Guest Editorial

Complex evolutionary artificial intelligence in cognitive digital twinning

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Abstract. This special issue of the Journal of Intelligent & Fuzzy Systems contains selected articles of complex evolutionary artificial intelligence in cognitive digital twinning.

1. Introduction

Complex Evolutionary artificial intelligence is an emerging research field, which fuses the search and optimization abilities of evolutionary computation (EC) and the learning ability of artificial intelligence for various tasks including optimization, classification, regression, clustering, and modelling. We view artificial intelligence as a software technology that learns from experience with respect to some class of tasks with a performance measure, such that its measured performance on the task improves with experience. We further consider that the learnt performance improvements from experience are orchestrated through evolutionary computation techniques, which are defined by population-based search methods.

We get 417 submissions from overall the word. Thanks for the reviewers' kindly work, we accept 50 papers from all the 417 submissions. All the included contents were anonymously reviewed by experts to maintain academic excellence and integrity. We wish to thank all, including authors, reviewers, and all the other participants, who have directly and indirectly contributed to the release of this special issue by their engagement Now we will introduce the accepted 50 papers briefly.

Article [1] studies the stock forecasting model, based on the image recognition technology, this study normalizes the image and performs feature recognition with grayscale images. It also proposes an algorithm model based on feature recognition. This model also combines the edge extraction technology to extract features, which reflects the actual rise and fall of the stock. Article [2] studies about sports gesture recognition. The sensor with gesture recognition algorithm is used to analyze the detailed motion capture of sports athletes. Article [3] studies the impact of various factors on the health level of young people's body and combines the source data and research goals to establish a comprehensive evaluation index system and an influential factor indicator system. It also uses AHP to conduct comprehensive evaluation, and obtains the comprehensive physical quality of young people, and gives corresponding suggestions according to the actual situation. Article [4] analyzes the intelligent landscape design and land planning based on neural network and wireless sensor network.

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Reasonable planning and design of urban landscape can make better use of urban land resources, alleviate the waste of land resources, and optimize the use of resources. Article [5] proposes an algorithm model for intelligent education. By using the composition scoring model and also according to the knowledge of the existing automatic scoring system at home and abroad, the feature selection method (TF-IDF, IG, CHI) is discussed and analyzed. In addition, this paper uses the multiple regression method to evaluate the final score.

Article [6] analyzes the integration performance statistics of green suppliers based on fuzzy mathematics and BP neural network. Through reasonable calculation method and model, the effective and reasonable evaluation results can be obtained. Article [7] attempts to build an evaluation system and model of innovation and entrepreneurship in colleges and universities to provide a complete and practical tool for government education authorities and universities to evaluate the implementation of innovation and entrepreneurship education. Article [8] combines image feature retrieval technology to construct a Japanese character recognition model and uses Japanese character features as the algorithm recognition object. HDR image is used instead of the pixel value of the image as the image data. Article [9] investigates consumer resale behavior based on machine learning and BP neural network. This study collects data through questionnaires, and combines neural network training models to take data training and data prediction and then compares and analyzes real data with predicted data, and visually displays the comparison results through statistical graphs. Article [10] studies the entrepreneurial model of distance intelligent classrooms, uses machine learning technology as the basis, and combines intelligent image recognition technology to identify the status and expression of students using face detection and expression recognition technology in distance education classrooms.

Article [11] disassembles the character recognition problem into a text matching problem of question and answer, and the textual entailment problem of answer and continues training on the data set of short text score. It is used to improve the recognition effect of in English text, from the perspective of machine learning. Article [12] applies machine learning and virtual reality technology to distance classroom teaching. Moreover, this study uses different channels to automatically learn global and local features related to facial expression recognition tasks. Article [13] discusses the diagnostic evaluation model of English learning based on machine learning technology. It compares the methods of random forest, Bayesian network, decision tree, perceptron, K-nearest neighbor and multi-model fusion, and selects the best algorithm for diagnostic analysis. It mainly evaluates and judges the errors in students' English learning. Article [14] studies and recognizes the input features of spoken Japanes based on support vector machines, and uses improved spectral subtraction based on spectral entropy for enhancement processing, modifies Mel filter bank, and introduces several improved MFCC feature parameters to improve traditional algorithms to adapt to the needs of spoken language recognition. Article [15] studies online teaching machine learning methods, and introduces adaptive learning rate and momentum terms to improve the gradient descent method of BP neural network to improve the convergence rate of the model.

