

Editorial: A decade of community-wide efforts in advancing medical image understanding and retrieval

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Access to images in scientific publications overall and in the biomedical domain specifically, has long been established a desirable feature for services providing access to scientific literature [6, 2]. Likewise, automatic identification of regions of interest in clinical images and image-based assisted diagnosis are widely recognized as a means for bringing potentially important health issues to clinicians' attention [11]. The individual research efforts in addressing these needs were faced with the lack of resources for development and evaluation of image search engines and tools for understanding image content. The medical image retrieval evaluation track within the ImageCLEF initiative was developed to facilitate research and evaluation of image retrieval and understanding methods. The evaluations included various image classification and retrieval tasks and followed the principles developed at the National Institute of Standards and Technology for the TREC challenges (Text REtrieval Conference).

This special issue of Computerized Medical Imaging and Graphics summarizes the advances in image processing and retrieval and lessons learned over the ten years of medical image evaluations in the ImageCLEF initiatives. Expanding on the previous overviews [5, 7], in the issue, Kalpathy-Cramer et al. [3] provide a broad overview of the evaluation campaign from the organizers perspective, including the descriptions of the datasets developed for the evaluations, the nature of the tasks, the participating teams and the image retrieval methods. The remaining papers provide an in-depth look at the individual team approaches to specific tasks. Not surprisingly, the ad hoc image retrieval task that played the central role in the evaluations is addressed in several papers. In this task, the participants had to search document collections (most recently, a set of open access PubMed Central journals) for images relevant to short descriptions and images provided as search topics.

In this issue, Stathopoulos and Kalamboukis investigate Latent Semantic Analysis applied to ad-hoc image retrieval and present an efficient approach that reduces computational complexity and space and time requirements compared to other approaches that produce similar search results [10]. Mourao et al. present a set of Inverse Square Rank (ISR) fusion algorithms aimed at increasing relevance of the images at the top of the ranked list of retrieval results [4]. The algorithms performed well using both text and visual features; however the best performance was achieved when the features were combined. This observation is corroborated by Simpson et al. who present their literature based approach to multimodal retrieval [9]. The multimodal approaches, particularly the ISR algorithms performed equally well in the case-based retrieval task, in

which the participants searched the same data collection as for the ad hoc task, but the goal was to find case studies similar to the patients' case descriptions provided in the task.

The case-based retrieval task, and specifically several fusion techniques, is addressed in-depth by Seco de Herrera et al. [8]. Among others, this work explores Rocchio's algorithm for early fusion of image features and various combinations of the ranks of retrieval results. Seco de Herrera et al. found that a weighted linear combination of the ranks of visual and text retrieval results performed best in case-based retrieval.

Finally, although image modality classification is mentioned in several other papers, Dimitrovski et al. focus on this task [1]. Dimitrovski et al. have explored various visual and textual features, and their combinations on the 2011, 2012 and 2013 ImageCLEFmed datasets. The visual features evaluated in this work are: LBP (Local Binary Patterns), FCTH (Fuzzy Color and Texture Histogram), CEDD (Color and Edge Directivity Descriptor), SIFT (Scale Invariant Feature Transform) and opponentSIFT. The authors found SIFT and opponentSIFT to be the best performing features for modality classification.

Overall, the work presented in this issue provides an excellent overview of the state of the art in image retrieval and classification, as well as an introduction to several reusable document collections that will continue serving as test beds for development of multimodal retrieval approaches.

## References

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