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Editorial

Artificial Intelligence Applied to Medical Imaging and Computational Biology

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The Special Issue "*Artificial Intelligence Applied to Medical Imaging and Computational Biology*" of the Applied Sciences Journal has been curated from February 2021 to May 2022, which covered the state-of-the-art and novel algorithms and applications of Artificial Intelligence methods for biomedical data analysis, ranging from classic Machine Learning to Deep Learning.

Medical imaging and computational biology continuously pose new fundamental medical and biological questions that often give rise to novel challenges in Artificial Intelligence. Moreover, the amount of biomedical data is constantly increasing due to the different image acquisition modalities and high-throughput technologies [1,2]. In these research fields, there is thus an increasing need for the application of cutting-edge computational approaches that generally involve Machine Learning or Computational Intelligence techniques, able to provide high-performance and specialized services in medical contexts [3]. Machine Learning and Computational Intelligence techniques can effectively perform image processing operations (such as segmentation [4–10], classification [11–14], and quantification [15–18]), in the fields of neuroimaging and oncological imaging. Although manual approaches often remain the golden standard in several tasks, Machine Learning can be exploited to automate and facilitate the work of researchers and clinicians. In addition, these fields often present new clustering and classification challenges, as well as combinatorial problems, which can be effectively addressed using novel strategies based on Machine Learning and Computational Intelligence techniques.

More recently, Deep Learning approaches [4,5,7,11,14,19] were shown to be very successful in computer vision and bioinformatics tasks owing to their ability to automatically extract hierarchical descriptive features from input images or gene expression data. They have also been used in the oncological, neuroimaging, and microscopy imaging domains for automatic disease diagnosis [12,13], tissue segmentation [16,20], and even synthetic image generation. However, the main issue remains the relative sample paucity of the typical datasets that leads to a poor generalization of the employed deep Artificial Neural Networks, considering the high number of required parameters. Consequently, parameter-efficient design paradigms specifically tailored to biomedical applications ought to be devised, also by exploiting Computational Intelligence based techniques (e.g., Evolutionary Computation, Swarm Intelligence, and neuroevolution).

In this context, advanced Machine Learning techniques were suitably exploited to combine heterogeneous sources of information, allowing for multiomics data integration [21,22]. Such kinds of analyses represent a significant step towards personalized medicine.

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