A Multi-Perspective Panel on User-centred Transparency, Explainability, and Controllability in Automations

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Abstract. At this time, there is a lot of discussion and attention on the adoption of artificial intelligence in real-world automations. In this panel, we will discuss the role of Human-Computer Interaction in creating meaningful devices, applications and systems to obtain automations that exploit technologies from artificial intelligence in such a way as to create meaningful and valuable experiences for individuals and society. Our specific focus is user control in automation, asking how HCI can provide automation that can solve the evergreen challenges of human-automation interaction, advancing the role of humans interacting with automation from servants to collaborators or even partners, and increasing human well-being. With new AI tools, the range of automation has widened including the automation of cognitive tasks.

Keywords: Automations, Human-Computer Interaction, Artificial Intelligence.

1 Motivations

How people interact with digital technologies is currently caught between the Internet of Things (IoT), where objects are continuously increasing their technological capabilities in terms of functionalities and connectivity, and Artificial Intelligence [16], which is penetrating many areas of daily life by supporting their increasing ability to support and automate functionalities, including creative and cognitive tasks, based on collected data and statistical predictions. In both trends, human control over technology is jeopardized, little is happening in terms of innovating how we conceptualize, design, implement and verify automations and allow users to control them.

While there is a long human factors research tradition on automation [7], such research has long been concentrated on highly specialized professional work tasks for

highly trained and specialized personnel [13], such as control centre operators or aircraft pilots. However, we live more and more in environments with dynamic sets of objects, devices, services, people, and intelligent support, which can be connected through various types of automations, with various types of peripheral interactions [3]. This opens up great opportunities, new possibilities, but there are also risks and new problems [2]. The available automations can be created through machine learning techniques, and then be activated by or recommended to users, or can even be directly created by users themselves exploiting configuration mechanisms. Automations are more and more used in environments rich in terms of the presence of connected objects, devices, and services [8]. The ambient nature of automated systems and their interwovenness in mundane, repetitive routines also supports the ordinariness of the involved user experience [6]. They are often based on sets of rules that connect the dynamic events and/or conditions with the expected reactions without requiring the use of complex programming structures, and have been used in several domains, such as home automation, ambient assisted living, robots, and industry. While referred to as a single term, automation is by nature polymorph and adding automation to a system may correspond to multiple (sometimes conflicting) objectives [15]. However, when they are automatically generated some problems can occur if the end user's viewpoint is not sufficiently considered. For example, previous studies describe how intelligent systems can fail to adapt to recent user changes or the difficulty users have understanding what information the system requires in order to be trained to generate the desired behaviour. Other studies reported difficulties in avoiding false alarms, communicating complex schedules, and resolving conflicting preferences. Such issues highlight the importance of providing conceptual and technological support for improving the transparency of such automations [16] and the possibility of human intervention [18]. However, early studies in the area of human factors have demonstrated that, in some cases, reliability of automation is not critical and users see benefits even in the presence of failures.

The panel aims to stimulate a multi-perspective discussion on how democratizing main technological trends by designing environments able to support user-centred transparency, explainability [10], and controllability in automations.

2 Discussion

Given the background described in the previous section, several points can be discussed in the panel, for example:

- What are the dark patterns when deploying automations in daily environments, examples of cases where such technological trends conflict with users' ability to actually obtain and control the desired daily automations?
- What are the application domains and associated scenarios where everyday automations actually controlled by end users can have a high impact on improving user experience and technology adoption (possible candidates: smart homes, ambient assisted living, retail, industry 5.0, …)?

