

PhD Thesis - Baptiste Wicht

Deep Learning Feature Extraction for Image Processing

Realization

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Keywords

- Machine Learning
- Deep Learning
- Image Processing
- Keyword Spotting

Our skills

Machine learning
Deep Learning
RBM, CRBM

Valorization

6 international peer reviewed
publications

Partnership

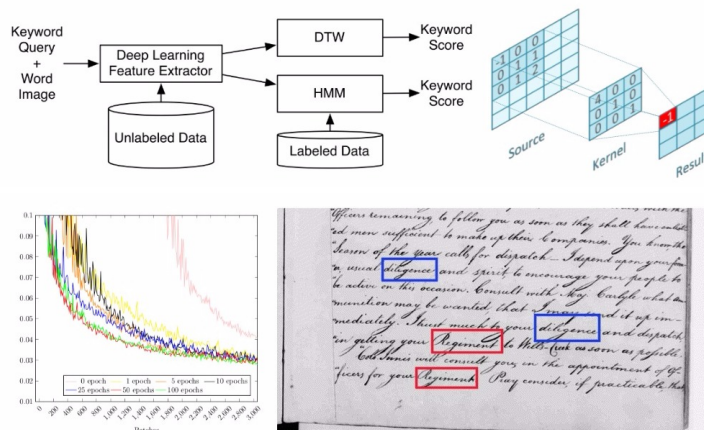
- DIVA - UNIFR

Funding

CTI/KTI
HES-SO

Schedule

2012 – 2017



Typically, hand-crafted features are extracted from images for further processing tasks. These features are then passed to a Machine Learning algorithm to learn specific models. These features are generally difficult to design and are poorly adaptable from one data set to the other. This thesis investigates the use of machine learning approaches to learn the feature extraction block instead of composing it a priori, by relying on handcrafted algorithms. This thesis attempts to answer two questions: are such learned features outperforming regular handcrafted features and what are the prerequisites and difficulties to perform the learning. More specifically, this thesis investigates the use of Restricted Boltzmann Machines (**RBMs**) and Convolutional RBMs (**CRBMs**) to learn features from images. Two tasks have been defined to develop the systems analyzed in this thesis.

Sudoku Recognition. This first experiment used a Deep Belief Network (DBN) that was trained in an unsupervised manner to recognize Sudoku images taken from Swiss newspapers. The goal was to study the impact of unsupervised pre-training using RBM with, among other things, an analysis of the capability to learn features on mixed printed and handwritten inputs.

Handwritten Keyword Spotting. A complete model for Keyword Spotting is designed. This model uses feature extracted using a CRBM training in a purely unsupervised manner. These features are then passed to a DTW algorithm or to a HMM in order to perform keyword spotting. The learned features have demonstrated to outperform significantly the handcrafted state-of-the-art features in most configurations.