**Context of the research activity**

The research activities are related to these topics:
1. Multi-core RISC-V architectures for Machine Learning
2. Intermediate code representations and compiler toolchains
3. Programming models for parallel computing
4. Machine Learning and Optimization algorithms

**Objectives**

In recent years, RISC-V architectures have been gaining momentum in many sectors, including the Internet of Things (IoT) and Machine Learning (ML). Focusing on edge ML applications, the adoption of computing clusters composed of several RISC-V cores can largely improve the capabilities of the microcontroller platforms that are the standard solution in this context. In addition to the multi-core approach, specialized hardware extensions can provide additional support to accelerate complete algorithms or partial computational patterns. In this context, Machine Learning and Optimization workloads on IoT devices are becoming more and more pervasive and impose strict performance and power constraints.

The context of this research activity is the study and design of a full-fledged software framework for the efficient deployment of Machine Learning and Optimization algorithms on IoT edge platforms based on the RISC-V architecture. Many practical use cases reveal that the efficient execution of these models on edge devices requires fine-grained hardware-specific optimizations. A software framework can relieve the programmer from the burden of manually optimizing code for different architectures and can provide some optimality guarantees on the algorithm deployment. These software frameworks include different layers, ranging from runtime libraries to compiler toolchains, with the aim to perform a “progressive lowering” of the application code from a high-level representation (e.g., Python or C code) down to a hardware-optimized instruction stream.
Skills and competencies for the development of the activity

- Master degree in Data Science, Computer Science, Computer Engineering, or equivalent qualification obtained in Italy or abroad
- Basic knowledge of Machine Learning and Optimization techniques
- Good knowledge of C/C++ programming languages