

Novel Approaches for Applying Linguistic Processing Techniques Based on Pattern Recognition and Machine Learning

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1. Introduction

The *Journal of Information Processing Systems (JIPS)* publishes a broad array of subjects related to information communication technology in a wide variety of prevalent and advanced fields, including systems, networks, architecture, algorithms, applications, security, and so forth. As the official international journal published by the Korean Information Processing Society and a prominent, multidisciplinary journal in the world, *JIPS* is indexed in ESCI, SCOPUS, EI COMPENDEX, DOI, DBLP, EBSCO, Google Scholar, and CrossRef. The purpose of *JIPS* is to provide a prominent, influential forum where researchers and professionals can come together to promote, share, and discuss all major research issues and developments. Published theoretical and practical articles contribute to their related research areas by presenting new techniques, concepts, or analyses, and feature experience reports, experiments involving the implementation and application of new theories, and tutorials on state-of-the-art technologies related to information processing systems. The subjects covered by this journal include, but are not limited to, topics related to computer systems and theories, multimedia systems and graphics, communication systems and security, and software systems and applications.

In this issue, which includes an invited paper by Professor E. Herrera-Viedma, there are 25 peer-reviewed papers. It contains diverse papers that address the area of linguistic processing, such as cross-lingual queries, language transliteration, text summarization and multilingual speaker identification, security technologies, cloud computing, big data, and mobile and wireless networks. It also contains experience reports, experiments that involve the implementation and application of new theories, and tutorials on state-of-the-art technologies related to information processing systems.

2. Related Works

In the following section, we will provide an introduction of the novel approaches and contributions

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of each paper published in this issue of JIPS. Professor E. Herrera-Viedma and his colleagues [1] reviewed and analyzed several proposals for improving the processing of disseminated information in University Digital Libraries (UDLs) that promote access to information of the user interest and preference. In particular, they focused on analyzing fuzzy linguistic recommender systems, especially fuzzy linguistic modeling tools, for managing the user's preferences and the uncertainty of the system. They analyzed four categories of existing proposals. The first, recommends a fuzzy linguistic recommendation system that utilizes specialized resources for users' interest areas and interesting supplementary resources for constructing multi-disciplinary groups [2]. The second, proposes a new approach for obtaining information about user preferences that reduces the great effort of previous suggestions. The user provides their preferences regarding research resources through an incomplete fuzzy language preference relationship and obtains a preference vector for each topic of interest via this information [3]. The third proposal enhances previous suggestions using memory-based recommendation systems to avoid information overload problems that persist within UDLs. The main idea is to make a new selection in the new recommendation round using the item selected earlier [4]. Finally, Tejada-Lorente et al. [5] deal with the task of finding the research resource related to the user in the recommendation generation process related to finding research resource that are relevant to the users and valid research resource in terms of the quality of the item. Their research outcomes help researchers, students, and teachers access resources of interest and thus, improves and complements the services provided by academic digital libraries.

Kim [6] proposes a wavelet histogram generation system in a distributed MapReduce environment. In the big data environment, it is a burden to handle a large amount data with fast creation speed and various properties. Therefore, it is more efficient to summarize big data information and data on their own. The wavelet histogram, which is a typical data summary generation technique, can generate optimal summary information that does not cause a loss of information about the original data. The wavelet histogram generation system that Kim [6] developed can generate the histogram through only one mapping task, so the entire generation time is reduced. In addition, since the user can specify an error boundary, the error of the restored data from the wavelet histogram can be adjusted in advance.

Zhang et al. [7] suggest a time-delay and amplitude modified BP algorithm for an ultra-wideband (UWB) by using through-the-wall radar imaging (TWRI). The propagation, speed, and direction of electromagnetic waves will change when passing through the wall, and the imaging will defocus, smear, and displace the true position of the target [8,9]. The simulation results that the authors obtained via using a finite difference time domain (FDTD) show that it is effective in increasing the scattering intensity of the targets behind the wall. Compensation for the diffusion loss in the spherical wave also play an important role in this.

Kumar and Chandra [10] propose a computer-aided diagnosis system, which is based on the wavelet based adaptive sigmoid function that uses mammogram images as an aid for diagnosing breast cancer [11]. Because of the poor contrast conditions in digital mammogram images, it is difficult to diagnose breast cancer. Thus, they propose pre-processing the wavelet-based adaptive sigmoid function, where the processing result selects which features to extract as the suspicious regions. The combination of texture features and gray level co-occurrence matrix features are able to extract and utilize training and testing purposes.