Article [16] analyzes the English information anaphora resolution based on SVM and machine learning algorithms and uses the CNN three-layer network as the basis to model the structure. It improves the semantic features by adding semantic roles and analyzes and compares the performance of the improved semantic features and combines semantic features to compare and analyze each feature combination and uses a dual candidate model to improve the system. Article [17] studies the application of EMG signal combined with the actual needs of athletes to construct an EMG signal acquisition system that can collect athletes' motion status. A wavelet packet principal component analysis model is used to improve the effect of EMG signal acquisition to ensure the recognition efficiency of athletes' motion state and uses linear discriminant analysis method as the motion recognition assistant algorithm. Article [18] uses the acceleration sensor as the carrier, and uses human-computer interaction to transform the action of the athlete into a machine-identifiable action unit. Article [19] studies the combination of current situation of the athletes' field and the training ground, and uses monocular vision as the video input interface, and combines the monocular vision technology in the research. Article [20] studies athlete target recognition and proposes a feature vector extraction method based on curvature zero point. Also based on the ideas of deep learning and convolutional neural networks, this paper builds an athlete feature recognition model and optimizes the algorithm.

Article [21] aims at the problem of target recognition errors caused by uneven brightness and

mutations in sports competition, and a dynamic template mechanism is proposed. To improve accuracy an unsupervised clustering method is used to design a classification strategy to achieve rapid target discrimination when the environmental brightness changes. Article [22] analyzes the financial stock market and combines VAR model and GARCH model to conduct financial analysis. It uses the standard deviation to characterize the fluctuation of futures and uses the univariate GARCH model to measure the fluctuation. Article [23] applies machine learning technology to the human resource management system, selects dimensions according to the prediction method, and builds a combined model consisting of an optimized GM (1,1) model and a BP neural network model.The model is implemented by a three-layer BP neural network. Article [24] analyzes the student sentiment classification model by neural network algorithm and uses the student group as an example to explore the application of neural network model in sentiment classification. Article [25] combines machine learning technology to analyze the key competences assessment of English teaching disciplines and builds an evaluation model corresponding to the threshold.

Article [26] based on BP neural network algorithm, athletes' motion capture based on wearable inertial sensors is developed and builds a wireless signal transmission scheme based on sensor system. At the same time, this paper constructs the coordinate system to complete the attitude angle settlement and motion recognition and combines the athlete's actual situation to establish the athlete's limb trajectory calculation model and analyzes the athletes' movement patterns. Article [27] research, combines the typical facts and characteristics of financial markets, from the perspective of quantile regression and SVR intelligent technology in computer science, to explore the research method of financial market risk spillover effects from a nonlinear perspective. Article [28] uses transfer learning as the technical support to study English speech emotion recognition. By comparing the performance of the English speech emotion recognition model based on CNN neural network and the proposed model, the statistical comparison data is drawn into a statistical graph. Article [29] builds a two-level state detection framework based on deep learning and HMM feature recognition algorithm, and expands it as a multi-level detection model through a reasonable state classification method. Article [30] combines Gaussian process to improve the active learning algorithm, use mixed Gaussian to explore the distribution characteristics of samples, and improve the classic relevance vector machine model.

Article [31] uses deep learning to complete the conversion between Chinese and English. The research focus of this paper is how to use language pairs with rich parallel corpus resources to improve the performance of Chinese-English neural machine translation. Article [32] combines intelligent image recognition technology to improve machine learning algorithms, and proposes an improved MSER-based character candidate region extraction algorithm and a convolutional neural network-based pseudo-character region filtering algorithm. Article [33] builds the language rules and morphological models of English morphological forms based on machine learning algorithms. Moreover, this study proposes a stemming extraction algorithm and a syllable division algorithm based on English characteristic rules. Article [34] combines the traditional clustering analysis algorithm and the random forest algorithm to improve the traditional algorithm and combines the human skeleton model to identify students' classroom behavior in real time. Article [35] modifies the rhythm through PSOLA, and uses the C4.5 algorithm totrain a decision tree for judging pronunciation of polyphones. In order to evaluate the performance of pronunciation discrimination method based on part-of-speech rules and HMM-based prosody hierarchy prediction in speech synthesis systems, this study constructed a system model.

