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EDITORIAL

Special issue on "artificial intelligence in cloud computing"

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Cloud computing equips artificial intelligence (AI) with tremendous power and considered to be one of the most important catalyst for developing innovative smart applications. With its potential to change the way data used to get stored and processed across various geographies,the scope and impact of AI have reached larger market. With all the cloud models, AI developers and consumers started to create an ecosystem that improve the lives of millions. Now digital assistants like Siri, Google Home, and Amazon's Alexa blend AI and cloud computing in our lives every day. AI practitioners based on the Infrastructure as a Service cloud model (IaaS) can use advanced infrastructure facilities—CPU, GPU, memory, disk, network, and O/S without waiting for an infrastructure team to prepare it. Moreover with Platform as a Service cloud model (PaaS), AI practionars can use variety of AI algorithms and data science services including jupyter notebooks, data catalog services to develop new generation smart applications. Additionally, consumers based on the Software as a Service cloud model (SaaS) can to employ and embed AI services within their application (e.g. Smart Building). Before the SaaS, software and data were only "on premise." SaaS moved everything to the cloud, collaboration and efficiency as well as sharing telents. With AI, the next step is to have "smart SaaS" as services can begin to use wider AI/machine learning to create higher consumer experience. Cloud computer, however, is adding more capabilities that can fuel the use of higher AI applications. Capabilities like containerization, developers can isolate applications to fit different computing environments and platforms. With Kubernetes the automating deployment, scaling, and management of containerized applications can be achieved where applications running on containers can run on

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different cloud providers without worrying about compute environment. On this large scale of research and development, AI capabilities are working in the cloud computing environment to make organizations more efficient, strategic, and insight-driven. Cloud computing offers businesses more flexibility, agility, and cost savings by hosting data and applications in the cloud. Artificial intelligence capabilities are now layering with cloud computing and helping companies manage their data, look for patterns and insights in information, deliver customer experiences, and optimize workflows [1].

Artificial intelligence is being embedded into cloud computing infrastructures to help streamline workloads and automate repetitive tasks as well as to monitor, manage, and even self-heal when an issue occurs. The future research on the empowerment of AI through cloud computing is without limit. This special issue aims to gather researches and practitioners working in the same field in order to present, discuss challenges and share original research works and practical experiences, and provide the latest and most innovative contributions. We would like to thank our reviwers who played an important role in selecting and commenting on the various submissions of this special issue. We would like to thank the EiC of the Computing Journal and the wonderful staff who help us through producing this special issue.

1 In this special issue

The first paper by Weiwei Lin et al. proposes a novel workload-aware power measuring framework. We first introduce separate power consumption models for different workload types based on their impacts on server components. Then we present the adaptive workload-aware power consumption measuring method (WSPM) for cloud servers, which proactively selects an appropriate power model for the upcoming workload through workload clustering, forecasting, and classification.

Hamza Turabieh et al. examined the students' performance inside the educational organization to reduce the probability of students' failure and enhance the understanding of students' learning process. To achieve this enhancement, we applied an enhanced wrapper feature selection method to understand the most valuable attributes (features) that affect students' performance. We have proposed a modified version of HHO algorithm by hybridizing it with kNN algorithm. The proposed contribution will control the population diversity and prevent premature convergence of HHO by injecting the current population with new solutions once all solutions belong to one cluster and stuck in local optima. We simulate the proposed modification of HHO algorithm as a feature selection algorithm for students' performance prediction problems. The proposed approach can enhance the original HHO algorithm and support our claim that controlling population diversity will enhance the exploration process of HHO algorithm.

Thuy Thi Le et al. investigated the object coreference resolution challenge in the context of opinion mining and proposed a CROAS model. The proposed CROAS model combines machine learning, deep learning, ontology-based reference, graph-based reference, and dependency grammar for object coreference resolution.

Specifically, a powerful new language representation method and machine learning support object classification of CROAS.

The fourth paper by Guang-Ho Cha proposes a similarity ranking technique that exploits the entire network structure of similarity relationships for multimedia, particularly image, databases. The main problem in the similarity ranking on multimedia is the meaning gap between the characteristics automatically computed from the multimedia dataset and the interpretation by a human from the multimedia itself. The similarity semantics usually lies on high-level human interpretation and automatically computed low-level multimedia properties may not reflect it. This paper assumes that the meaning of the multimedia is affected by the context or similarity relationships in a dataset and therefore, we propose the ranking technique to catch the semantics from a large multimedia dataset.

