2-2023

Human-centered AI for software engineering: Requirements, reflection, and road ahead

David LO
Singapore Management University, davidlo@smu.edu.sg

Citation

Human-Centered AI for Software Engineering: Requirements, Reflection, and Road Ahead

David Lo
School of Computing and Information Systems
Singapore Management University
Singapore
davidlo@smu.edu.sg

ABSTRACT

Since its inception in the 2000s, AI for Software Engineering (AI4SE) has grown rapidly. AI in its different forms, e.g., data mining, information retrieval, machine learning, natural language processing, etc., has been demonstrated to be able to produce good results for automating many tasks, including specification mining, bug and vulnerability discovery, bug localization, duplicate bug report identification, failure detection, program repair, technical question answering, code search, and many more. AI4SE has much potential to improve software engineers' productivity and software quality. Due to its potential, it is currently one of the most popular research areas in the software engineering field.

To advance AI4SE, this keynote puts forward *Human-Centered AI4SE*. Without considering humans, it is easy for AI-powered tools to hinder rather than help humans in their job or introduce unwanted and unacceptable side effects. Human-centered AI4SE puts humans (i.e., software practitioners) at the forefront of the design of AI4SE tools, with the goal of amplifying and augmenting software practitioners' capabilities. I will describe some requirements of human-centered AI4SE. Specifically, among others, the need to (i) *listen* to humans, (ii) *learn* from (and like) humans, and (iii) *synergize* with humans. For each requirement, I will present a reflection on the progress the AI4SE area has made over the years, including work done by our research group in Singapore. At the end of this talk, I will describe the road ahead for the above-mentioned requirements toward making AI4SE tools *trustworthy*, which is an essential attribute to allow them to be widely used by practitioners.

CCS CONCEPTS

• **Software and its engineering** → **Software libraries and repositories**; **Software maintenance tools**; **Software testing and debugging**; • **Computing methodologies** → **Artificial intelligence**; • **Cross-computing tools and techniques** → **Empirical studies**; • **Human-centered computing** → **User studies**.

KEYWORDS

AI4SE, Automated Software Engineering, Empirical Software Engineering

ACM Reference Format:
David Lo. 2023. Human-Centered AI for Software Engineering: Requirements, Reflection, and Road Ahead. In *16th Innovations in Software Engineering Conference (ISEC 2023), February 23 - 25, 2023, Allahabad, India.* ACM, New York, NY, USA, 1 page. https://doi.org/10.1145/3578527.3581767

BIODATA

David Lo is a Professor of Computer Science and Director of the Information Systems and Technology Cluster at the School of Computing and Information Systems, Singapore Management University. For close to two decades, he has championed AI4SE, specifically demonstrating how AI – including data mining, machine learning, information retrieval, natural language processing, and search-based algorithms – can be used to transform passive software engineering data, stored in various software repositories, into automation and insights. He has published 400+ AI4SE papers that have gathered close to 25k citations. He has won 15+ international awards, including the IEEE TCSE Distinguished Service award, two Test-of Time (or Most Influential Paper) awards, and six ACM Distinguished Paper awards. He is an IEEE Fellow (for contributions to synergizing software engineering and data mining), Fellow of Automated Software Engineering (for significant and sustained contributions to the automated software engineering community), ACM Distinguished Member, and NRF Investigator (2023-28). He has served as a PC Co-Chair of ISEC'20 and ASE'20 (among others) and is serving as a PC Co-Chair of ESEC/FSE'24 and ICSE'25. He has also served as the General Chair of ASE'16, MOBILESoft'20 and MSR'22. More information about him and his work can be found at: http://www.mysmu.edu/faculty/davidlo/.