Nagpal et al. [12] provide a detailed survey of Structured Query Language (SQL) injection according to different types. SOL injection attacks are one of the greatest concerns in addressing security risks

[13]. As the countermeasures become more sophisticated, these continue to evolve by avoiding the defense mechanism. The authors present research on SQL injection detection/prevention techniques and tools. According to their results, various articles/research papers have found that are not completely successful, because some are not yet implemented, or some technologies are impractical because they cannot handle all types of attacks. Thus, researchers and developers are focusing on appropriate countermeasures to enhance security against SQL injection attacks.

Murat et al. [14] propose a transliteration approach based on semantic information, such as language origin and gender, which are automatically learned by person name from Uyghur to Chinese. The proposed approach integrates semantic scores with a general transliteration model and generates the semantic knowledge-based model, which can produce the best candidate transliteration results. The proposed method integrates semantic scores that are based on two models: the general knowledge-base model and the transliteration model. The semantic knowledge-base model incorporates orthographic grapheme-based mapping to calculate the best probable mappings between a Uyghur syllable and Chinese character, and then, it produces the final transliteration. On the other hand, the semantic knowledge-based transliteration model makes use of related semantic instances in the training data to obtain the semantic information about the names of people for items such as gender and language origin. This paper can be contributed an effective attempt toward transliteration of person name as a case study and incorporates language and gender into transliteration.

Mobile applications that use JavaScript [15] access internal resources from mobile devices. JavaScript is one of the languages that is crucial in configuring the web service client environment and is processed by the interpreter method by the JIT compiler. Therefore, when simultaneously queried for multiple operations, JavaScript stops while the web browser runs to perform processing. Kim [16] proposes a novel JavaScript processing method to overcome the limitation of resources in mobile applications and guarantees performance by native application software that provides high-computing services. His approach shifts the JavaScript process of a mobile device onto a cloud-based computer server. His performance experiment shows that this proposed algorithm is six times faster in computing speed compared to the existing mobile browser's JavaScript process, and three to six times faster than the Web Worker of HTML5 [17].

Haque et al. [18] propose an automatic method to summarize a Bengali publication, such as a newspaper. The proposed approach for pronoun replacement is carried out in order to minimize the dangling pronoun from summary. Furthermore, summarized sentences are ranked using term frequency, sentence frequency, numerical figures, and title words after replacing pronoun. Their proposal uses the rule-based system with the hidden Markov model and Markov chain model, which is based on 3,000 Bengali news articles and studied some Bangla grammar books for analysis. Their evaluation demonstrates the effectiveness of their proposed technique over the latest existing methods.

Malhotra and Jangra [19] study relationship object oriented metrics with changes proneness attribute of a class in object-oriented program language. The proposed prediction models on this study can help us in identifying change prone classes of a software. It concentrates the changes of prone classes during testing to yield a better quality. Thus, previous researches have focused on statistical methods for predicting change prone classes, not the machine learning approach. Therefore, they studied existing machine learning methods that are used for identifying change prone classes. Their work will help developers to design an effective model that results in less change prone classes and better maintenance.

Tang et al. [20] propose a new method based on relationships among bilingual comparable corpus to

conduct Cross-lingual query expansion, which is also called cross-language query expansion (CLQE) [21]. CLQE is an efficient way to enhance the precision rate of cross-language information retrieval (CLIR) technology [22]. The detailed procedure of their proposed method is as follows: at first, word vectors that characterize bilingual words are trained using bilingual comparisons in Chinese and Thai. The correlation analysis between Chinese words and Thai words is calculated based on these word vectors, and then Thai candidate expansion terms are selected through correlation values. Then, the multi-group Thai query expansion sentence is created by the Thai candidate extension word based on the Chinese query statement. Finally, it can use Chinese and Thai query expansion methods to obtain optimal sentences and perform Thai query expansion. According to their experimental results, their proposed multi-language query extension method can effectively improve the accuracy of Chinese and Thai cross-language information retrieval.

Hong and Oh [23] present a new method to render motion blurring in real time using triangular motion paths. The basic idea is that the motion path of the moving triangle can find the visible time span of the moving triangle for a given pixel. It triangulates a motion path, and then uses hardware rasterization to acquire a visible time range to produce blurred images. To resolve the occlusion problem, it uses a sorting algorithm in the depth order dimension in a front-to-back order and bitwise operations for the sorted intervals. It calculates and accumulates the average color of each interval based on the last updated viewable time range to produce the final pixel color.

