

## Doctoral School of Information and Biomedical Technologies Polish Academy of Sciences

Domain: **IT**

### **Subject**

Image Semantic Segmentation Based on Deep Neural Networks

### **Supervisors, contact**

Professor Maria Ganzha, (Maria.Ganzha@ibspan.waw.pl, tel. +48 22 3810353)

or

Professor Marcin Paprzycki, (marcin.paprzycki@ibspan.waw.pl, tel. +48 22 3810353)

### **Assistant supervisor**

dr eng. Tatiana Jaworska (Tatiana.Jaworska@ibspan.waw.pl, tel. +48 22 3810223)

### **Place of research**

Systems Research Institute PAS, 6 Newelska Str, Warsaw, Poland.

Recruitment & Selection: **interview**

Number of positions: **1**

### **Project Description**

Current developments of Deep Neural Networks now allow for image semantic segmentation. Frequently, networks, such as R-CNN [1], SegNet or U-Net [2] are used for this purpose. In this case, relatively large and correctly segmented image sets are necessary for network training.

A Content-Based Image Retrieval (CBIR) system [3] containing segmented and tagged images has been developed in the SRI PAS. These images can be the proper training set for a semantic segmentation network [4]. At present, the images are segmented and later the segmented elements are classified. After designing and training a network appropriately, the classification process might be accelerated by attributing the classes to the segments directly. Additionally, the network's generalizing ability facilitates detail generalization, which, in the existing method, generates noise.

Implementation of the state-of-the-art methods may not yield the expected results, because not only are there a great number of classes in the CBIR system, but also there are insufficient of segments for each class. Due to this reason, the work object is to design a new and more effective deep network architecture for image semantic segmentation [5].

### **References**

- [1.] He K, Gkioxari G, Dollar P, Girshick R. *Mask R-CNN*. In: IEEE International Conference on Computer Vision; 22-29 Oct. 2017; Venice, Italy: IEEE. p. 2980-2988.
- [2.] Chen L.C, Zhu Y, Papandreou , Schroff F, Adam H. *Encoder-Decoder with Atrous Separable Convolution for Semantic Image Segmentation*. In: 15<sup>th</sup> European Conference on Computer Vision ECCV; 8-14 Sep. 2018.; Munich, Germany: Springer. p. 833-851.
- [3.] Jaworska T. *The Concept of a Multi-Step Search-Engine for the Content-Based Image Retrieval Systems*. In: Borzemski L, Grzech A, Świątek J, Wilimowska Z, Eds. Information Systems Architecture and Technology. Web Information Systems Engineering, Knowledge Discovery and Hybrid Computing; 2011; Wrocław: Oficyna Wydawnicza Politechniki Wrocławskiej. p. 189-200.
- [4.] Jaworska T. *Object extraction as a basic process for content-based image retrieval (CBIR) system*. Opto-Electronics Review. 2007 Dec.: p. 184-195.
- [5.] Rhu M, Gimelshein N, Clemons J, Zulfiqar A, Keckler S.W. *Virtualized Deep Neural Networks for Scalable, Memory-Efficient Neural Network Design*. In: the 49<sup>th</sup> IEEE/ACM International Symposium on Microarchitecture (MICRO-49); 15-19, Oct. 2016; Taipei, Taiwan: IEEE/ACM. p. 1-13.

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