During the accelerated development of telecommunications, networking, and rapid progress of the so-called big data and it's methods, more and more data is transmitted each day. These can be GPRS/3G/4G/LTE packets, streaming data such as movies or music files (eg. the Video-on-Demand services, VoD) or data from content delivery systems, also that related to the huge rise in popularity of social networking eg. Facebook or Twitter).

Due to the abundance of available unlabeled data, there is an increasing pressure on machine learning society to construct new or optimize existing algorithms that can effectively process it. Our aim in this project is to address this demand in the case of most commonly applied unsupervised methods based on probabilistic approach, in particular density estimation, density clustering and analysis of independent components (ICA).

Our main idea is to reformulate or approximate existing optimization problems in this field (in particular by changing cost functions) so that the modified problems either get a closed-form solutions or can be very efficiently minimized.

In the first part of our project we will focus our attention on the most popular tools of unsupervised machine learning, while in the second step we will consider their applications, with a particular attention to deep learning.

The above methodology can be applied for ICA problem. Let us asume that we have two images, see Fig. 1(a). But we have only its noisy versions, see Fig. 1(a). Our goal is to recover the orginal ones. The results of our algorithm and classical FastICA ptrocedure we present in Fig. **??**.

One of the possibile application of the above ide in the case of ICA problem leads to the WeICA method, which has lower computional complexity see Figure. 1.

(a) Original images 42049 and 220075.

(b) Sum and subtraction of images.

(c) WeICA.

(d) FastICA.

(e) WeICA.

(f) FastICA.

Figure 1: Comparison of images separation by our method (WeICA) with FastICA.