Khiat and Benaissa [24] describe a new ontology alignment approach, which is composed of associating structure-based and reasoning-based approaches to discover new semantic communications between entities in different ontologies [25]. Their idea is based on logic inference and structural similarity computing. It consists of obtaining the shared inferred taxonomy by first performing logical reasoning on the ontology that results from the merger, which is from an initial reference alignment of the two ontologies that are to be aligned. Then, an intra-taxonomic structural measure is applied. The test set to evaluate the performance experiment are the biblio test of the benchmark series and anatomy series of the Ontology Alignment Evaluation Initiative (OAEI) 2012 evaluation campaign. The proposal is compared with LogMap and YAM++ systems [26], and has been proven to be more relevant than YAM++ for certain types of ontologies. It also significantly improves the structure-based and reasoning-based methods. Furthermore, it shows that more performance than those of the LogMap system in terms of precision, recall, and F-measure.

Bharkad and Kokare [27] propose a reduced approach for fingerprint matching using discrete cosine transform (DCT)-based feature dimensionality. Usually, the DCT allows a small region around the core point of fingerprint image. The architecture of proposal consists of a block fingerprint image database function, fingerprint image localization, DCT calculation, ROI estimation, feature calculation, feature database, distance calculation, and matching [28]. The performance of their proposed method was evaluated on a small database from Bologna University and two large FVC2000 databases. The proposed method reduces the false acceptance rate from approximately 18% to 4% on DB1, approximately 29% to 16% on DB2, and approximately 26% to 17% on DB3.

Traditional text similarity measurement methods based on word frequency vectors, which ignore the semantic relationship between words that are obstacles to the computation of text similarity, as well as the higher order and scarcity of document similarity. To address these problems, an improved singular value decomposition method is used to reduce dimensionality and remove noises from the text representation model. Thus, Li et al. [29] propose some novel text similarity measurement methods

using singular value decomposition and the optimal number of the singular values. Their methods can analyze the optimal number of singular values and calculate the semantic relevance between words in a structured semantic space. In order to calculate the similarity between two documents in terms of semantics, finding the similarity definition between the inverse index structure generation algorithm and the vector is proposed. Experimental results on the benchmark corpus show that the proposed method facilitates the evaluation scale of the F-measure.

Bang et al. [30] present a new type of interface, called an Interactive Experience Room, as a new system that allows users to apply their intent and actions directly to the virtual space without special devices or development. Virtual reality that indirectly the user can experience situations that have not been sensed in real environment by realizing virtual environment. However, most existing methods have the disadvantage of being limited in their ability to reduce costs or the user's physical activity by using a special device attached to their body. In this paper, the authors propose an interactive experience space that can extend the actual experience to virtual reality using an infrared sensor and user postures with test contents that are based on other proposed technologies. The goal of their idea is to create a new, extendible physical space and increase user interest and immersion while minimizing existing limitations.

Kumar et al. [31] propose a novel approach and development for fuzzy-membership based writer identification for handwritten Devnagari script. This paper provides the defining structural properties from graphologists and handwriting experts, fuzzy subsets that use structural linguistic variables described by handwriting experts, and an estimation of fuzzy membership values as feature values. Moreover, they designed a Devnagari pangram to collect their benchmark dataset and tested the performance of their system on fuzzy-based writer identification. Their system yielded 100% accuracy on the training set, with a maximum of 97% and 88% accuracies on the test set with and without the rejection of handwriting samples, respectively.

One of the important issue in complex network analysis is the analysis of weighted network link prediction. The local structure-based unsupervised methods are widely used to manage the predictive task, but there are other problems that must be solved as well. The first one is that common neighbors create different influences on potential links. The next is that weighted values are associated with links in a local structure. Thus, Wu et al. [32] propose adapting an effective link prediction model, which is a local naive Bayes model, into a weighted scenario to address these issues. As such, they propose a weighted local naive baseline (WLNB) probabilistic link prediction framework. One of their important contributions is that the weighted cluster coefficients are integrated so that their model can infer the weighted contribution at the prediction stage.

Nagaraja and Jayanna [33] propose a new approach combining Gaussian mixture model-universal background model (GMM-UBM) and learning vector quantization (LVQ)-based classifiers for mono-lingual and cross-lingual speaker identification using multi-taper mel-frequency cepstral coefficient (MFCC) features. The results show that their proposed combination system can be used to improve the multilingual speaker identification process. They compared the performance of various classifier combinations of multilingual speaker identification operations and observed that the sum rule outperformed other classifier combining methods.

