

## **Guest Editorial**

# **Emerging Services in the Next-Generation Web: Human Meets Artificial Intelligence**

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Recent prompt development in ICT (Information and Communications Technology) has caused a great impact to our daily lives. We can use a browser on laptop to access our works, an app on phone to chat with our friends, and a pre-deployed sensor at home to execute our commands remotely. Almost all of above mentioned instances imply that an inalterable relation between human beings and ICT services exists.

Service provision is always a key factor to ensure the success of in ICT as well as the web development. In the past, developers, and researchers as well, often provide services by predicting what, and how, target users would be expecting. Empirical study, e.g., questionnaire, field study, etc., of course, is conducted to achieve the purpose. But however, reaction time of services on the web to be updated is way less than expectations from users (i.e., human beings). This issue can be formulated as the more we can understand the human, the more precise services we can provide to our users. Prediction, and/or anticipation, of human beings through the support of artificial intelligence techniques thus becomes an emerging topic in order to better develop the next-generation web.

What is the difference between prediction and anticipation in technosocial systems? Is there a common anticipatory feature in biological structures, cultural structures, and technological ones? Humans remain, either individually or collectively, very poorly skilled when it comes to foresee the outcomes of their actions and take inspired decisions. The practice of prediction has made effective progress in the last decades in

certain disciplines and thanks to intelligent systems, but mostly as a mechanistic and probabilistic protocol, based on reactive causation and often keeping the human factor out of the loop because of its complexity. Anticipatory system is an implementation to compensate disadvantage of the system with the factors from human. In a view of computing and engineering, anticipatory system is the one that can effectively make the forecasting, where the outcome of the forecasting affects the forecaster, and the one whose current states can be influenced by the future states. Effectual anticipation is a desired model of the future that acts in the present, a way of acting which does not obey the instinct of immediate gratification but uses final causation and deeper aspirations. It is a sensibility for destiny ramifications, the capacity to imagine and project into the future the consequences of our intentions.

In order to achieve the goal of anticipation, intelligence, in which we shall look at it from both human intelligence and machine intelligence parts, plays an important role. The intelligence here defines an integration of different techniques, approaches and thoughts to overcome individual limitations and achieve synergistic effects. It has been applied to provide human-like expertise embodied by domain knowledge, uncertain reasoning and adaptation to complex environments for specific purposes (e.g., human supports). It covers a wide areas ranging from science, engineering and business and is considered as an essential approach to tackle real-world research problems. Considering mentioned phenomenon, a promising shift from system centric to human centric is revealed by the growth of technology and related commercial products, such as Apple i-devices, Google Glass, Tesla electric vehicle, and etc., which dramatically change our perspective upon information technology, in recent years. Researchers (and company as well) tend to provide tailored and precise solutions wherever and whenever human beings are active according to individuals' needs. Making technology usable by and useful to, with interdisciplinary concerns and hybridization of intelligent technologies, human beings in ways that were previously unimaginable has becoming an emerging issue to explore potential supports in the next era.

This special issue aims at revealing the fundamental technologies and potential research focuses on the web and its potential applications. We especially expect to find out the relation between human beings and everyday-growth intelligence. Understanding the context is the key to make achievement. The notion of context, in fact, is not new but require further explanation. The new scenario of intelligence under different types of context is more complicated. The need of multimodality (or interdisciplinary) should be defined between different context and different type of intelligence. On the other hand, intelligence among a group of people relies on typical media, or simply known as the approach that implements the intelligence. Although intelligent techniques became a common way to implement smart systems, a wide spectrum of issues (e.g., different computing paradigms and their applications) need to be taken into deep consideration. How to efficiently use different approaches to design an efficient, friendly-accessed, and high-performance hybrid intelligent systems to ease users (and their existing environment) remains a challenge. The development of a new

style of hybrid intelligence will need sophisticated adaptation techniques for different smart devices under different context.

