Using deep learning for object recognition in robotics

Deep learning is a new concept in machine learning. It allows representation learning, i.e. learning of feature representations automatically instead of having to define them manually based on expert knowledge.

Traditional machine learning can be efficient, but applying it to very complex problems usually means to spend very much time manually designing input features to feed the appetite of a learning algorithm. Deep learning is a focus of the current artificial intelligence research because of the advantage of self-teaching which removes a great deal of manual labour. It is also becoming proficient in unsupervised learning, where systems learn concepts as they process large amounts of unlabelled data. Such capabilities could be helpful as we attempt to build machines that better perceive their surroundings.

Deep Learning represents learning multiple levels of representation and abstraction that help to make sense of data such as images, sound, and text. At the moment, most of the deep learning algorithms are based on building of massive artificial neural networks that are broadly inspired by how our brain works. Recent methods based on deep learning have demonstrated state-of-art performance in a wide variety of tasks, including visual recognition, audio recognition and natural language processing.

Most of the research in the field of deep learning for robotics are concerning the recognition of objects. The ability to identify and differentiate objects is the basis of the intelligence of robots which must move in an environment and interact with it. Subsequently, learning behaviours based on a goal is possible and not necessarily very difficult to achieve. Deep learning was already successfully used in the method of detecting robotic grasps for novel objects that allows to avoid hand design of features.

The aim of our work is to research ability to use deep learning in applications of object recognition. We will apply this model to specific tasks and estimate its effectiveness. A particular attention will be paid to efficient implementations of deep learning model on limited computing resources (that are available on the robot). If the method proves to be efficient in specific tasks, results could be essential for various industrial and household services.