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EDITORIAL

Special collection on biological and biomedical image analysis

Yong-Jin Liu[1,*], Xiu-Jie Wang[2,3,*]

[1] Department of Computer Science and Technology, Tsinghua University, Beijing 100084, China
[2] Institute of Genetics and Developmental Biology, Innovation Academy of Seed Design, Chinese Academy of Sciences, Beijing 100101, China
[3] University of Chinese Academy of Sciences, Beijing 100049, China
* Correspondence: liuyongjin@tsinghua.edu.cn; xjwang@genetics.ac.cn

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With the advances in various types of imaging sensor technologies in recent years, the value of image-based discoveries has been increasingly recognized in the biological and biomedical research fields. Consequently, image content analysis has attracted more and more attention. Furthermore, the rapid development of artificial intelligence methods and their application in biological and biomedical image analysis have enabled many important scientific discoveries and clinical practice, for example, the deep-learning-based recognition and disease diagnosis on chest computed tomography (CT). Yet, despite of these exciting progresses, there are still great needs in more deep analysis on biological and biomedical image data. This special collection of *Quantitative Biology* collects nine papers related to image analysis in neuroscience, molecular biology, agriculture and anthropology fields, with a focus on novel biological and biomedical image analysis, published in this issue and the next one.

Neuroscience has been one of the major fields that promoted the applications of biomedical images. To capture the main findings of previous brain anatomical studies, Chai *et al*. developed a deep-learning-based method BioBERT, which is capable to extract the anatomical regions of mammalian brains from literature abstracts, therefore to provide clues of most studied brain regions for neuroscience researchers. To enhance the accuracy of medical image analysis, Sun *et al*. proposed a scale-adaptive superpixel algorithm to generate variable sizes of superpixels according to the complexity of image content, therefore achieved automatic superpixel size adjustment and superior performance on medical image segmentation. Emotion study is an important direction of neuroscience. Feng *et al*. implemented a data-driven and machine-learning-based analysis approach to study neuroanatomical patterns associated with fear of negative evaluation (FNE), and had identified potential brain regions related to FNE; Mao *et al*. combined generic algorithm and random forest classifier to analyze electrocardiogram (ECG) signals, showing the advantage of such method in attention recognition studies; Li *et al*. thoroughly compared the reported high quality functional magnetic resonance imaging (fMRI) studies on major depressive disorder, revealed both consistent and inconsistent research results. They therefore call attention to achieve more accurate and comparable fMRI data, as well as a standard fMRI data processing pipeline. In terms of molecular biology, Ohmido and colleagues reviewed the current progresses in imaging analysis of the chromosome and chromatin structures in plant nuclei at different cell cycle stages, and further pointed out the future needs for effective image analysis in chromosome and chromatin structure studies. Agricultural application is a new direction for image analysis. In this aspect, Yi *et al*. utilized a weak supervised learning algorithm to achieve better results in crop lesion segmentation and recognition, as well as in other general image segmentation tasks; Liang and Chen proposed a tracking guided action recognition method to detect the actions of cows, demonstrating an important application of imaging analysis in future factory farming. Anthropology, forensic science and archaeology all involve skull recognition. Zhao *et al*. constructed a

convolution neural network to achieve a high accuracy in skull-based Han and Ughur ethnic classification. Application tests of this method on other ethnics are highly desired.

With the accumulation of image data in the biological and biomedical fields, the power of artificial intelligence, especially deep-learning-based methods, will become more prominent. The novel methods reported in this special collection are likely to promote image analysis of related fields, and we expect more image-driven scientific discoveries and clinical applications to continue to emerge in the near future.