Opening the AI Black Box for a better HCI

Two themes for developing the AI for HCI syllabus

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In this statement, we will focus on the opportunities and problems set by two specific applications of Artificial Intelligence (AI) techniques in Human-Computer Interaction (HCI). We focused on these during our latest research that we consider them as two important themes for developing the syllabus.

The first problem is the introduction of AI support for helping the user in making decisions in domains such as finance, military, transportation, healthcare, law etc. Nowadays, Deep Neural Networks are consistently overperforming other techniques in such applications, when enough data is available. But, considering the high number of parameters they use, their performance comes at the cost of being less interpretable by both end-user and system developers, so they are considered as black-box models.

The effort of the research community towards eXplainable AI (XAI) systems tries to fill this gap. The research community focused more on the techniques that we can build for explaining AI but less on why users should use such explanations. Factors such as the application domain and the end-user profile are often considered separately from the data analysis, without a real correlation between them. We currently have different attempts to categorise the explanation techniques (see for instance [1]), but we are lacking integrated system design methodologies supporting both the performance need and the overall usability in the AI-based systems. HCI education in such a context is crucial: the development of an effective system requires both a good comprehension of the AI techniques and expertise in human factors. Indeed, explanations consist not only on model parameters or data relationships but also their presentation to the end-users, including proper representation metaphors and visualizations. In this regard, an important step towards integrating the two aspects into a single framework was introduced in [2]. It provides the connection between the theory of human decision making and the available XAI techniques in the literature. In particular, they show how to start from the identification of the user's goals and tasks for understanding which pieces of information are needed by users for taking decisions, and they discuss how to present them through the currently available techniques. Besides, they show how to apply the techniques for mitigating cognitive biases that lead to decision errors. However, the main reason why the development of the explanations is currently driven by the AI is the combination of the available data and the required performance on the decision task, which often forces the model selection. Once such a decision has been taken, the choice of the available explanation techniques is reduced. This justifies the need for a good background on the AI side, to balance the tradeoff between the user and the performance needs. Our feeling is that we are going to need such skills into the same expert, instead of having a separate profile of AI and HCI expert in a team.

One of the main failures in this field in applying HCI theories and methods has been recently highlighted in [3]. The paper criticises the current evaluation methodology of XAI based on 1)

asking the user to predict the AI's outcome on simple and artificial tasks or 2) requesting subjective trust and preference ratings to users, demonstrating that they do not reflect the usage of the system on actual tasks. Therefore, it's important to evaluate the performance of human+AI performances in real decision tasks in a realistic context, without relying only on subjective measures about the explanation usability or performance metrics.

The second experience we would like to share in this workshop is related to AI-based techniques that provide important support to gestural interaction, where the recognition of the input is uncertain. In such a context, learning from data allows achieving the accuracy required for reliable recognition, which is the basis of a usable system. While AI techniques enable the interaction, the problem of inspecting the underlying recognition system still holds. This time it's the UI developer that needs additional information besides the gesture label: guidance systems based on feedback and feedforward require information on the execution while the user is performing it, independently from how we design them. This is because the temporal extent of a gesture performance is perceivable for the users. So, from a user interface engineering point of view, such a problem needs a recognition technique providing both high accuracy and some inspectability level for providing information while the user performs the gesture. The development of AI systems and the HCI research addressed these two problems in isolation, the former proposing very accurate classifiers, the latter through compositional gesture models that defined both the whole gesture and its sub-parts, but providing poor recognition performance. The state of the art solutions to this problem required knowledge from both disciplines for selecting techniques that fulfil both requirements [4,5]. This shows how a good background in the two disciplines is useful not only in developing the systems for the end-users but also for engineering generic user interface toolkits for particular interaction modalities.

References

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