

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

Domain: **IT**

### Subject

Semantic Similarity in Content-Base Image Retrieval (CBIR)

### Supervisors, contact

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### Place of research

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

Recruitment & Selection: **interview**

Number of positions: **1**

### Project Description

One of the fundamental functionalities of a content-based image retrieval system (CBIR) is answering user queries in order to retrieve proper information. However, proper information does not mean the return of a visual similar image, but rather of a semantically similar one. In the recent years, many researchers have intensively analysed similarity evaluations between whole images, their fragments, or some image elements, such as contours. Content-based similarity models have been developed [1] so as to comply with the system needs and user requirements regarding semantic multimedia retrieval.

Convolutional neural networks (CNN), which are rapidly developing at present, can easily recognize particular objects in images, such as cars, people, etc., or find similarity between two images of the same class, especially in medicine [2] but cannot retrieve more complex notions, for instance a city, or tropics. The multiple semantic interpretation results in a retrieval problem because it needs to take into account simultaneously: image complexity, the number of objects, low-level features, object layout and the associations which an image evokes in humans. For this reason, in the SRI PAS the CBIR system, offering to the user some elements of semantic retrieval based on specific criteria has been developed [3] but still there is no quantitative method for image similarity evaluation, even though researchers tried to introduce some image similarity metrics [4].

The research subject for a Ph. D student is to define a semantic image description in a quantity way in order to compare the content of images. The second object is to implement the semantic image description to a new CBIR search engine.

### References

- [1] C. Beecks, M. S. Uysal and T. Seidl, "A Comparative Study of Similarity Measures for Content-Based Multimedia Retrieval," in *Multimedia and Expo (ICME)*, Suntec City, 19-23 July, 2010, pp. 1552-1557.
- [2] S. Czolbe, O. Krause and A. Feragen, "Semantic similarity metrics for learned image registration," in *Medical Imaging with Deep Learning*, Lübeck, 7 - 9 July 2021, pp. 1-14.
- [3] T. Jaworska, "How to Compare Search Engines in CBIR?," in *Proceedings of the SAI COMPUTING CONFERENCE 2016*, London, UK, 2016, pp. 280-289.
- [4] T. Jaworska, "An Asymmetric Approach to Signature Matching," in *Multimedia and Network Information Systems*, vol. 506, A. Zgrzywa, K. Choraś and A. Siemiński, Eds., Wrocław, Springer, 2016, pp. 27-37.

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