBLICATIONS

This list is only a selection; see the full articles on my **Google Scholar Profile**. Refer to my website for the complete list of book chapters, books, and technical manuals I authored.

- *Tommaso Cucinotta, Alexandre Amory, **Gabriele Ara**, Francesco Paladino, and Marco Di Natale* (2023), "**Multi-Criteria Optimization of Real-Timez DAGs on Heterogeneous Platforms under P-EDF**". In *ACM Transactions on Embedded Computing Systems*, just accepted, ACM.
- ***Gabriele Ara**, Tommaso Cucinotta, Agostino Mascitti* (2022), "**Simulating Execution Time and Power Consumption of Real-Time Tasks on Embedded Platforms**". In *Proceedings of the 37th ACM/SIGAPP International Symposium on Applied Computing* (ACM SAC 2022), Brno, Czech Republic, ACM.
- *Leonardo Lai, **Gabriele Ara**, Tommaso Cucinotta, Koteswararao Kondepu, Luca Valcarenghi* (2021), "**Ultra-low Latency NFV Services Using DPDK**". In *Proceedings of the 7th IEEE Conference on Network Function Virtualization and Software Defined Networks* (NFV-SDN 2021), Heraklion, Greece, IEEE.
- ***Gabriele Ara**, Leonardo Lai, Tommaso Cucinotta, Luca Abeni, and Carlo Vitucci* (2021), "**A Framework for Comparative Evaluation of High-Performance Virtualized Networking Mechanisms**". In *Cloud Computing and Services Science - CLOSER 2020 Revised Selected Papers, Communications in Computer and Information Science* (CCIS), vol 1399 (pp. 59-83), Springer.
- *Gabriele Serra, **Gabriele Ara**, Pietro Fara, and Tommaso Cucinotta* (2021), "**ReTiF: A declarative real-time scheduling framework for POSIX systems**". In *Journal of Systems Architecture*, Volume 118, 2021, 102210, ISSN 1383-7621, Elsevier.
- ***Gabriele Ara**, Tommaso Cucinotta, Luca Abeni, and Carlo Vitucci* (2020), "**Comparative Evaluation of Kernel Bypass Mechanisms for High-performance Inter-container Communications**". In *Proceedings of the 10th International Conference on Cloud Computing and Services Science* (CLOSER 2020), Prague, Czech Republic (pp. 44-55), SCITEPRESS.
Best Paper Award winner

SOFT SKILLS

Throughout my career, I worked both in small teams and alone. I am open to comparison and **dialogue**, enjoying the **confrontation** with my peers and **learning** from more experienced people. I have developed enough flexibility to fit in **multicultural** and **heterogeneous** teams. I am also very **determined** and **self-motivated**, and I can rely on my problem-solving ability when working independently, ensuring I can manage tasks autonomously to meet goals and deadlines, even under tight time schedules.

SKILLS SET

Languages and Standards

C++ (ISO C++98/03/11/14/17/20/23) | C (ANSI C, C99/17/23, MISRA) | POSIX | Bash | Java | Python

Virtualization Technologies

OCI Containers | Docker | LXC | Podman | QEMU | KVM

Development and Debugging Tools

GNU Make | CMake | Ninja | GCC/G++ | LLVM/Clang | GDB | CPack/CTest | RPM/DEB | Git

Hardware Platforms

Xilinx UltraScale+ | Raspberry Pi | NVIDIA Jetson | Intel x86 | AMD64 | ARMv7 | ARMv8

AREAS OF EXPERTISE

Linux system programming | Linux administration | Linux kernel scheduler | Linux kernel frequency governor | High-performance networking | DPDK | System virtualization

HONORS & AWARDS

- **Best Paper Award Certificate** at the 10th International Conference on Cloud Computing and Services Science (CLOSER 2020)
- **National Selection Participant** for the Italian Olympiad in Informatics (2012)
- **10th Place** at the Italian National Turing Machine Programming Competition (2013)

LANGUAGES

Italian *Native Proficiency*
English *Full Professional Proficiency*