MSc thesis project / Internship

Deep Learning for Industrial Robotic Applications

Internship projects

Fizyr is currently looking for bright and talented master students who are willing to carry on research and development in deep learning and computer vision, for a MSc thesis project or internship of at least 6 months. Fizyr has a pool of experienced deep learning engineers who can provide support both on pure development and practical implementation.

Autonomous object picking

Pick&place is one of the core tasks of logistics applications. Picking an item from a bin mainly consists of two steps: locating the item in the bin, and then deciding a 6D position where to place the gripper. For the latter, Fizyr has developed a deep learning autonomous grasp algorithm based on existing literature. Initial results are promising, however more work needs to be done in order to achieve quality, robustness and speed necessary for an industrial deployment. The student is invited to explore the existing algorithm and follow the existing path or propose new interesting directions. Ultimately, the challenge is to convert successful experiments from a controlled laboratory environment to unpredictable situations in a warehouse. Such development is one of the major challenges for cutting-edge technological companies.

Autonomous object placing

Pick&place is one of the core tasks of logistics applications. Once an object is picked, a placing position must be quickly computed in the destination bin. The proposed position must be free from collisions with the bin and other items and should be optimized so to be able to fill the bin as tightly as possible. Fizyr has developed a placing algorithm based on the use of the Point Cloud Library (PCL). Initial results are promising, however more work needs to be done in order to achieve quality, robustness and speed

necessary for an industrial deployment. The student is invited to explore the existing algorithm and follow the existing path or propose new interesting directions. Ultimately, the challenge is to convert successful experiments from a controlled laboratory environment to unpredictable situations in a warehouse. Such development is one of the major challenges for cutting-edge technological companies.

Improvement of CNN inference speed

Convolutional Neural Networks (CNN's) have substantially improved in accuracy performances over the years. Though, in the industrial sector, speed is also a key component. Several methods have been devised to decrease inference speed in CNN's without harming quality. The student is invited to explore, implement and compare such methods, aiming at finding the best trade-off between inference speed and prediction accuracy. The project will also involve low-level programming, bridging the gap between deep learning and embedded software.

CNN inference on CPU

Convolutional Neural Networks (CNN's) are mostly developed on GPU's, both for training and inference. While training can be remotely performed in offices with access to suitable hardware, inference is continuously performed on systems inside warehouses, on the sole hardware that can be placed in these warehouses. In such systems, often the GPU can represent half of the cost of the hardware. In order to cut costs, Fizyr is interested in performing inference on CPU's. The student is invited to optimize CNN inference on CPU and compare it with the GPU performances. The project will mostly be focused on low-level programming, bridging the gap between deep learning and embedded software.

Semi-supervised learning for training set augmentation

In deep learning applications, the possession of annotated data has a crucial value. Though, the procedure of data annotation often costs time and resources. Fizyr is interested in exploring semi-supervised learning, a solution between supervised and unsupervised learning, in order to augment the training set size exploiting unannotated data. The student is invited to research, implement and compare the existing semi-supervised learning techniques, making use of the available Fizyr datasets. By doing so, the student will ultimately gain a large first-hand experience in implementing training and evaluation procedures of Convolutional Neural Networks with widespread libraries such as TensorFlow and Keras.

Unsupervised learning for quality inspection

The goal of quality inspection is to separate defect products from their pristine counterparts. The main challenge arises from the unpredictability and variability of the defects present on products: annotating existing defects might lead the network to not recognize a new, never encountered type of defect. Furthermore, defect products tend to be in a much smaller quantity than the intact. For these reasons,

unsupervised learning represents an interesting solution. The student is invited to study, implement and evaluate the state-of-the-art methods on unsupervised deep learning for quality inspection. By doing so, the student will ultimately gain a large first-hand experience in implementing, training and evaluating Convolutional Neural Networks with widespread libraries such as TensorFlow and Keras.

Preferred skills

- Programming experience with Python and/or C++;
- Knowledge of Machine Learning and Computer Vision;
- Basic knowledge of Linux.

Contacts

For more information about the company, visit the website: www.fizyr.com
If interested in one or more projects, please send CV and motivational letter to: career@fizyr.com