Lecture Notes in Artificial Intelligence 12274

Subseries of Lecture Notes in Computer Science

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Knowledge Science, Engineering and Management

13th International Conference, KSEM 2020
Hangzhou, China, August 28–30, 2020
Proceedings, Part I

Springer

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ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Artificial Intelligence
ISBN 978-3-030-55129-2 ISBN 978-3-030-55130-8 (eBook)
https://doi.org/10.1007/978-3-030-55130-8

LNCS Sublibrary: SL7 – Artificial Intelligence

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The International Conference on Knowledge Science, Engineering and Management (KSEM) provides a forum for researchers in the broad areas of knowledge science, knowledge engineering, and knowledge management to exchange ideas and to report state-of-the-art research results. KSEM 2020 is the 13th in this series, which builds on the success of 12 previous events in Guilin, China (KSEM 2006); Melbourne, Australia (KSEM 2007); Vienna, Austria (KSEM 2009); Belfast, UK (KSEM 2010); Irvine, USA (KSEM 2011); Dalian, China (KSEM 2013); Sibiu, Romania (KSEM 2014); Chongqing, China (KSEM 2015); Passau, Germany (KSEM 2016); Melbourne, Australia (KSEM 2017); Changchun, China (KSEM 2018); and Athens, Greece (KSEM 2019).

The selection process this year was, as always, competitive. We received received 291 submissions, and each submitted paper was reviewed by at least three members of the Program Committee (PC) (including thorough evaluations by the PC co-chairs). Following this independent review, there were discussions between reviewers and PC chairs. A total of 58 papers were selected as full papers (19.9%), and 27 papers as short papers (9.3%), yielding a combined acceptance rate of 29.2%.

We were honoured to have three prestigious scholars giving keynote speeches at the conference: Prof. Zhi Jin (Peking University, China), Prof. Fei Wu (Zhejiang University, China), and Prof. Feifei Li (Alibaba Group, China). The abstracts of Prof. Jin's and Prof Wu's talks are included in this volume.

We would like to thank everyone who participated in the development of the KSEM 2020 program. In particular, we would give special thanks to the PC for their diligence and concern for the quality of the program, and also for their detailed feedback to the authors. The general organization of the conference also relies on the efforts of KSEM 2020 Organizing Committee.

Moreover, we would like to express our gratitude to the KSEM Steering Committee honorary chair, Prof. Ruqian Lu (Chinese Academy of Sciences, China), the KSEM Steering Committee chair, Prof. Dimitris Karagiannis (University of Vienna, Austria), Prof. Chengqi Zhang (University of Technology Sydney, Australia), who provided insight and support during all the stages of this effort, and the members of the Steering Committee, who followed the progress of the conference very closely with sharp comments and helpful suggestions. We also really appreciate the KSEM 2020 general co-chairs, Prof. Hai Jin (Huazhong University of Science and Technology, China), Prof. Xuemin Lin (University of New South Wales, Australia), and Prof. Xun Wang (Zhejiang Gongshang University, China), who were extremely supportive in our efforts and in the general success of the conference.

We would like to thank the members of all the other committees and, in particular, those of the Local Organizing Committee, who worked diligently for more than a year to provide a wonderful experience to the KSEM participants. We are also grateful to Springer for the publication of this volume, who worked very efficiently and effectively.

Finally and most importantly, we thank all the authors, who are the primary reason why KSEM 2020 is so exciting, and why it will be the premier forum for presentation and discussion of innovative ideas, research results, and experience from around the world as well as highlight activities in the related areas.

June 2020

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Abstracts of Invited Talks

Learning from Source Code

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Abstract. Human beings communicate and exchange knowledge with each other. The system of communication and knowledge exchanging among human beings is natural language, which is an ordinary, instinctive part of everyday life. Although natural languages have complex forms of expressive, it is most often simple, expedient and repetitive with everyday human communication evolved. This naturalness together with rich resources and advanced techniques has led to a revolution in natural language processing that help to automatically extract knowledge from natural language documents, i.e. learning from text documents.

Although program languages are clearly artificial and highly restricted languages, programming is of course for telling computers what to do but is also as much an act of communication, for explaining to human beings what we want a computer to do[1]. In this sense, we may think of applying machine learning techniques to source code, despite its strange syntax and awash with punctuation, etc., to extract knowledge from it. The good thing is the very large publicly available corpora of open-source code is enabling a new, rigorous, statistical approach to wide range of applications, in program analysis, software mining and program summarization.

This talk will demonstrate the long, ongoing and fruitful journey on exploiting the potential power of deep learning techniques in the area of software engineering. It will show how to model the code[2,3]. It will also show how such models can be leveraged to support software engineers to perform different tasks that require proficient programming knowledge, such as code prediction

[1] A. Hindle, E. T. Barr, M. Gabel, Z. Su and P. Devanbu, On the Naturalness of Software, Communication of the ACM, 59(5): 122–131, 2016.

[2] L. Mou, G. Li, L. Zhang, T. Wang and Z. Jin, Convolutional Neural Networks over Tree Structures for Programming Language Processing, AAAI 2016: 1287–1293.

[3] F. Liu, L. Zhang and Z. Jin, Modeling Programs Hierarchically with Stack-Augmented LSTM, The Journal of Systems and Software, https://doi.org/10.1016/j.jss.2020.110547.

and completion[4], code clone detection[5], code comments[6,7] and summarization[8], etc. The exploratory work show that code implies the learnable knowledge, more precisely the learnable tacit knowledge. Although such knowledge is difficult to transfer among human beings, it is able to transfer among the automatically programming tasks. A vision for future research in this area will be laid out as the conclusion.

Keywords: Software · Source code · Program languages · Programming knowledge

[4] B. Wei, G. Li, X. Xia, Z. Fu and Z. Jin, Code Generation as a Dual Task of Code Summarization, NeurIPS 2019.

[5] W. Wang, G. Li, B. Ma, X. Xia and Z. Jin, Detecting Code Clones with Graph Neural Network and Flow-Augmented Abstract Syntax Tree, SANER 2020: 261–271.

[6] X. Hu, G. Li, X. Xia, D. Lo, S. Lu and Z. Jin, Deep Code Comment Generation, ICPC 2018: 200–210.

[7] X. Hu, G. Li, X. Xia, D. Lo, S. Lu and Z. Jin, Deep Code Comment Generation with Hybrid Lexical and Syntactical Information, Empirical Software Engineering (2020) 25: 2179–2217.

[8] X. Hu, G. Li, X. Xia, D. Lo, S. Lu and Z. Jin, Summarizing Source Code with Transferred API Knowledge, IJCAI 2018: 2269–2275.

Memory-Augmented Sequence2equence Learning

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Abstract. Neural networks with a memory capacity provide a promising approach to media understanding (e.g., Q-A and visual classification). In this talk, I will present how to utilize the information in external memory to boost media understanding. In general, the relevant information (e.g., knowledge instance and exemplar data) w.r.t the input data is sparked from external memory in the manner of memory-augmented learning. Memory-augmented learning is an appropriate method to integrate data-driven learning, knowledge-guided inference and experience exploration.

Keywords: Media understanding · Memory-augmented learning

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