Computing4Human 2021: The 2nd International Conference on Human-centered Artificial Intelligence*

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Abstract. The 2nd international conference on human-centered artificial intelligence (Computing4Human) is hosted by the University of Economics, The University of Danang, on the 28th of October 2021. This conference tackled various research areas: the Computational Humanities and Social Sciences, Smart Infrastructure, Smart Healthcare, Secure and Green IoT Communications, Explainable Recommendation and Retrieval, and Business Intelligence. We collected 35 papers, which were fully refereed and underwent a single-blind review process by at least three reviewers. Finally, 26 papers have been published for six technical tracks.

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Keywords: Computational Humanities and Social Sciences, Smart Infrastructure, Smart Healthcare, Secure and Green IoT Communications, Explainable Recommendation and Retrieval, Business Intelligence.

1 Introduction

The 2nd international conference on human-centered artificial intelligence (Computing4Human) will be held in Danang, Vietnam (and virtual conference), which is organized by the University of Da Nang. Computing4Human begun initially under the name of the international workshop on computational humanities and social sciences in 2020 [12]. The rapid development of artificial intelligence (AI) techniques and their applications has remarkably changed how we live and how our societies operate. At the last event, we have focused on these changes in the humanities and social sciences fields. The last event covered embracing domain knowledge of humanities and social sciences fields into AI methodologies [9,11], solving research issues in these fields by employing AI techniques [32,16], and social and humane issues caused by the novel AI techniques and applications [10]. However, the influence of AI's advent is not easy to be investigated by only perspectives adopted from the humanities and social sciences. For example, we need city planning experts to discuss further research directions of smart infrastructure or data-driven city planning, and smart healthcare research is difficult to be conducted without comments from medical doctors.

Therefore, this year, we have aimed at gathering scholars who deal with AI techniques in various domains. We have removed boundaries of the area of interest of this conference and extended the area to artificial intelligence methodologies for every user-intimate (human-centered) application and novel issues caused by the advent of AI techniques in every domain. The main purpose of Computing4Human 2021 has been to search for unexplored areas of human-centered AI applications and develop advanced methodologies for these areas by encouraging open discussions between scholars in AI and researchers with domain expertise. In this regard, we founded technical tracks to cover the various domains of human-centered AI applications.

2 Technical Tracks

Computing4Human 2021 has dealt with six research areas: the Computational Humanities and Social Sciences, Smart Infrastructure, Smart Healthcare, Secure and Green IoT Communications, Explainable Recommendation and Retrieval, and Business Intelligence. Technical tracks have been organized in each research area, and the track chairs operated evaluation and selection processes for their submissions. Totally, we collected 35 papers and have published 26 papers, which were fully refereed and underwent a single-blind review process by at least three reviewers.

2.1 Computational Humanities and Social Sciences

Jin-Taek Kim, Eun-Soon You, and O-Joun Lee founded this track on Computing4Human 2020, and Kim and You have mainly hosted it this year. This track has aimed to discuss

novel research directions and contributions belonging to intersections between the two research communities (i.e., humanities and social sciences and artificial intelligence). Thereby, track chairs attempted to gather various opinions from different research areas, including computer science, computational linguistics, digital humanities, political science, economic, and so on.

Digital humanity studies were focused on multimedia content. Hochang Kwon [14] discussed political and aesthetic possibilities of interactive documentaries, Lee et al. [17] analyzed usages and functions of shot-types in movies, and Han et al. [5] conducted a case study for metaverse platform as a novel recreation culture. Also, Kwak et al. [13] presented a comparative study for conversational virtual agents and robots.

There have also been studies for applying data analysis techniques to issues in social sciences. Regarding smart governance, Vo and Le [30] analyzed e-government adoption in Vietnam. In a more specific case, Nguyen et al. [20] discussed factors that influence the behavioral intention of citizens for sorting solid waste. For the education sector, Chuc and Ngoc [4] analyzed laptop usage behaviors of students. In addition, Tran and Nguyen [25] have proposed a machine learning model for predicting employment periods of workers by focusing on business administration.

2.2 Smart Infrastructure

Hongsuk Yi and Khac-Hoai Nam Bui have extended coverage of Computing4Human 2021 to smart infrastructure. Recently, the emerging technologies on the Internet of Things (IoT), cloud/edge computing, and data analytics have enabled the realization of cyber-physical systems. Therefore, the trend of "IoT meetings AI" has become an emergent research topic for future smart cities and infrastructures. This track encourages authors from academia and industry to submit new research results about technological innovations and novel applications based on AI-powered IoT for smart cities and infrastructure.

