Artificial Intelligence in Engineering and Society: Blue Skies, Black Holes, and the Job of Requirements Engineers (Keynote)

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***Abstract*—The democratization of artificial intelligence (AI) has brought substantial achievements in science, engineering disciplines, and society as a whole. New technologies based on large language models, multi-modal learning, embodied AI, and the quest for artificial general intelligence (AGI) promise to further change the world's landscape as we know it. At the same time, AI's rapid and uncontrolled evolution also poses serious risks to society, such as the concentration of power, exclusion, discrimination, and manipulation of reality. The keynote will present some experiences in AI democratization, including the usage of explainable machine learning approaches for agronomists, NLP-based solutions for railway engineers, image processing techniques for the maintenance of riverbeds, and mobile data processing in road safety assessment. The talk will outline the latest technological advancements in AI, e.g., in healthcare and science, and will show how large language models like ChatGPT and Bing Chat can solve long-standing requirements engineering (RE) problems. For example, requirements completeness can be easily checked and addressed with simple prompts, and model generation from requirements becomes a one-click task. The keynote will then describe the risks that current AI development poses to society. Besides the increasingly convincing deep fakes, and the widely discussed risks for privacy and reputation, we must be aware of the uncontrolled speed of AI evolution. As AI continues to advance, it will replace many jobs that require intellectual skills. This could lead to a significant number of people losing their jobs, as they may not have the necessary skills to adapt to the new labour market. People and entire countries that cannot exploit technological developments will be excluded from the game, and this will cause resentment and the possible emergence of new fundamentalism. The race for semiconductors is already creating hot spots and rifts between the superpowers.**

In this context, RE researchers are called to new technical and societal challenges. With pieces of code and even entire programs that can be automatically generated with large language models, the craft of prompting becomes the new requirements specification, and the concept of structured APIs dissolves into natural language interfaces. At the societal level, AI regulations are making their first steps, and we are called to contribute to operationalise the norms while preventing over-regulation. Equipped with years of experience at the boundary of the technical and social facets of systems, RE researchers are pivotal subjects in the new golden age of AI.

BIOGRAPHY

Alessio Ferrari is research scientist at CNR-ISTI (Consiglio Nazionale delle Ricerche - Istituto di Scienza e Tecnologia dell'Informazione "A. Faedo", Pisa, Italy - http://www.isti.cnr.it), where he worked as post-doc researcher and temporary research scientist since 2011. He received his Ph.D. in Computer Engineering from the University of Florence, Italy, in 2011. During the Ph.D., he worked as system engineer at General Electric Transportation Systems (GETS) s.p.a., a world-leading railway signalling company. His primary research interests are: applications of natural language processing (NLP) techniques to requirements engineering (RE); user and customer interviews in RE; RE education and training; empirical formal methods, and empirical software engineering. He is part of the EU DESIRA and CODECS projects on sustainability. He has been WP leader of the European Project ASTRail, funded by the Shift2Rail Programme, and participated in other EU projects, such as Learn PAd, about business process models applied to public administration procedures, and 4SecuRail, about formal methods in railways. He is the author of over 100 papers in conferences and journals, including ICSE, IEEE RE, IEEE TSE, and REJ. He regularly serves in the PC of ICSE, IEEE RE, REFSQ, AIRE, is one of the founders of the NLP4RE workshop series, has been the Local Organiser of REFSQ 2020, and Program Chair of REFSQ 2023. He is highly involved in open science, and has been Artifact Evaluation Chair of FormaliSE 2023, RE 2022, and iFM 2022. He is also part of the TOSEM Replicated Computational Results Distinguished Reviewers Board.