2018-00604 - PhD Position: Semantic segmentation with minimal supervision

**Contract type:** Public service fixed-term contract  
**Level of qualifications required:** Graduate degree or equivalent  
**Function:** PhD Position  
**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 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 PMEs, 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 PhD will be supervised by Dr Miaojing Shi and Dr Yannis Avrithis. 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 goal of this PhD is to study semantic segmentation in images or video with minimal supervision. This task will be placed into a setting where only image-level annotation is provided [KL16]. To begin, additional supervision such as clicks [BRF16], strokes [VC17], or bounding boxes [RPK17] may also be assumed. Towards the end of the PhD, the student is expected to work with datasets of mixed levels of supervision, including a harder, semi-supervised setting where there are only a few image-level labels as well as a large amount of unlabeled images.

Several ideas can be investigated in the context of deep learning. For instance, generative adversarial learning can be employed to either augment the dataset [SSS17] or bridge the predicted segmentations with their ground truth [LCC16]. Recurrent neural networks (RNN) can be applied to video segmentation in particular to localize and segment semantic parts across nearby frames [TAS17]. On unstructured image datasets, ideas like deep metric learning [FWR17] and random-walk label propagation [VC17] can be extended across pairs or groups of images. Cross-category transfer learning [XWL18] can be a further extension.

**Keywords:**

semantic segmentation, minimal supervision, deep architectures, adversarial learning, recurrent networks, metric learning

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**General Information**

- **Theme/Domain:** Vision, perception and multimedia interpretation  
- **Scientific computing (BAP E)**  
- **Town/city:** Rennes  
- **Inria Center:** CRI Rennes - Bretagne Atlantique  
- **Starting date:** 2018-09-01  
- **Duration of contract:** 3 years  
- **Deadline to apply:** 2018-04-25

**Conditions for application**

Thank you to send us these documents by applying online:

- updated CV  
- cover letter  
- letters of recommendation eventually  
- degree transcripts

**More informations:** miaojing.shi@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.

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**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 candidate should ideally have a degree in Computer Science, Applied Mathematics or Electrical Engineering; solid mathematical background and programming skills; fluency in English language; preferably, prior experience in computer vision, machine learning or data mining.

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

Remuneration
Gross salary: 2653 euros