Master thesis proposal

Deep learning for fashion analysis

Computer vision has been revolutionized by the advent of deep learning. The AlexNet paper (Krizhevsky et.al., 2012) paved the way of training deeper networks for image classification using convolutional neural networks that run on GPUs.

In recent years, frameworks like Tensorflow, Pytorch, and Keras allow for rapid prototyping of advanced machine learning models, and the field is moving faster than ever.

Semantic segmentation is the task of segmenting images into semantic regions of interest. The standard example is images taken from cameras on vehicles, where the task may be to classify what pixels in the image belong to road signs, pedestrians, and other vehicles. One successful system for this task is Deeplab (see references below). The approach uses convolutional neural networks with attention to cope with scale in the input images.

Machine learning for fashion. In the domain of analysis of fashion images, the objects of interest may be humans and different categories of clothing and accessories. This is a field that hasn’t yet achieved as much attention, and therefore data availability is scarcer. This means that interesting research questions arise.

- How can we make the best use of the data that is available?
- Can we augment the available data with data from other sources?
- Can we use data from other tasks to improve the results on this task?

RISE AI is running a project together with partners in the fashion industry and in academia to explore the possibility of using data-driven machine learning techniques for the analysis of fashion data. The analysis may be things like spotting trends from images on blogs and social media, determining if images belong to certain styles or trends, determining the age of the designs in an image, etc.

In this master thesis, you will implement machine learning models for fashion data. The work requires students that are skilled in machine learning. Familiarity with computer vision is beneficial, and statistical inference is a cornerstone in the techniques that will be employed. You will start with some simpler, existing models that were developed for related tasks, and eventually extend or develop more advanced solutions. The tasks that you will carry out may be related to improving semantic segmentation (see above), to performing time-series analysis of images that have been processed by some existing model for classification or semantic segmentation, or to combining different kinds of data sources, such as data from different domains, or data of different modalities (text, images, videos, etc).
The work is suitable for two students. Working without a partner is also a possibility for a motivated student. There are readily available datasets for several of these tasks. If the student has certain interests, collecting data to perform the corresponding required experiments may be needed.

The work will be performed in collaboration with RISE AI at Research institute of Sweden (see below).

**Related courses:**

- Machine learning (TDA231)
- Deep machine learning (SSY340)

**Required skills:**

- Experience of implementing machine learning models
- Familiarity of computer vision
- Programming skills (and preferably with some experience of relevant frameworks such as Tensorflow, Pytorch, or Keras. You are free to choose programming language, but Python is highly recommended.

**Keywords:** Machine learning, computer vision, artificial neural networks, deep learning, convolutional neural networks, sequence analysis.

**Potential supervisors:** Olof Mogren, RISE AI, olof.mogren@ri.se

RISE AI is part of Research institutes of Sweden (and formerly SICS). We are an organization of around 60 researchers working on AI-related tasks within different fields including natural language processing, computer vision, and network analysis. Our Gothenburg office was started in May 2018 and comprises a (so far) small team of researchers focusing on machine learning.

For more info, visit http://ri.se or email olof.mogren@ri.se.

**Reading and resources:**

3. Fashionista dataset (https://github.com/grahamar/fashion_dataset)
6. Deep learning (book; freely available online; Ian Goodfellow and Yoshua Bengio and Aaron Courville; https://www.deeplearningbook.org/)