

PhD Position - University of Caen, CNRS GREYC Laboratory

Frugal AI for image segmentation

Topic

The advent of deep learning has been a real tsunami in the machine learning community, leading to results, especially in computer vision, that we would not have expected a few years before. For many vision tasks, the performances of deep learning algorithms have become equivalent or even superior to human performances.

However, these results have been obtained at the cost of ever-increasing use of resources such as : the size of the model, the time and energy needed to train them, with ever-larger databases and ever-higher annotation requirements. This increase in resource requirements has major drawbacks, related to the impact that ML has on the environment, the difficulty to implement models on embedded architectures, or the challenges raised when models have to be trained on tasks for which little training data is available.

These observations have very recently led some authors [1, 2] to introduce the concept of *frugal machine learning* and to define what a frugal machine learning methodology should be, and how to evaluate frugality.

In this dissertation, we will study frugality in the context of AI for image segmentation [3]. The objective will be to propose frugal models that can provide efficient results while being structured to provide a reduced time and space complexity. More precisely, we will consider several aspects of frugality and take inspiration from the following recent works : i) the conception of lightweight models by design [4, 5] ii) the compression of existing models [6] iii) the pruning of existing segmentation models [4, 7] iv) frugality on image label and zero shot image segmentation [8, 9].

Qualifications

Candidates must have an MSc or engineering degree in a field related to computer science, electrical engineering, or applied mathematics, with strong programming skills (in particular with deep learning frameworks). Experience with image processing will be a plus. Candidates are expected to have abilities to write scientific reports and communicate research results at conferences in English.

Information and application

The position is starting as soon as possible with a salary of 32kEuros gross, and will be located in Caen, France.

Applications should include the following documents in electronic format : i) A short motivation letter stating why you are interested in this project, ii) A detailed CV describing your past research background related to the position iii) The transcripts for master degrees. iv) The contact information for three references (do not include the reference letters with your applications as we will only ask for the reference letters for short-listed candidates)

Please send your application package to frederic.jurie@unicaen.fr and olivier.lezoray@unicaen.fr.

Ideally located in the heart of Normandy, two hours from Paris and just 10 minutes away from the beaches, Caen, William the Conqueror's hometown, is a lively and dynamic city.

Références

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- [6] Moonjung Eo, Suhyun Kang, and Wonjong Rhee, “A Highly Effective Low-Rank Compression of Deep Neural Networks with Modified Beam-Search and Modified Stable Rank,” *arXiv :2111.15179 [cs]*, Nov. 2021.
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- [8] Mengde Xu, Zheng Zhang, Fangyun Wei, Yutong Lin, Yue Cao, Han Hu, and Xiang Bai, “A Simple Baseline for Zero-shot Semantic Segmentation with Pre-trained Vision-language Model,” *arXiv :2112.14757 [cs]*, Dec. 2021.
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