AI Techniques in Software Engineering Paradigm

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ABSTRACT

In the next decade, Artificial Intelligent (AI) techniques can see wide adoption in our daily life to release human burden. In our recent Software Engineering research, we investigated on the design of novel AI methods to facilitate all three major phases in software engineering: development, operation, and analysis. In this talk, I will first introduce the AI techniques we employed, including machine learning framework, classification, clustering, matrix factorization, topic modeling, deep learning, and parallel computing platform. Then I will explain the challenges in each phase and describe our recently proposed methodologies. First in development phase, we suggested an automated code completion technique via deep learning. Our technique learns the code style from lots of existing code bases, and recommends the most suitable token based on the trained deep learning model and current coding context. Besides, to help developers in conducting effective logging, we designed a tool named LogAdvisor, which tells developers whether they should write a logging statement in the current code block or not. Secondly, in operation phase, we implemented a continuous and passive authentication method for mobile phones based on user touch biometrics. Different from the traditional password authentication scheme, our method can recognize malicious attackers based on abnormal user behaviors. Moreover, we developed PAID, which automatically prioritizes app issues by mining user reviews. Finally, in analysis phase, we designed systematic data analytics techniques for software reliability prediction. Besides, to make full use of the crucial runtime information, we proposed effective methods for every step in log analysis, including log parsing, feature extraction, and log mining. Furthermore, we developed a CNN-based defect prediction method to help developers find the buggy code. In the end, we expect to establish a comprehensive framework for systematic employment of AI techniques in the Software Engineering paradigm.

CCS CONCEPTS

• **Software and its engineering**;

KEYWORDS

Artificial intelligence, software engineering

BIO

Michael Rung-Tsong Lyu is a Professor and Chairman of Computer Science and Engineering Department at The Chinese University of Hong Kong. He worked at the Jet Propulsion Laboratory, the University of Iowa, Bellcore, and Bell Laboratories. His research interests include software reliability engineering, distributed systems, fault-tolerant computing, service computing, multimedia information retrieval, and machine learning. He has published 500 refereed journal and conference papers in these areas, which recorded 26,500 Google Scholar citations and h-index of 79. He served as an Associate Editor of IEEE Transactions on Reliability, IEEE Transactions on Knowledge and Data Engineering, and Journal of Information Science and Engineering. He is currently on the editorial boards of IEEE Transactions on Service Computing and Software Testing, Verification and Reliability Journal. He was elected to IEEE Fellow (2004), AAAS Fellow (2007), Croucher Senior Research Fellow (2008), IEEE Reliability Society Engineer of the Year (2010), and ACM Fellow (2015). Prof. Lyu received his B.Sc. from National Taiwan University, his M.Sc. from University of California, Santa Barbara, and his Ph.D. in Computer Science from University of California, Los Angeles.