In the paper by Deguang You et al. a novel approach for CPU load prediction of cloud server combining denoising and error correction was proposed. In this new method, filtering followed by recombining noise signal before prediction and error correction after prediction is the two most important techniques. For the filtering and recombining of noise signal before prediction, CEEMDAN is used to decompose the original signal into multiple IMF components, screened the effective IMF, and recombined them with Fréchet calculation. For the error correction after prediction, we predicted the error in advance of the actual load prediction from the historical CPU load error data. It works by doing a preliminary prediction for allowing an initial round of error correction. Experimentation was designed to test the efficacy of the proposed approach by comparing a collection of experimental runs set up by different configurations.

The authors Sun-Young Ihm et al. propose an unbalanced-hierarchical (UB-H) layer. This method increases the total number of layers and reduces the index building time, compared to the UB-Layer and the convex hull method. The proposed method first divides the dimensions of input data hierarchically into two or three sub-datasets. Next, we build the sub-convex hull in each sub-dataset and construct the final UB-H as an index by combining each sub-convex hull.

The seventh paper by Sandeep Kumar Sood et al. proposes a fog-based intelligent healthcare system, which diagnoses the possible DeV infection of the individuals using Naive Bayesian Network and generates real-time diagnostic, suggestive, and emergency alerts to the concerned stakeholders (individuals, government agencies, and health organizations). The proposed system aware and suggests the individuals diagnosed with possible DeV infection medically confirm the incidence of the infection by consulting with the doctors and through proper recommended laboratory tests. The proposed system has utilized the environment event index (EEI) to ascertain the health sensitivity of the possibly infected individual concerning the occurrence of undesired environmental events, and generate emergency alerts to the doctors or caregivers for taking timely remedial actions. The proposed system has also pinpointed the DeV infected and risk-prone areas on Google Maps using SNA and provided an efficient warning alert system for the visitors or residents in those areas. The system helps in preventing the further spread of DeV by alerting uninfected individuals and government healthcare agencies and aids in effective and precautionary control of the infection.

Ruiping Wang et al. proposes an illumination-robust feature detection method that consists of two parts: Front-end EIRFT and back-end ATFAST feature detection. The EIRFT effectively improves the image quality and the latter successfully solves the problem that traditional FAST algorithms cannot extract enough feature points in underexposure and overexposure images by improving the threshold function in the traditional FAST method. In the experimental section, we proved that the proposed method has excellent algorithm stability and illumination robust. At the same time, in terms of the number of repeated features and repeatability rate, the proposed algorithm also has significant advantages over state-of-the-art feature-based and learning-based detection methods in the case of underexposure.

Girish L et al. propose a model for anomaly detection in an OpenStack cloud environment. In the proposed model, we used Stacked and Bidirectional LSTM models to build the neural network. For the experiment, the data is collected from OpenStack using collected. The collected data sets 10 features and class labels. Using LSTM neural network, we were able to detect the anomalies in the OpenStack environment.

A novel streamlined sensor data processing method is proposed by Shimin Hu et al. called Evolutionary Expand-and-Contract Instance-based Learning algorithm (EEAC-IBL). The multivariate data stream is first expanded into many subspaces, then the subspaces which are corresponding to the characteristics of the features are selected and condensed into a significant feature subset. The selection operates scholastically instead of deterministically by evolutionary optimization which approximates the best subgroup. Followed by data stream mining, machine learning for activity recognition is done on the fly. This approach is unique and suitable for such extreme connectivity scenarios where precise feature selection is not required, and the relative importance of each feature among the sensor data changes over time. This stochastic approximation method is fast and accurate, offering an alternative to the traditional machine learning method for smart home activity recognition applications.

A Novel Indoor Localization System Using Machine Learning Based on Bluetooth Low Energy with Cloud Computing by Quanyi Hu et al. proposes to propose a novel indoor localization system in a multi-indoor environment using cloud computing. Prior studies show that there are always concerns about how to avoid signal occlusion and interference in a single indoor environment. However, it finds some general rules to support our system being immune to interference generated by occlusion in the multi-indoor environment. A convenient way is measured to deploy Bluetooth low energy (BLE) devices, which mainly collect large information to assist localization. A neural network-based classification is proposed to improve localization accuracy, compared with several algorithms and their performance comparison is discussed. It also designs a distributed data storage structure and establishes a platform considering the storage load with Redis.

The paper by Junsheng Xiao et al. proposes a few shot segmentation networks for skin lesion segmentation, which requires only a few pixel-level annotations. First, the co-occurrence region between the supported image and query image is obtained, which is used as a prior mask to exclude irrelevant background regions. Second, the results are concatenated and sent to the inference module to predict the segmentation

of the query image. Third, the proposed network is retrained by reversing the support and query role, which benefits from the symmetrical structure.

Reference

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