Tajwar et al. [34] present a new, effective round robin CPU scheduling algorithm. The proposed algorithm is based on a dynamically allocated time quantum in each round. It is essential in the round robin algorithm to reduce the number of context switches by systematically altering the time quantum

[35]. The time quantum constitutes the most appropriate section of the round robin algorithm for alteration in order to ameliorate the performance. The performance of their algorithm improves average wait time, average turnaround time, and context switching.

Han and Park [36] describe a new traffic information service model that collects sensed traffic information using smart devices in real time from an individual vehicle. Using an application installed in a smart device, it enables drivers to share traffic information on all roads in real time. To accomplish the goal of their proposal, it consists of a traffic information management model to process and manage real-time data, a road node-based indexing technique to efficiently store and manage locations, and a learning and prediction model based on the hidden Markov model to predict driving directions. According to their experiments, the proposed model is able to efficiently process the traffic information collected from each vehicle, and the driving prediction model provides an accuracy of more than 96.7%.

Certificateless public key cryptography (CL-PKC) is a noteworthy research topic in modern cryptography [37,38] because it can avoid the escrow problem of the identity-based cryptosystem (ID-PKC) and reduce the risks that comes with handling certificate management. Nayak et al. [38] proposes a certificateless blind signature protocol based on elliptic curve cryptography (CLB-ECC). Due to the smaller parameter size of the proposed scheme, it is reasonable to apply to lightweight cryptography, such as wireless and mobile environments. The proposed scheme has been proven to be secure against two different types of adversaries' attacks. Furthermore, it is computationally more efficient than traditional schemes as it uses an elliptic curve cryptosystem with 160-bit point representation.

Zia et al. [39] propose an interaction strength metric for the retrieval of the most influential users in online social networks. The interactive strength can be measured by the three factors of re-tweet strength, commencing intensity, and mentioning density. Using this metric, the authors introduce a novel algorithm called IPRank that deals with the communications between followers and posters in order to rank the most influential people based on their proposed interaction strength metrics.

Clustering is a popular technique that has been applied to many research domains, such as image analysis, pattern recognition, data mining, medical science, etc. [40]. The main purpose of clustering is to find groups of similar objects, which are known as clusters, and objects within clusters that share similar characteristics. Kumar and Sahoo describe an improved cat swarm optimization algorithm (CSO) to enhance the opposition-based learning method for effective clustering. CSO is a new meta-heuristic algorithm based on the behavior of cats, which is introduced by Chu et al. [41]. They propose enhancing CSO algorithm diversity characteristics using the opposition-based learning method [42] and the Cauchy mutation operator, that are used to overcome the local optima problem. The Cauchy mutation operator is used to prevent the CSO algorithm from falling into the local optima, especially in the tracing mode [43].

Rathore et al. [44] propose the new approach to detect a Cross-Site Scripting (XSS) attack on SNSs. The existing approaches for web pages are not efficient in defending against an XSS attack on SNSs [45]. As such, they propose a machine learning-based detection technique to detect an XSS attack on SNSs. Their approach is performed based on three features of datasets, including URLs, web pages, and SNSs. It depends on the machine learning classifiers to label the web pages into two categories: XSS or non-XSS. It consists of four steps, which are: feature identification, collecting web pages, feature extraction and training dataset construction, and machine learning classification. The evaluation results show that their approach performs better in a SNS environment. Their research achieved the highest accuracy of 0.972 and the lowest false positive rate of 0.87.

Patil and Kokate [46] propose joint channel estimation and data detection for a multiple input multiple output (MIMO) for a wireless communication system. In a wireless environment, the high data rate of multimedia systems is a major research topic for the MIMO of wireless communication systems. Accurately estimating the MIMO channel is a much more challenging issue than doing so for the SISO channel [47]. There are a number of channel estimation schemes suggested in the research on channel estimation for MIMO systems, such as training-based channel estimation (TBCE), blind channel estimation (BCE), and semi-blind channel estimation (SBCE). They propose a new approach to joint channel estimation and data detection, which is based on TBCE enhancement with sphere decoding.

3. Conclusion

In this issue, we present 25 novel and original papers from around the world. We introduce state-of-the-art research on subjects ranging from lingual processing, handwriting identification, text summarization, object tracking, cloud computing and big data, mobile networks, to security techniques. However, more than anything else, we want to convey our deepest appreciation to all of the authors who have contributed to this issue by sharing their valuable research outcomes with us. We also want to sincerely thank all the reviewers who kindly accepted our review invitations. Without their hard work, putting together this high-quality journal would not have been possible.

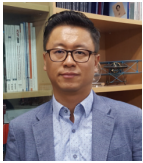
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