This special issue received 95 submissions from 16 countries where the corresponding authors were majorly counted by the deadline for manuscript submission with an open call-for-paper period of 4 months. All these submissions are considered significant in the field, but however, only one-third of them passed the pre-screening by guest editors. The qualified papers then went through double-blinded peer review based on a strict and rigorous review policy. After a totally three-round review, 12 papers were accepted for publication. These accepted papers mainly look at our issue from the union of human-centric design, machine learning, blockchain techniques, statistical methods, ICT-enabled service provision, smart living, social, privacy and security related issues for next-generation web which have brought lively discussions to the publics.

A quick overview to the papers in this issue can be revealed below, and we expect the content may draw attentions from public readers, and furthermore, prompt the society development.

The first paper titled “A Novel Distant Target Region Detection Method Using Hybrid Saliency-Based Attention Model Under Complex Textures”, by Jaepil Ko et al., proposes a hybrid visual attention model to effectively detect a distant target. The proposed model employs the human visual attention mechanism and consists of two models, i.e., the training model, and the detection model. When the image containing the target is input into the detection model, a task of selectively promoting only features of the target using pre-trained data is performed. The authors found that the desired target is detected through the saliency map created as a result of the feature combination. In this work, the model has been tested on various images, and the experimental results demonstrate that the proposed model detected the target more accurately and faster than other previous models.

The second paper titled “Exploring the Effectiveness of Deep Neural Networks with Technical Analysis Applied to Stock Market Prediction”, by Ming-Che Lee et al., presents a work that explores the feasibility and efficiency of deep network and technical analysis indicators to estimate short-term price movements of stocks. A four-layer Long Short-Term Memory (LSTM) model was constructed. This work uses well-known technical indicators such as the KD, RSI, BIAS, Williams% R, and MACD, combined with the opening price, closing price, daily high and low prices, etc., to predict the trend of stock prices. It shows that the combination of technical indicators and the LSTM deep network model can achieve 83.6% accuracy in the three categories of rising, fall, and flatness.

The third paper titled “Text recommendation based on time series and multi-label information”, by Yi Yin et al., proposes a novel method to ameliorate the correlation analysis issue in the recommendation method using the time series. The authors specify

a certain text collection according to the interests of users and integrate the varied label values of the text and build the correlation coefficient between text and its related text with the differential analysis. Finally, the similarity degree of the text is calculated out using the improved cosine similarity correlation matrix to promote a recommendation of similar text. The experiments indicate that the proposed method can ensure the quality of the text, with an improvement of accuracy by 8.63% as well as an improvement of recall rate by 5.25%.

The fourth paper titled “Message Propagation in DTN Based on Virtual Contact of Behavior Model”, by Ho-Hsiang Chan et al., presents a work that simulates message propagation in a delay tolerant network (DTN), which is a kind of network structured to deliver messages intermittently, using virtual contact of a behavior model. The paper considers a scenario in which nodes make virtual contact in cyberspace and incur message delivery based on their behavior patterns. The verifying experiment is conducted using both survey and simulation that analyzes how messages propagated in different behavior pattern groups. It is derived from the simulation that to quicken message propagation, directing messages to one of the behavior groups yields the maximum benefits. It provides the basis for further research on collecting data of desired scenarios to establish respective propagation models.

The fifth paper titled “Enhanced image preprocessing method for an autonomous vehicle agent system”, by Kaisi Huang et al., proposes a deep time-economical Q network (DQN) input image preprocessing method to train an autonomous vehicle agent in a virtual environment to solve the training cost issue of neural networks. The current frame top-view image is combined with the images from the previous two training iterations. The DQN model uses this combined image as input. The experimental results indicate higher performance and shorter training time for the DQN model trained with the preprocessed images compared with that trained without preprocessing.

The sixth paper titled “A Study of Universal Zero-Knowledge Proof Circuit-based Virtual Machines that validate general operations & reduce transaction validation”, by Soon Hyeong Jeong et al., studies the zero-knowledge proof algorithm for general operation verification in the blockchain network. In this system, the design of a zero-knowledge circuit generator capable of general operation verification and optimization of verifier and prover was also conducted. This work develops an algorithm for optimizing key generation. Based on all of these, the zero-knowledge proof algorithm was applied to and tested on the virtual machine so that it can be used universally on all blockchains.

