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Editorial

Special Issue "Advances in Machine and Deep Learning in the Health Domain"

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Machine and deep learning techniques are fuelling a revolution in the health domain and are attracting the interest of many cross-disciplinary research groups all over the world.

The Special Issue "Advances in Machine and Deep Learning in the Health Domain" focuses on original research covering novel theories, methods, algorithms, architectures, and applications related to areas of machine and deep learning applied to the health domain. As is known, machine and deep learning deal with data with the goal of extracting information and related knowledge that is hidden within to make predictions and, subsequently, decisions. The list of topics related to this Special Issue was quite wide, covering issues related to artificial intelligence and machine learning, with reference to their application in, among other areas, knowledge management, data mining, decision support systems, precision medicine, healthcare systems, image and signal processing, sensors, and biomedical applications.

The response from the international scientific community has been very positive, and the number of papers submitted indicates the large appeal of the topics concerned. The review process was thorough, accepting only 17 manuscripts of high quality and showing a wide variety of the topics discussed.

In the following, we briefly introduce each of these research papers. Each paper will be based on the authors' own words so that its contributions can be better presented.

In [1], a binary moth–flame optimization (B-MFO) is proposed to select effective features from small and large medical datasets. The experimental results demonstrate the superior performance of B-MFO in solving feature selection problems for different medical datasets compared to other comparative algorithms.

Arora et al. [2] propose a brain tumour segmentation and detection system where experiments are tested on the collected BraTS 2018 dataset. A fully automatic methodology to handle the task of glioma segmentation in pre-operative magnetic resonance image scans is developed using a U-Net-based deep learning model.

In [3], a completely autonomous brain tumour segmentation approach based on deep neural networks is presented. This paper presents a convolutional neural network (CNN) model along with parametric optimization approaches for analysing brain tumour magnetic resonance images. The authors tuned the parameters of the CNN approach through three new advanced optimization techniques, i.e., the sunflower optimization algorithm (SFOA), the forensic-based investigation algorithm (FBIA) and the material generation algorithm (MGA).

Silva et al. [4] focus their manuscript on reviewing solutions that use sensor-based data, possibly in combination with other intrinsic or extrinsic information, processed by some form of an intelligent algorithm, to provide healthcare professionals with knowledge that can improve the decision-making process when dealing with a patient at risk of developing pressure ulcers.

In [5], a methodology is proposed for a computer-aided design (CAD) system that detects global patterns using texture descriptors based on statistical measurements that allow

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melanoma detection from dermoscopic images. The proposed method is more effective than other state-of-the-art methods for melanoma detection in dermoscopic images.

Qureshi et al. [6] propose a novel CNN architecture to classify skin lesions into two classes: benign and malignant. The Google Xception model is used as a base model, on top of which new layers are added and then fine-tuned. The model is optimised using various factors to achieve the optimal performance gain for the classifier output.

Alzahrani et al. [7] present an automated acne counting and severity grading method from facial images. The attention mechanism guides the regressor model on where to look for the acne lesions by locating the most salient features related to the studied acne lesions. The obtained results demonstrate improved performance compared to state-of-the-art methods.

In [8], a new data augmentation method based on an image fusion technique to construct a large dataset on all existing tones is described. The fusion method consists of a pulse-coupled neural network fusion strategy in a non-subsampled shearlet transform domain comprising three steps: decomposition, fusion, and reconstruction. The proposed augmentation method can be used as a solution to the lack of dark skin images in the dataset.

Moumgiakmas and Papakostas [9] present a review, including scientific publications related to the use of robust feature extraction methods in motor imagery from 2017 until today. Motor imagery brain-computer interfaces (MI-BCIs) are systems that receive the users' brain activity as an input signal in order to communicate between the brain and the interface or an action to be performed through the detection of the imagination of a movement.

The authors of [10] present the first Pareto front-based optimization for patient admission scheduling (PAS) using a set of meta-heuristic approaches. Compared with single-objective optimization approaches, it deals with the dynamic aspect of this problem by comparing historical window-based decomposition with day decomposition.

The authors of [11] tested different types of machine learning classifiers to predict what category of happiness a statement belongs to. The model constructed with the CNN performed the best. The prediction accuracy within this dataset declined with age, with the exception of the single-parent subgroup. The results also showed an improved performance for the married and parent subgroups and lower performance for the non-parent and unmarried subgroups.

The authors of [12] propose a method to detect the left bundle branch block (LBBB) through QRS electrocardiogram (ECG) complex segments taken from the MIT-BIH arrhythmia database. LBBB is a common disorder in the heart's electrical conduction system. The method utilises the maximal overlap discrete wavelet transform with the adaptive neuro-fuzzy inference system (ANFIS) classifier.

Feradov et al. [13] create a baseline detector for the automated detection of improper sitting postures, which was used to evaluate the applicability of Hjorth's parameters—activity, mobility and complexity—on the specific classification task. Based on the accelerometer data, they computed Hjorth's time-domain parameters, which they stacked as feature vectors and fed to a binary classifier, i.e., K-nearest neighbours (kNN), decision tree, linear support vector machine (SVM), and Gaussian SVM.

The authors of [14] propose a novel criticality analysis (CA) methodology as a feasible method to extract the dynamic interactions involved in human gait. Human gait is a series of continuous metabolic interactions specific to humans. To quantify the effectiveness of the CA methodology, an SVM algorithm was implemented to identify the non-linear relationships and high-order interactions between multiple gait data variables.

In [15], the authors propose a lightweight image classification system capable of discriminating between healthy and cancerous lymphocytes in leukaemia patients using image processing and feature-based machine learning techniques. The features are composed of statistical, morphological, textural, frequency, and contour features extracted from

each image. After training, these classifiers were combined into an ensemble classifier to improve the results.

In [16], the authors aimed to investigate the operability of the entire 23 pulmonary function parameters stipulated by the American Thoracic Society (ATS) and the European Respiratory Society (ERS) to design a medical decision support system capable of classifying the pulmonary function tests into normal, obstructive, restrictive, or mixed cases. The 23 respiratory parameters specified by the ATS and the ERS guidelines, obtained from a pulmonary function test (PFT) device, were employed as input features to a multi-layer perceptron (MLP) neural network. The framework was applied to 201 PFT examinations: 103 normal and 98 abnormal cases.

Bhimavarapu et al. [17] present a framework for predicting physical activity based on information about health status, preferences, calorie intake, race, and gender. Using information concerning co-morbidities, regions, and exercise/eating habits, the proposed recommendation system recommends exercises based on the user's preferences.

Before we end this Editorial, we wish to thank all the main contributors to this Special Issue who have all played an important role in its success. First, we thank the contributing authors for their original ideas and solutions and for choosing our Special Issue to present their works to the international scientific community. In addition, special thanks must be given to the reviewers for spending their time evaluating the papers and providing the authors with sound suggestions aimed at further improving their papers.

Last but by no means least, we wish to wholeheartedly express our most sincere gratitude to everybody at *Computers* for their effective support in the management of this Special Issue, as their help made everything easy to manage.

The combination of the efforts from all of the above actors has led to *Computers* publishing this Special Issue, presenting novel, interesting and relevant contributions to the "Advances of Machine and Deep Learning in the Health Domain". We hope these papers represent a solid foundation on which the international scientific community can base further research in the near future.

Conflicts of Interest: The authors declare no conflict of interest.

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