Feature learning via denoising auto-encoder: Application to subtraction translucent anatomical structures from radiographs

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Introduction

Today microblogging services are used my millions of people, who use them for making short posts. The users also can include hashtags in their text. A hashtag is a string with a hash symbol in front of the words, commonly used for expressing the main idea of the text. With an enormous increase in microblogging services usage among social nets hashtags attract more attention as efficient tools for data mining such as public opinion analysis, microblog retrieval, prediction, etc.
The problem is, that there is a small number of posts with hashtags made by the authors. Thus and automated hashtag recomendation became an interesting area for research.

Background

Due to attention to this problem a big variety of methods were suggested. We can roughly divide them in collaborative filtering, generative and classification models. However, most of them are state-of-the-art solutions those are efficient on a specific task they were made for. According to (Yuyun Gong, 2016) we can use Convolutional Neural Network instead to increase the performance for hashtag recommendation. However, a standard CNN cannot operate with text, so authors propose an attention model for data integration.
Before replicating (Yuyun Gong, 2016) experiment, we tested authors model on images as a solution for wrinkle detection task. There we discovered that the model can be enhanced with Gradient Boosting and, as a result, showing even better performance.

Materials

In the following work we used (Li, Wang, Deng, Wang, & Chang, 2012) dataset containing 50M user tweets as a test set. For training set a https://github.com/3Top/word2vec-apipretrained twitter dataset with 27B tweets is used. The data was processed

Methods

In this section will method be described in details. split down in follow parts:

1. image preprocessing.
2. features learning.
3. build prediction model.
4. train and evaluate.
5. postprocessing.

A. Image Preprocessing.

Before we start to conduct any training operations, normalization had take place. First we apply low pass filter to subtract global intensity gradient in lungs that originated from 3D lungs elliptical structures projection onto 2D image. The most noticed moment in normalization is to apply energy-based normalization (?, ?). Ten time iterated energy-based normalization that has been applied on each input images from the test set was enough to converge energy's ratio. This technique allow noticeable better cross datasets evaluation.

B. Features Learning.

Since we want to provide justification for selected features, unsupervised machine learning technique namely convolution auto-encoder was employed. For this purpose we first cut images on patches 28x28 pixels and select only those, which had interacts with range of interest (in this case it was lungs). According to (?, ?) all input patches was divided in two groups with applied and on them Gaussian and salt paper noise and trained separated models on them. The resulting first-layer filters are Gabor-like and was added to general kernels pack.

C. Build Prediction Model.

At this moment kernels pack size achieved 200 kernels this lead to expand original features space up to 260 (including kernels from (M. Loog, 7 November 2005) method to compare feature's importance), hence, to deal with high dimension space such high complex ensemble made of

random forests was employed.

D. Train and Evaluate

E. Postprocessing.

References

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