- What are the most suitable interaction paradigms, technologies, metaphors, programming styles to allow people to easily create, understand, modify [11], debug [10, 12], and control, the automations most relevant for them in their daily activities (e.g., wizards, chatbots, block-based, data flow, process-oriented, augmented reality [1], Programming-By-Demonstration [9])?
- How will interactions based on large language models affect the way users will understand and control automations and recommendation systems?
- What are the principles, design practices, and methodologies available in Human-Computer Interaction (HCI) that could be adopted to empower the end-users to control automations in AI systems, and how they should evolve to better address the new challenges?
- What unsolved challenges are we facing when providing more user control with highly automated systems?
- What can the role of recommendation systems be in smart environments that users can control? When, how, and for what purpose can recommendations be useful, usable and reliable?
- What are the most effective ways to explain the automations that populate surrounding environments as well as their actual effects on users with limited technological knowledge?
- How do humans interact and control automation for cognitive and creative tasks [17] and how does it impact our sense of agency and responsibility ?

3 Schedule

We plan to organise the panel in the following manner:

- Opening and introductions: 10min
- Moderated discussion: 35min
- Questions by audience: 35min
- Concluding remarks and closing: 10min

4 Panelists

Philippe Palanque research is focusing on dependability, usability and safety of interactive critical systems. As AI technologies (such as machine learning) are making their way inside this type of system, the research addresses the assessment of usability and dependability of such interactive systems embedding AI technologies. He is also working on identifying explicit criteria (as in [4]) in order to demonstrate the need for such technologies as their integration is often related to fad and less to actual need as “classical programming” allows implementing behaviours which are usually attributed to AI

technologies as demonstrated for recommender systems in large civil aircrafts [5]. His contribution to the panel will be to question the need for such technologies and the clear identification of benefits and drawbacks they bring to interactive systems and interactive technologies.

Fabio Paternò has long investigated methods and tools for end-user development, and in recent years has also focused on how to exploit them in the context of recent technological trends (Internet of Things and Artificial Intelligence) in several application domains in order to improve their transparency and user control. In the panel he will discuss the possible composition paradigms of automations in daily environments (visual wizards, conversational interfaces, mobile augmented reality), their integration with recommendation systems, and how to introduce explainability mechanisms that are able to provide answers to the most frequent user questions.

Virpi Roto's expertise is in employee experience design when automation systems are introduced to industrial workplaces. While the new automation systems are envisioned to be as autonomous as possible, there needs to be an employee monitoring autonomous automation and helping it when needed. In other words, people are assigned the servant role of watching the computers. Virpi wants to avoid the passive monitoring work by designing automation as a service for the employees. The smarter the automation becomes, the more chances there must be to provide more control for the employees.

Albrecht Schmidt is focusing on how control changes when we use generative AI. In knowledge work, users traditionally have full control and exercise this control. When academics, lawyers, and journalists write a text each word matters. When designers or engineers create objects, their creativity is seen in their attention to detail. If we now augment and automate cognitive tasks to improve efficiency, we face unique challenges in control. The central questions are: How should we design interactions and interfaces for knowledge work to allow comprehensive control, while getting the full benefit of generative AI? How can we ensure that decision-making is done in a responsible way and that users understand the results of 'their' work?

Simone Stumpf has a long-standing research focus on user interactions with machine learning systems, and most recently has focused on involving lay users in teachable machine learning systems, interactive Explainable AI (XAI) and AI fairness. She is interested in developing design principles for enabling better human-computer interaction with AI systems, leading to more transparent and responsible AI. Her contribution to the panel will focus on how to involve users in the design of AI systems at all stages in the development lifecycle, how to choose levels of automation within a socio-technical AI system, and the dangers of ignoring user-centred design for AI.

Jürgen Ziegler is conducting research at the intersection of HCI and AI. With his team, he has a long-standing track record in recommender systems with a special focus on interactive recommending, and on transparency and explainability of recommendations. In recent work, he has specifically studied conversational recommendation

methods, exploring various design options for optimizing the user experience. In the panel, he will raise the often neglected issue of how intelligent techniques can be seamlessly integrated in conventional user interfaces. He will discuss implications of the recent breakthroughs in language technology on recommending and decision-making, also reflecting on them in the light of argumentation theory. Arising from the advent of powerful language models is also the question which future demands these technologies will put on users with respect to cognitive and language skills.

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