2018-00752 - Post-doc position: Learning data-dependent lightweight networks for visual representation

**Contract type:** Public service fixed-term contract

**Level of qualifications required:** PhD or equivalent

**Function:** Post-Doctoral Research Visit

**Level of experience:** Up to 3 years

**About the research centre or Inria department**

The Inria Rennes - Bretagne Atlantique Centre is one of Inria's eight centres and has more than thirty research teams. The Inria Centre 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.

**Team presentation:** [https://www.inria.fr/en/teams/linkmedia](https://www.inria.fr/en/teams/linkmedia)

The challenge that multimedia faces today is that of context awareness, i.e., describing documents in the context in which they appear (context of a collection, social context, etc.). Following this line of thought, the seminal idea of LinkMedia is that of content-based media linking with the ultimate goal of enabling better multimedia applications and new innovative services. Taking a content-based perspective, we seek to create explicit links at different levels to better reflect the context: links at the signal level, e.g., with repeating patterns; links at a semantic level, e.g., to follow topics or stories; links at a paradigmatic level, e.g., to have further details or comments on a topic. LinkMedia investigates a number of key issues related to multimedia collections with explicit links: Can we discover what characterizes a collection and makes its coherence? Are there repeating motifs that create natural links and which deserve characterization and semantic interpretation? How to explicitly create links from pairwise distances? What structure should a linked collection have? How do we explain the semantic of a link? How explicit links can be used to improve information retrieval? To improve user experience? Addressing such questions, our goal is to lay down scientific foundations for collection structuring by means of explicit links and to study new usages and content processing techniques induced by structured context-aware collections.

**Context**

The post-doc will be supervised by Dr Yannis Avrithis. The position has a duration of two years and is part of a research and innovation grant in collaboration with a number of industrial partners, and with applications to large scale image retrieval and recognition. Work will be carried out within Inria team LinkMedia. The team specializes in multimedia content processing for analytics, gathering specialists from different fields: natural language processing, image processing and computer vision, data mining, databases.

**Assignment**

The objective of this post-doc is to study deep learning methods for visual representations that are in the intersection of learning with little or no supervision and learning lightweight network architectures for user under limited resources, like mobile devices.

Transfer learning is a standard way to adapt to new domains and tasks, e.g., object detection [RBH15], with less supervision than when learning from scratch, but this level of supervision is still significant. In image retrieval, fine-tuning can be performed with algorithmic rather than human supervision [GBR09]. Unsupervised manifold learning [TRI08] is an alternative that can improve the representation without any external algorithm. Metric learning [CHL09] is a more general framework for learning from pairwise or more complex relations between samples, but it is most commonly supervised [KMT14]. Semi-supervised learning [WRK08] can exploit the distribution of large quantities of unlabeled data, while low-shot learning [HGT17] and meta-learning [FAL17] rather consider unseen classes at inference.

On the other hand, there has been considerable progress on designing lightweight architectures for mobile and embedded vision applications, based e.g. on quantizing weights or activations, pruning connections, and low-rank or sparse matrix factorizations, in particular depth-wise or group convolutions [ZDL17]. These developments have focused on supervised classification so far rather than other tasks and supervision settings. Recently, semi-supervised learning has been connected to progressive learning of the network structure [WK17], while residual networks have been connected to progressive inference [LS18]. It is the objective of this post-doc to investigate such ideas of adapting the architecture to the task and supervision data at hand, either at learning or dynamically at inference.

**References:**


**General Information**

- **Theme/Domain:** Vision, perception and multimedia interpretation
- **Scientific computing (BAP E)**
- **Town/City:** Rennes
- **Inria Center:** CR Rennes - Bretagne Atlantique
- **Starting date:** 2018-09-01
- **Duration of contract:** 2 years
- **Deadline to apply:** 2018-09-31

**Contacts**

- **Inria Team:** LINKMEDIA
- **Recruiter:**
  - Avrithis Ioannis / iovannis.avrithis@inria.fr

**About Inria**

Inria, the French National Institute for computer science and applied mathematics, promotes “scientific excellence for technology transfer and society”. Graduates from the world’s top universities, Inria’s 2,700 employees rise to the challenges of digital sciences. With its open, agile model, Inria is able to explore original approaches with its partners in industry and academia and provide an efficient response to the multidisciplinary and application challenges of the digital transformation. Inria is the source of many innovations that add value and create jobs.

**Conditions for application**

Please include the following in your application:

- updated CV
- research statement
- recommendation letters
- degree transcripts

For more information, contact iovannis.avrithis@inria.fr

**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.

**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.
Main activities
Not applicable.

Skills
The subject is at the intersection of two problems typically treated separately so far, i.e., deep learning with limited supervision and learning lightweight network architectures. The candidate should ideally have a PhD degree in one of the two problems and good knowledge of the other; a strong publication record in relevant computer vision and machine learning venues such as CVPR, ICCV, NIPS and ICLR; solid mathematical background and programming skills; fluency in English language.

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Sports facilities

Remuneration
Gross salary: 2653 euros