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 Renner - 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 institutes, etc.

Team presentation: 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 explicit links? LinkMedia does not only strive to create new links but also to discover what kind of links should be linked in a collection. 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 Ioannis Avritsis. 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 use under limited resources, like mobile devices.

Transfer learning is a standard way to adapt to new domains and tasks, e.g., object detection [RHG15], 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 [SAR16]. Unsupervised manifold learning [BA14] is an alternative that can improve the representation without any external algorithm. Metric learning (CHLOS) is a more general framework for learning from pairwise or more complex relations between samples, but it is mostly commonly supervised (KMA14). Semi-supervised learning (KWR08) can exploit the distribution of large quantities of unlabeled data, while low-shot learning [HG17] and meta-learning [FA17] 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 [ZHT17]. 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 [WL17], while residual networks have been connected to progressive inference [LMB17]. 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:


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