Offer #2022-05591

Ultra Low-power AI for Embedded Devices

Renewable contract : Yes

Level of qualifications required : Graduate degree or equivalent

Other valued qualifications : Masters of Science + experience

Fonction : Temporary scientific engineer

Level of experience : From 3 to 5 years

Context

The context of this position is a partnership with Orange and Freie Universität Berlin (TinyPART project) as well as with the RIOT community, around the topic of experimental low-power AI and TinyML. The goal is to implement multi-scale Machine Learning, applicable not only in the cloud and at the edge but also on microcontrollers.

Assignment

Missions :
Support, evaluate and develop experimental Machine Learning software libraries for low-power connected objects. Set up demonstrators using Machine Learning in the context of the thing-edge-cloud continuum.

For a better grasp on the targeted topics :
See practical literature such as TinyML [1] for inference on microcontroller, as well as some of the recent existing research articles on learning on microcontroller (such as [2][3]), low-power federated learning (such as [4]), and keynotes on the topic such as [5]. Also see embedded ML software bases such as those proposed by EdgeImpulse, TensorFlowlite-micro, etc., and embedded software platforms for 32-bit microcontrollers, especially RIOT [6].).

References:
[1] T. Warden, D. Situnayake, "TinyML", O'Reilly, 2019..
[2] MCUnetv3 https://tinytraining.mit.edu/
[3] H. Ren et al. "TinyML with Online-Learning on Microcontrollers" Proceedings of IJCNN, 2021
[4] MM Grau et al. "On-Device Training of Machine Learning Models on Microcontrollers With a Look at Federated Learning." ACM GoodIT, 2021.
[5] C. Adjih, "Machine Learning for IoT", Workshop on IoT and Emerging Technologies, 2022.
[6] RIOT operating system for low-power IoT.

Main activities

Main activities :
- Review state of the art for on-device learning on microcontrollers
- Test/benchmark existing solutions on supported low-power hardware
- Integrate selected solutions in RIOT (aiming to extend and facilitate wider hardware support)
- Prototyping and demonstrations with low-power TinyML (e.g., HCI gesture detection voice command...)
- Contribute to modify/develop engine for dynamic execution of inference models

Complementary activities:
- Upstreaming of code in the RIOT ecosystem and implementation of CI
- Organization of hackathons
- *Academic experimental research publications & documentation in the field of TinyML*

Collaboration :
Some trips/stays in Berlin may be realised in this context, thanks to our collaboration with Freie Universität Berlin on this topic.

Skills

Technical Skills and Level Required:

- Knowledge and proficiency in Machine Learning techniques
- Knowledge and mastery of Python, and low-level C programming language and tools
- Knowledge and mastery of low-level software optimization techniques, e.g. on 32-bit microcontrollers

Languages :
- Good command of scientific English;

Interpersonal skills :
- Teamwork (partially geographically distributed).

Benefits package

- 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) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of 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

General Information

- **Theme/Domain :** Distributed programming and Software engineering
  Software Experimental platforms (BAP E)
- **Town/city :** Palaiseau
- **Inria Center :** Centre Inria de Saclay
- **Starting date :** 2023-03-01
- **Duration of contract :** 2 years
- **Deadline to apply :** 2023-02-28

Contacts

- **Inria Team :** TRIBE
- **Recruiter :**
  Baccelli Emmanuel / Emmanuel.Baccelli@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

- Be passionate about innovation and applied experimental research.
- Be comfortable with community-based open source software development.
- Know how to take initiatives and lead an action in this context.

Warning : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :
As part of its diversity policy, all Inria positions are accessible to people with disabilities.