Vuong and Tran [31] raised a fundamental issue for whether artificial intelligence techniques contribute to innovation and value creation in the tourism industry. We have to deliberate this issue regarding a ripple effect of technology development on the whole community. To et al. [24] presented a more practical study for smart city applications. To solve the lack of labeled data, they attempted to generate a labeled image dataset by deploying object detectors on edge devices. A few studies dealt with weather forecasting, which is getting significant due to climate change. Ho et al. [6] attempted to predict rainfall in Vietnam, and An et al. [1] have proposed a novel neural network optimizer for emulating atmospheric phenomena.

2.3 Smart Healthcare

Computing4Human 2021 has launched a new technical track on smart healthcare with Hae Gyun Lim. This track aimed to explore the potential applications of novel AI technologies (big-data analytics, management of chorionic diseases, medical devices, medical imaging, and integration of AI and internet of things) to enhance the traditional healthcare strategies for supporting the development of the emerging platform and new healthcare medical device for innovating the healthcare ecosystem. Thus, the

track committee has invited research contributions ranging from diagnostic imaging interpretation, robot-assisted surgery systems, cybersecurity, fraud detection, health monitoring, drug creation technology, among others.

Truong and Truong-Dinh [27] discussed usages of wearable healthcare technology with a case study of Vietnam. Also, they analyzed factors that affect users' usage intention of wearable healthcare devices. On the automated diagnosis, Pham et al. [7] have proposed a method for detecting children with ADHD (Attention Deficit Hyperactivity Disorder) by analyzing their EEG signals.

2.4 Secure and Green IoT Communications

The number of Internet-of-thing (IoT) devices, such as vehicles, unmanned aerial vehicles (UAVs), and sensors, has been increasing rapidly. Therefore, there is a requirement for huge energy consumption for massive IoT networks. In addition, the beyond fifth generation and sixth generation (B5G/6G) networks will be expected to handle thousands of times more data than current networks. Tri M. Ngo, Mai T. P. Le, Tuan D. Dao, and Hieu V. Nguyen have launched the secure and green IoT communication track to discuss these issues. On this track, Hung Quang Nguyen [19] has proposed a novel identity-based cryptography algorithm to resolve the security issues on smart home applications.

2.5 Explainable Recommendation and Retrieval

Recommendation and retrieval services are necessary for human beings in modern societies. Despite the erstwhile development, methodologies for enhancing the persuasibility of these services have not been significantly improved. Therefore, Nam D. Vo and O-Joun Lee have founded this track to gather novel approaches and ideas for the explainable recommendation and retrieval systems.

Jeon et al. [8] have proposed a representation learning model for citation relations in bibliographic networks. Their model, which is a modification of transformer, can consider the context of citations. The contextual representations of citations can be applied to explainable recommendation and retrieval in academic services. Nham Cao Thi [23] has proposed an explainable prediction model for churn of bank customers. For generating explanations, a state-of-the-art method, Shapley Additive exPlanations (SHAP), was employed. Quynh and Dung [22] also attempted to predict customers' behaviors and analyze feature importance. Dinh-Van Phan [21] attempted to model relationships between civil servants using knowledge graphs and explain their kinship. Additionally, Nguyen et al. [18] attempted to predict factors that affect the readiness of big data adoptions.

2.6 Business Intelligence

The conventional business intelligence systems aim to improve companies' performances in various aspects, such as marketing, human resource management, and production. Artificial intelligence techniques can expand the purposes to more qualitative factors: customer satisfaction, company identity, social responsibility, and sustainable growth. This

point is critical for modern business environments that focus on future values and ESG (environmental, social, and governance) rather than short-term profits. Therefore, Duc-Quynh Tran and Phuong-Mai Nguyen have founded this track on Computing4Human 2021 to discuss future directions in AI-enhanced business intelligence.

Trinh et al. [2] conducted an interesting study for analyzing the impact of social media celebrities on their followers' purchase intention. Similarly, Chu et al. [3] discussed the effects of digital content marketing of e-commerce platforms on purchase intention, in the focus of customers' passive use. Le et al. [15] also dealt with e-commerce. They propose a novel broker-based trade allocation method to enable agent-based e-commerce platforms to consider the constraints of buyers and sellers.

A few studies dealt with stock markets. Tran et al. [26] have proposed a novel stock market prediction method based on financial news analysis. Tung et al. [28] have proposed a sentiment analysis model (PhoBERT) to classify news headlines related to stock markets according to sentiment. Additionally, Tuyen et al. [29] presented a case study for the digitalization of corporate training of a well-known company, Viettel group.

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