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Editorial

Special Issue on Artificial Intelligence in Medical Imaging: The Beginning of a New Era

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Artificial intelligence (AI) can be considered the real revolution of the 21st century. This approach is increasingly used in everyday life and is also expanding in the medical field. Clinical practice has always focused on the evaluation of radiological parameters obtained from a few data [1]. AI introduces a change, as it requires a large dataset to work, but in turn avoids user-based evaluation. This aspect can be especially helpful in diagnostics, in which it is becoming very popular [2,3]. AI is finding wide application in the tumor field and for skin cancer [4], being able to detect variations in the image that would not be visible only with human eyes. Its application is increasingly widespread, even in neuroimaging analysis [5].

AI is based on the use of models that need to be implemented. Choosing the correct model is an important aspect as some models may work better than others, even according to the right training and testing sets [6,7]. Another important aspect, especially in diagnostics, is image segmentation, because mis-segmentation could introduce errors that can lead to misinterpretations. For this reason, AI itself is under study to create systems that implement automatic segmentation without errors [8]. Spatial resolution is one of the main problems when it comes to studying images. That is why new systems have been created to display images in super resolution. The problem is that this requires large storage memories and expensive calculations that have led to the study of a new "light" system to create images with super resolution (and less heavy) to be used in medicine [9]. The problem of memory and computational costs is quite recurrent considering AI; in fact, new methods are under study to select the most characteristic features and eliminate redundant ones. The problem is that in medicine it is not easy to eliminate some features even if redundant as they can diversify one disease from another [10]. Another approach may lie in the creation of small subnets that contain specific characteristics indicative of particular diseases [11].

The large number of features extracted is a problem, but so is the size of the dataset. In fact, in medicine, very often the dataset is not enough to train a model. That is why data augmentation was introduced to generate larger datasets from available data [12].

However, even today the biggest problem related to AI in medicine is the concept of the "black box". Doctors do not trust this approach at all because they do not know what happens within the system that provides output to a given input. This is why explainable AI is spreading lately, a discipline that tries to explain what happens within the systems of AI [13].

At the same time, other innovative systems are spreading such as augmented reality, which is an immersive technology that together with AI could be used to improve the performance of surgeons during interventions [14,15]. That is why different approaches to superimpose the images created in specific parts of the body and their accurate representations are being studied [16]. In addition, AI can also be used in a new emerging discipline: radiomics. This discipline allows us to extrapolate information by evaluating the voxels themselves, their arrangement and the relationships that exist. Along with AI, radiomics can create a system that takes an incoming image and evaluating changes

Citation: Nardi, C. Special Issue on Artificial Intelligence in Medical Imaging: The Beginning of a New Era. *Appl. Sci.* **2023**, *13*, 11562. https://doi.org/10.3390/app132011562

Received: 10 October 2023
Accepted: 17 October 2023
Published: 23 October 2023

in characteristics can provide a diagnosis or prognosis [17]. AI is becoming increasingly used as new approaches develop. For example, active learning ensures achieving great performance by using as few high-quality sample annotations as possible [18].

Finally, AI can be used in fields related to medicine introducing social benefits. One example is the possibility of studying nonvoluntary facial microexpressions. This can be used in the field of safety, psychology and medicine [19].

Much remains to be accomplished to replace humans in the medical field, although the introduction of AI has begun to bring many benefits, especially as a support system.

Conflicts of Interest: The author declares no conflict of interest.

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