Offre n°2023-06134

Post-Doctoral Research Visit F/M Federated Learning under Energy Limit

Type de contrat : Fixed-term contract

Niveau de diplôme exigé : PhD or equivalent

Fonction : Post-Doctoral Research Visit

Niveau d'expérience souhaité : Recently graduated

A propos du centre ou de la direction fonctionnelle

The Inria University of Lille centre, created in 2008, employs 360 people including 305 scientists in 15 research teams. Recognised for its strong involvement in the socio-economic development of the Hauts-De-France region, the Inria University of Lille centre pursues a close relationship with large companies and SMEs. By promoting synergies between researchers and industrialists, Inria participates in the transfer of skills and expertise in digital technologies and provides access to the best European and international research for the benefit of innovation and companies, particularly in the region.For more than 10 years, the Inria University of Lille centre has been located at the heart of Lille's university and scientific ecosystem, as well as at the heart of Frenchtech, with a technology showroom based on Avenue de Bretagne in Lille, on the EuraTechnologies site of economic excellence dedicated to information and communication technologies (ICT).

Contexte et atouts du poste

This post-doctoral position will be supported by the Fed-MALIN project.
Fed-MALIN addresses a number of challenges that arise when Federated Learning (FL) is deployed over the Internet, including privacy, fairness, energy consumption, personalisation, and location/time dependencies.
Fed-MALIN will also contribute to the development of open-source tools for FL and will use them for concrete applications in medicine and crowdsensing.

The position is part of a collaboration between two teams of Inria Lille: Spirals (Self-adaptation for distributed services and large software systems Magnet (Machine Learning in Information Networks).

Mission confiée

The context of this project is Federated Learning (FL) where devices have an a priori and known budget for energy consumption. The exact energy consumption of devices is unknown, but can be evaluated by local measurements reported by middleware toolkits, like PowerAPI (http://powerapi.org). The aim is to design and implement online strategies in FL algorithms that are adaptive to the constraints of the energy limit and to the consequences of these constraints. You will study the impact of budgeted limits and energy consumption approximation on the client and the server side. In particular, devices can adapt the amount of information sent to the server and reduce the computational cost of gradients (using, for instance, quantization or sampling data or parameters).
On the server side, it is therefore necessary to mitigate the induced biases due to the unavailability of the devices, the heterogeneity of the collected gradients. These strategies are driven by local information in the first place, but need to be tuned in a collaborative way.

Principales activités

The post-doctoral research activity includes several key steps:

- Study (local) energy consumption measurement. This include the quality and robustness of PowerAPI measurements, the impact of quantization, model sizes, batch sizes, loss function in classical gradient descent-descent algorithms. Model predictions for energy consumption could also be studied and evaluated;
- Study and manage the impact of heterogeneity of gradients at the server level on the convergence and the accuracy in (standard) aggregation steps. Possible strategies to mitigate the induce bias could also depend on auxiliary knowledge communicated by the clients;
- Devise new collaborative approaches for adaptive consumption of the budget across FL iterations.

Compétences

PhD in computer science, machine learning, or software engineering/distributed computing.
Strong programming skills in Python/Pytorch.
Prior experience in Federated Learning will be an asset.

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) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking 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

Rémunération

Gross monthly salary (before taxes) : 2788€

Informations générales

- **Thème/Domaine :** Optimization, machine learning and statistical methods
  Scientific computing (BAP E)
- **Ville :** Villeneuve d'Ascq
- **Centre Inria :** Centre Inria de l'Université de Lille
- **Date de prise de fonction souhaitée :** 2023-10-01
- **Durée de contrat :** 2 years
- **Date limite pour postuler :** 2024-04-30

Contacts

- **Équipe Inria :** MAGNET
- **Recruteur :**
  Tommasi Marc / Marc.Tommasi@inria.fr

A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 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 200 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.

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.

Consignes pour postuler

Sécurité défense :
Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

Politique de recrutement :
Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.