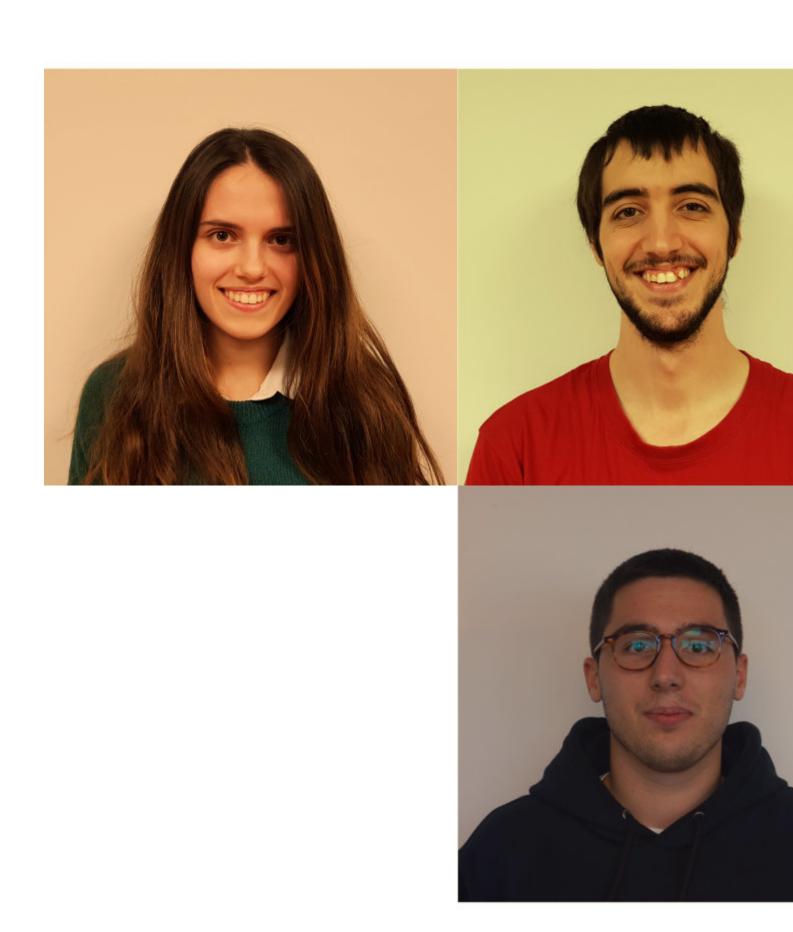# Mobile and embedded-based HPC

HPC systems are historically "recycling" ideas and technologies from larger markets: this has been true when HPC adopted x86 CPUs after the boom of desktop PCs in the 90's, once again recently with GPUs boosted by the gaming market, etc.

Summary

Being able to explore, detect, and evaluate new technologies from different markets in an HPC context is of paramount importance for HPC innovation.

Our group has been leading the Mont-Blanc EU projects enabling Arm technology in HPC since 2013. We have a solid experience in bring-up and deployment of Arm-based HPC systems. We focus on the evaluation of computing systems from embedded, mobile and other areas and enabling their use in HPC. We aim at bringing them into an HPC context and demonstrate their potential with ideas, use-cases and tools understood and accepted by the HPC community.

Since 2016 we collaborate with Aingura IIoT, an R&D spinoff of the Ainzu industrial group optimizing the production process of heavy duty manifacturing machinery. The computational and algorithmical needs of modern industry are incredibly close to the HPC offer, so we collaborate for bringing supercomputing solutions into the so called "industry 4.0".

Research topics

- **Evaluation of new HPC clusters**
  Performance evaluation using benchmarks and complex applications of HPC clusters powered by emerging technologies (e.g., Arm-based HPC clusters).
- **Emulation of new architectures with FPGAs**
  We use FPGA-based systems for enabling software development and RTL verification for RISC-V architectures.
- **Predictive maintenance in Industry 4.0**
  Signal processing, data acquisition and optimization of algorithms for predicting faults in highly sensorized industrial environments.

Interested in collaborating with us? Contact us, join us!

Objectives

- Explore areas where efficient computation is required, study their needs and understand their environment from an HPC perspective
- Identify technologies that expresses potential for the early-adoption in an HPC context and bring those innovation from other market sectors to HPC
- Promote the use of HPC methods in other scientific and technological areas (e.g., smart industry). Isolate use-cases from other areas and boost their performance
- Leverage and extend the functionalities of tools and methods developed by the HPC community within BSC and beyond (e.g., performance analysis tools, programming models, system software)

Vision

- **Trust the measurements**: Sometimes new technologies are over-simplified for marketing purposes. Understanding them in their context and trusting what we measure not in what our mind tells you to

expect is fundamental.

- **Measure well**: Digital design and performance analysis are often crowded with simulators and models for measuring and predicting performance. Being able to select the right tool for measuring what we want to study is the first step for quantifying observables.
- **Optimize**: Fight against inefficiency. Other market areas may not focus on efficiency: make them feel the thrill of true high-performance.
- **Collaborate across-disciplines**: Keep an open and curious mind. Domain scientists and technologists are using specialized vocabularies, but often they have problems that are more common than the words used to express them.
- **Help and educate**: Other research groups and new generations may want to know what we do. Let's make an effort to keep our work accessible.

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