

# ISC WORKSHOP PROPOSAL 2020

## Title of the workshop

Approximate and Transprecision Computing on Emerging Technologies (ATCET),  
Second Edition

## Scope of the workshop

In the last 10 years, the demand for new computing strategies driven by energy-efficiency has grown exponentially. Flop-per-watt (thus, per-euro) has become de-facto a driving model in hardware design. Results in this direction have been significant, leveraging first multi-core parallelism and then recently moving toward heterogeneous architectures (e.g., multicore CPU coupled with GP-GPUs). However, these evolutions will not be sufficient in the long term. To maintain an exponential increase in computational efficiency, we will need to rely either on an unlikely breakthrough discovery in hardware technology, or on a fundamental change in computing paradigms.

This workshop aims to attract experts who explore approximation in hardware and software from both a statistical and a deterministic viewpoint, as a computing paradigm shift to break the current performance and energy-efficiency barriers of systems at all scales, from sensors to supercomputers. Approximate computing is a viable method for building more efficient, scalable and sustainable systems. However, it also places formidable challenges across the entire computing software and hardware stack. Addressing these challenges requires balanced expertise in mathematics, algorithms, software, architecture design and emerging computing platforms. It is the intention of this workshop to bring together experts across these areas to present the latest findings and discuss future opportunities for approximate computing. In more detail, the workshop will cover the following areas:

1. Approximate and transprecision computing: from the physical limits to the architecture and circuit design; from the algorithm design to the error analysis; from innovative technology to real applications.
2. Programming abstractions: from structured and disciplined approximation in computation, communication and data transfers, to quality control and techniques to recover from over-approximation.
3. Computing platforms: from tiny low-power devices for IoT applications, up to classical HPC systems embedding imprecise massively parallel accelerator.
4. Applications: examples from data analytics, machine learning, deep learning, and scientific computing, where uncompromised quality with scalable order-of-magnitude time- and energy-to-solution reduction is reachable relying on approximation for a significant amount of calculations.

## Relevance and impact of the workshop for ISC

The workshop covers key topics aligned with ISC:

- Beyond Moore's Law
- Future Challenges for Programming Models and Languages
- Exascale Systems

The workshop provides an opportunity to have in-depth discussions, presentations, and interactions on these topics. This will promote future collaborations and better coordination around the development on approximate and transprecision computing techniques.

### Expected outcome from the workshop

- Promote research and development in approximate and transprecision computing
- Align developments in algorithms, software, and hardware design towards unified and successful platforms for approximate and transprecision computing
- Foster a common discussion across multiple disciplines
- Raise energy-awareness in the big data community as well as in HPC
- Promote collaboration between academia, industry and SMEs
- Strengthen the community in energy efficient computing
- Demonstrate impact of approximate and transprecision computing on real applications

### Format of the workshop

This year workshop is organized as a half-day scientific event, and all speakers are invited so that the quality of the talks will be very high and aligned to the ISC audience expectations. At the moment, we plan for a morning session and we are flexible to re-schedule it in the afternoon with similar format.

START	END	DURATION	THURSDAY, JUNE 25 2020
09:00	10:00	01:00	Invited Keynote: Frank K. Gurkaynak, ETH – Zurich, Switzerland
10:00	10:30	00:30	Invited Talk: Alberto Bosio, École Centrale de Lyon, France
10:30	11:00	00:30	Invited Talk: Dimitrios S. Nikolopoulos, Virginia Tech, USA
<b>11:00</b>	<b>11:30</b>	<b>00:30</b>	<b>Coffee break</b>
11:30	12:30	01:00	Invited Keynote: Christos-Savvas Bouganis, Imperial College, UK
12:30	13:00	00:30	Invited Talk: Davide Rossi, University of Bologna, Italy
<b>13:00</b>	<b>14:00</b>	<b>01:00</b>	<b>Lunch</b>

### Organizing committee

Cristiano Malossi, IBM Research – Zurich, Switzerland  
 Luca Benini, ETH Zurich, Switzerland  
 Norbert Wehn, University of Kaiserslautern, Germany  
 Roger Woods, Queen’s University of Belfast, UK  
 Andrew Emerson, CINECA, Italy

### Workshop advertisement

The workshop will be promoted on social networks (Twitter, LinkedIn, etc.) as well as on relevant scientific community mailing-list. The workshop will be sponsored by the OPRECOMP project (oprecomp.eu). OPRECOMP consortium is made of ten partners from

industry, academia, and research centers, located in six different European countries. All partners will actively promote the workshop through their websites and collaborators.