Balancing Autonomy and Trust to Enable Intelligent Robotic Process Automation

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Abstract

Robotic Process Automation (RPA) is a maturing technology that sits between the fields of Business Process Management (BPM) and Artificial Intelligence (AI). RPA allows organizations to automate high-volume and repetitive tasks performed by human operators. These tasks are enacted using a software (SW) robot that works on the applications' user interfaces (UIs) as the original human operators did. The current generation of RPA tools is driven by predefined rules and manual configurations made by expert users rather than intelligent solutions, making the current practice time-consuming and error-prone. In this talk, we focus on a recent line of research devoted to leveraging the combined use of process mining and reasoning about actions in AI to evolve RPA from a mere automated technology to a (framed) autonomous solution capable of complex decision-making activities. In this journey, we also conceptualize the notion of trust between humans and SW robots by discussing the research challenges to pioneer new trust-aware solutions that work in partnership with the human workforce and strike the right balance of autonomy and trust for achieving intelligent RPA.

Keywords

Intelligent Robotic Process Automation (RPA), Software (SW) Robot, Trust, Process Mining, Reasoning about Actions in AI

Robotic Process Automation (RPA) is a maturing technology that sits between the fields of Business Process Management (BPM) and Artificial Intelligence (AI). RPA allows organizations to automate high-volume and repetitive tasks performed by human users without changing the underlying IT systems [1]. These tasks are enacted using a software (SW) robot that works on the applications' user interfaces (UIs) as the original human operators did. Since RPA has proven to work reliably [2], many organizations have recently adopted it [3].

The current generation of commercial RPA tools is driven by predefined rules and manual configurations made by expert users rather than intelligent solutions, making the current practice time-consuming and error-prone [4, 5]. To mitigate this issue, many researchers are investigating how to leverage AI algorithms and intelligent techniques to improve the accuracy and execution of SW robots to make them more autonomous and capable of complex decision-making activities [6, 7]. The research literature shows that, among the others, techniques from computer vision [8], machine learning [9], natural language processing [10], conversational AI [11], automated planning [12] and process mining [13, 14] were proposed to inject intelligence into current RPA technology.

In an era where RPA is pushing the automation of human tasks to the extreme, on the other hand, recent research studies conducted on the effectiveness of RPA within organizations

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have found that implementation of SW robots does not always lead to the assumed effect, and many SW robots are subsequently withdrawn. Consequently, the human workforce takes over robotized tasks to perform them manually again and, in practice, replaces SW robots, leading to a costly remanualization of the respective task [15]. One frequently cited barrier to wider RPA adoption is the *lack of trust* between humans and SW robots [16, 17, 18]. Since human employees are expected to share responsibilities with the SW robots, trust in their performance is crucial for ensuring this technology's adoption and proper use.

Although the literature on human-AI collaboration has extensively explored trust issues, offering valuable lessons for RPA [19], the development of a *framework striking a balance between providing autonomy and trust for RPA* requires considering the transactional, non-anthropomorphic and abstract nature of SW robots, which is a specific nuance of this technology. That is, the end-user perception of trust in RPA strongly depends on the outcomes the SW robots deliver as the result of task execution.

In this talk, after discussing a recent line of research devoted to leveraging the combined use of process mining and reasoning about actions in AI to evolve RPA from an automated technology to a (framed) autonomous solution, we report on the key insights of a Dagstuhl Seminar organized in July 2024, entitled *Improving Trust between Humans and Software Robots in Robotic Process Automation.*[1] The seminar was organized to pioneer new intelligent trust-aware RPA solutions that work in partnership with the human workforce. Specifically, we present the key factors contributing to creating or eroding trust in RPA and consolidate them in a conceptual framework that indicates the dimensions and characteristics of trust. Then, we specify the notion of trust in RPA as a measurable construct – *Willingness to Give Up Control (WGUC)* – that allows assessing the level of trust between humans and SW robots. Finally, we present the significant research challenges in the transition toward trustworthy and intelligent RPA, and chart a roadmap for future RPA research.

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