CCF Transactions on Pervasive Computing and Interaction (2022) 4:103–105
https://doi.org/10.1007/s42486-022-00099-1

EDITORIAL

# Editorial for special issue on human-centered cooperative computing

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Published online: 18 March 2022


## 1 Introduction

In the early 1990s, Jonathan Grudin, one of the pioneers in the field of HCI/CSCW, described how HCI shifts its focus and broadens its concerns as "computer reaches out". Indeed, three decades later, the research topics of HCI/CSCW/Ub icomp have been evolving along with computing technologies. From mainframes to personal computers, mobile phones, and then wearables and AIoTs, computing technologies have become increasingly approachable, personalized, and socially connected. Particularly, the computing paradigm now comprises rich forms of cooperation in a broad sense, e.g., between humans, computers, sensors, smart agents. The special issue on Human-Centered Cooperative Computing (HCCC) of CCF TPCI is to bring together work to better understand and address various issues brought about with the advancement of computing, and cooperative computing in particular, not only from machine but also from human perspectives.

## 2 This issue

This special issue consists of five articles, and together, they cover a range of cooperative computing mechanisms, blockchain technologies, crowdsourcing, SNS, as well as new forms of human machine collaborations. The theme of human-centered cooperative computing is also manifested in various forms, from examining collective privacy management strategies on social network sites and data-driven analysis of human behavior on distributed applications, to exploring cooperative mechanisms to draw on the strengths of humans and machines together to address challenges and ensure quality results for real world issues such as sound event detection and crowdsourcing image segmentation. To provide readers a quick overview of the five articles collected, a brief summary for each of them is presented as below.

The first article, by Yao Li, Hichang Cho, Reza Ghaiumy Anaraky, Bart Knijnenburg, and Alfred Kobsa, focuses on social network sites (SNS) and provides insights of collective privacy management strategies to inform future privacy design for SNS providers, by surveying Facebook users, examining antecedents, and testing the prediction model across countries, including the US, Singapore and South Korea. Although significant differences are found between the three countries, users' privacy attitudes, social norms, and self/collective control beliefs can still predict the adoption of collective privacy management strategies in general. The understanding developed of users' collective privacy management strategies will help multinational SNS providers to design global and country specific design strategies with regard to collective privacy management strategies.

The second article, by Tian Min and Wei Cai, focuses on decentralized application (DApp) developed on blockchain platforms such as Ethereum, and examine user profiles by drawing on publicly available data sources, transforming hexadecimal addresses into readable application names, and analyzing the behavioral characteristics of the user based on the categories of DApp with visual data, statistical metrics, and unsupervised learning. Through this data-driven approach, basic understanding of user profiles are developed, e.g. players are more significantly affected by ETH prices and fees, while investors are willing to tolerate increased commission to continue trading, and heuristic attempts are implemented to facilitate practical systems, including abnormality detection and recommendation using the datasets.

The third article, by Zheng Xu, Chaofan Liu, Sitong Wang, Peng Zhang, Tun Lu and Ning Gu, also focuses on

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blockchain technologies, and proposes a cross-chain collaboration model and consistency maintenance method to improve the cross-chain interoperability and enable the large-scale application of blockchain. The proposed method can capture the causal relationship between cross-chain operations and solve the conflict caused by concurrent cross-chain operations. Experiments show that the eventual consistency of cross-chain data is effectively maintained and the responsiveness of cross-chain operation is improved with this method.

The fourth article, by Shengtong Ge, Zhiwen Yu, Fan Yang, Jiaqi Liu and Liang Wang, focuses on human machine collaboration for sound event detection (SED), which has promising applications in security monitoring, intelligent medical treatment, industrial production and so on. To support SED, which is still at its early stage of development, human machine collaboration SED or HMSED is explored as a way to make the data annotation less labor-intensive as in the manual approach, and at the same time, fully leverage human beings' strengths, including their intelligence, flexibility and adaptability in the face of complex problems and changing environment. In this approach, two CNN models with embedding-level attention pool module are employed for weakly-labeled SED, an end-to-end guided learning process for semi-supervised learning is proposed, a group of median filters with adaptive window size in the post-processing of output probabilities of the model is used, the results of machine recognition and manual annotation feedback are combined to optimize the model, and an interactive annotation interface for HMSED is developed. Extensive exploratory experiments on the effects of human workload, model structure, hyperparameter and adaptive post-processing show the superiority of the HMSED approach compared to some classical SED approaches.

The fifth article, by Yang Yi, Pengpeng Chen and Hailong Sun, focuses on crowdsourcing and presents a method called CrowdSeg to improve the aggregating results of crowdsourced image segmentation tasks by taking the complex internal structure information, the pixel proximity information in particular, into account. A convolutional auto-encoder that can extract the proximity information of adjacent pixels as embedding features, which are then used for pixel clustering with k-means algorithm to determine whether the cluster is the object or background according to the result accepted by the majority. With four real world datasets of biomedical images collected from workers of a real-world crowdsourcing platform, it is found that the proposed method outperforms the baselines, and is more effective and stable than other methods. The real-world datasets and source code are also released for all experiments.

The evolution of computing technologies has brought unprecedented benefits, e.g., cost reduction, improved efficiency, pervasive availability, personalized and intelligent services. Meanwhile, it also raises challenges and concerns, as they introduce new implications and demands to our daily lives, expose us to new attacks and threats, and cause undesirable societal impacts and consequences. These emerging challenges make human-centered cooperative computing more relevant now than ever. It is hoped that this special issue will stand as a small but firm step forward in that direction.

**Acknowledgements** We would like to thank all the authors for their academic contributions to this special issue, as well as the guidance and support from the Editor-in-Chief, Professor Zhiwen Yu, the Senior Journal Development Editor Dr. Du Liu, and Journal Editorial Office Assistant Surya Selvam. Thanks also go to the external reviewers for their valuable contributions. Lastly, we express our gratitude to the copy editors for their help in producing this special issue.

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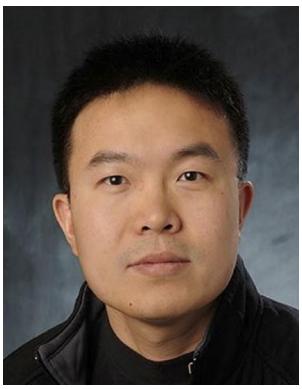

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