A propos du centre ou de la direction fonctionnelle

The Inria Rennes - Bretagne Atlantique Centre is one of Inria’s eight centres and has more than thirty research teams. The Inria Center is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative SMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

Contexte et buts du poste

CAIRN (Energy-Efficient Computing Architectures) Inria project-team, Rennes, France.

https://team.inria.fr/cairn/

The CAIRN project-team pursues cutting edge researches on new architectures, algorithms and design methodologies for flexible, high-end computing, and energy-efficient domain-specific computing architectures. The team research directions are built around domain-specific systems in four main contexts: hardware accelerators, approximate computing, resilient computing, emerging technologies. The proposed research program perfectly fits in the CAIRN main research directions. The highly international research environment and the innovative studies conducted within CAIRN will provide all the favorable conditions for reinforcing existing international collaborations and developing new ones.

Mission confiée

Digital computing systems are an increasingly fundamental part of our existence. In the last decade, Artificial Intelligence (AI) has revolutionized the way people use and rely on computing machines [5–7]. The deep learning paradigm and, in particular, Deep Neural Networks (DNNs) enable electronic systems to perform increasingly complex tasks and are the focus of extensive studies, all over the world. To name a few, personal assistants help us to quickly retrieve information from the web and control smart objects in our houses, AI-based robots perform hard and repetitive tasks autonomously and help doctors with medical therapy, and AI-based algorithms help researchers in medical and drug research.

DNN-based systems have been studied from different standpoints in the last decades. First of all, the ability of a DNN to perform classification tasks with the highest possible accuracy has been the main focus for a long time [8]. Their incredibly high effectiveness comes at the price of an extremely large algorithmic complexity, thus of an enormous computational power.

Investigating new approaches to improve the efficiency of AI-based systems is necessary. From a general perspective, it is widely accepted that full-precision computing is inappropriate for next-generation AI-based applications due to hardware and energy costs. Therefore, the worldwide research community has moved towards the design of novel reduced-precision-computation techniques and low-cost hardware. Thus, novel non-conventional computing paradigms are increasingly employed to improve the energy efficiency of AI-based systems. Among others, popular research topics in this sense are neuromorphic computing and in-memory computing, which dispute the efficiency of conventional computing paradigms and promote a more brain-inspired methodology [12]. Another non-conventional computing paradigm, the Approximate Computing (AxC), has been increasingly applied to AI-based systems to push further their resource efficiency. AxC profits from the intrinsic error-tolerance of AI applications and systems – especially DNNs – to achieve high benefits in terms of resource efficiency [2,3]. Specifically, AxC carefully introduces some inaccuracy – that will be intrinsically tolerated – to increase the computing systems’ efficiency in terms of performance, area, and power consumption.

Principales activités

Therefore, this research positions mainly focuses on studying the Approximate Computing as an emerging paradigm to design the next-generation resource-efficient AI-based safety-critical systems. In details, in the context of AxC, there is the opportunity to relax the system reliability constraints to trade them off with important power savings and performance boosting [14, 15]. While this surely increases system efficiency on the one hand, utilizing approximation techniques in safety-critical scenarios represents a delicate and tricky task. Indeed, despite the energy efficiency optimization opportunities, reliability still represents a key requirement in most advanced safety-critical contexts. On the other hand, using approximation techniques in safety-critical systems, but also in endangering human lives. In particular, approximate AI-based systems must be designed to be reliable in order to be used in safety-critical scenarios, such as autonomous driving, robotics, and e-health.

Keywords – Artificial Intelligence, Deep Learning, Safety-critical systems, Energy efficiency, Approximate Computing, Reliability, Testing, Diagnosis, Verification, Digital Design, Design-for-Reliability

Bibliography


Institutions génériques

- Domaine : Architecture, langages et compilation
- Système B réseaux
- Ville : Rennes

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A propos d’Inria

Inria est l’institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2 600 personnes. Ses 200 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3 500 scientifiques pour relever les défis du numérique, souvent à l’interface d’autres disciplines. L’institut fait appel à de nombreux talents dans plus d’une quarantaine de métiers différents. 900 personnels d’appui à la recherche et à l’innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 180 start-up. L’institut s’efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l’économie.

Consignes pour postuler

- Veuillez vous adresser par mail à Olivier.Sentieys@inria.fr

Informations générales

- Domaine : Architecture, langages et compilation
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Bibliography

Avantages
- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours)
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Rémunération
Monthly gross salary amounting to 2653 euros.