Article [36] takes the answer records of students' exercises as data, and combines the characteristics of the field of education to propose an exercise recommendation algorithm based on hidden knowledge points and an exercise recommendation method based on the decomposition of student exercise weight matrix. Article [37] improves RVM based on the method of feature extraction and empirical modal decomposition of ACLLMD method, and establishes classroom theoretical teaching quality evaluation model and experimental teaching quality evaluation model based on RVM algorithm. Article [38] combined with the network performance characteristics of large data volume, complex data to propose a new BP neural network algorithm. By dynamically changing the momentum factor and learning rate, the algorithm has greatly improved the accuracy and stability of the error. Article [39] systematically describes the behavioral decision-making mechanism of individual investors and institutional investors from the perspective of network learning. In addition, this study builds an evolutionary model of

investor behavior based on Bayesian learning strategies. Article [40] uses machine learning technology to build a basketball sport feature recognition model. Moreover, this research mainly takes the characteristic information of basketball in the state of basketball goals as the starting point and compares and analyzes the detection methods by detecting the targets in the environment.

Article [41] proposes a logistics engineering optimization system based on machine learning and artificial intelligence technology. Moreover, based on the classifier chain and the combined classifier chain, this paper proposes an improved multi-label chain learning method for high-dimensional data. Article [42] combines the bat algorithm to construct a data processing model to obtain an artificial intelligence innovation and entrepreneurship system with data analysis capabilities. Article [43] research builds a smart home care service platform based on machine learning and wireless sensor networks around the state of the elderly's home life, disease stage, physical state, and intellectual state. Article [44] builds a model system suitable for college students' employment and entrepreneurship forecast and guidance through artificial intelligence algorithms and fuzzy logic models. The diversity-enhanced employment recommendation system developed in this paper uses the MVC three-tier architecture. Article [45] builds an analysis model based on artificial intelligence and fuzzy neural network. According to the operation of each loop, this study designs a scheduling strategy that dynamically allocates network utilization according to the dynamic weight of the loop, and periodically changes the sampling period of the system, so that the system can not only run stably but also maximize the use of limited bandwidth.

Article [46] builds an auxiliary teaching system based on computer artificial intelligence and neural network based on the traditional teaching model. In Article [47], Based on the neural network and network characteristics, a system model is constructed, and the application of structural disturbance theory in dynamic networks is studied. By combining structural disturbances and local topology, a new similarity measurement method suitable for dynamic networks is proposed. Article [48] combines the image features to construct a neural network-based ancient architecture decoration art data system model, and graphically expresses the static construction mode

and dynamic construction process of the architecture group. Based on this, three-dimensional model reconstruction and scene simulation experiments of architecture groups are realized. Article [49] combines artificial intelligence technology and Internet of Things technology to build an efficient, fast, and accurate industrial equipment monitoring system. Article [50] combines the actual needs to design and implement a multi-media system based on the Internet of Things and cloud service platform. Moreover, through in-depth research on the MQTT protocol, this study proposes a message encryption verification scheme for the MQTT protocol, which can solve the problem of low message security in the Internet of Things communication to a certain extent. Article [51] explained the bacterial foraging algorithm for the development and optimization of speech coder. It is depicted how by filtering the limited number of high energy components of transformed coefficients with parallel programming can maintain the speech signal quality in coding over wide range of bit rates. Article [52] elaborates the structure of Luo converter with optimized PI controller. Positive Output Elementary Luo Converter (POELC) is designed for boost operation by choosing the appropriate duty cycle. The PI controller parameters are optimized using Cuckoo and Crow search algorithms. The proposed control methods are investigated for the transient and steady state region. Article [53] illustrates a new compilation of Micro-grid by distributed energy sources using three phase three-level Space vector multilevel inverter. In olden days only 3Φ inverter was designed and they were connected to the consumer with higher harmonics without automatic control feeding power to the consumer end. Article [54] major topic of research in the field of data security. Data publication in privacy preservation provides methodologies for publishing useful information; simultaneously the privacy of the sensitive data has to be preserved. This work can handle any number of sensitive attributes.

In conclusion, this special issue would not have been possible without the help of many people. As guest editors, we would like to take this opportunity to thank the authors for their contributions and the reviewers for their invaluable comments and timely responses. We also would like to thank the JIFS Editor-in-Chief and staff for their support during the preparation and production of this special issue.