The seventh paper titled “Image Target Detection Algorithm Compression and Pruning Based on Neural Network”, by Yan Sun et al., optimizes and compresses some algorithms by using early image detection algorithms and image detection algorithms based on convolutional neural networks to handle the issues of a large number of parameters and high storage and computational costs in detected models. This work discusses the Faster-RCNN algorithm and the YOLO algorithm. A target detection

model based on the Significant area recommendation network is proposed to solve the problem that the candidate frame is not significant which is extracted in the Faster-RCNN algorithm. Experiments show that the image detection algorithm based on compressed neural network images has certain feasibility.

The eighth paper titled “Collaborative Filtering Recommendation Algorithm in cloud computing environment”, by Pei Tian, studies the collaborative filtering detection algorithm in the cloud computing environment for personalized recommendation technology. The algorithm migrates the collaborative filtering detection technology and applies it to the cloud computing environment. It shortens the recommendation time by using the advantages of clustering. A new recommendation algorithm can improve the accuracy of recommendation and proposes a parallel collaborative filtering recommendation algorithm based on the project. The algorithm is designed with a programming model. The experimental results show that the proposed algorithm has a shorter running time and better scalability than the existing parallel algorithm.

The ninth paper titled “The Application of Virtual Reality Technology in the Digital Preservation of Cultural Heritage”, by Hong Zhong et al., mainly studies the application research of virtual reality technology in the digital preservation of cultural heritage. First, the system creates an immersive environment for users, displays the objects realistically in the virtual reality system, thereby digitizing the technical protection of cultural heritage. Secondly, it uses the virtual environment model of material cultural protection to build and use the terrain to generate and edit. Finally, the radial basis function is used to calculate the value in the virtual environment, so that the digital preservation of cultural heritage is more accurate. Experimental data shows that 35.54% and 64.46% of users are more likely to use the handle to interact with three-dimensional objects. This study indicates that the virtual environment reality technology specification is more efficient than the original technology in the process of digitizing cultural heritage.

The tenth paper titled “Extraction of Mosaic Regions through Projection and Filtering of Features from Image Big Data”, by Seok-Woo Jang, proposes an algorithm that detects mosaic regions blurring out certain blocks using the edge projection. The proposed algorithm initially detects the edge and uses the horizontal and vertical line edge projections to detect the mosaic candidate blocks. Subsequently, geometrical features such as size, aspect ratio, and compactness are used to filter the candidate mosaic blocks, and the actual mosaic blocks are finally detected. The experiment results show that the proposed algorithm detected mosaic blocks more accurately than other methods.

The eleventh paper titled “Network Analysis of Social Awareness of Media Education for Primary School Students Studied through Big Data”, by Su-Jeong Jeong et al., aims to examine the social debate about media education in Korean society, how media education is being conducted in this important primary school period. The data was collected in the last 5 years (2014.08.07-2019.08.07) from internet portal sites with

keywords of “primary school media education” and “primary school media literacy”. Semantic network analysis, CONCOR analysis, and content analysis were used as data analysis methodology. This study reveals that it is the right time to provide future education that can have a sound digital identity so that media education can be achieved in a media-friendly local community and educational environment.

The twelfth paper titled “Machine Learning Based Distributed Big Data Analysis Framework for Next Generation Web in IoT”, by Sushil Kumar Singh et al., introduces a machine learning-based distributed big data analysis framework for the next-generation web in the internet of things (IoT) to solve the issue of latency, accuracy, load balancing, centralization, and others in the cloud layer when transferring the IoT data. This study utilizes feature extraction and data scaling at the edge layer paradigm for processing the data. Extreme learning machine is adopting in the cloud layer for classification and big data analysis in IoT. The experimental evaluation demonstrates that the proposed distributed framework has a more reliable performance than the traditional framework.

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