INSTITUT DES SYSTEMES INTELLIGENTS ET DE ROBOTIQUE
OFFRE DE THÈSE

Sujet de thèse

Titre de la thèse : Learning and making decisions with GUI: A computational neuroscience approach

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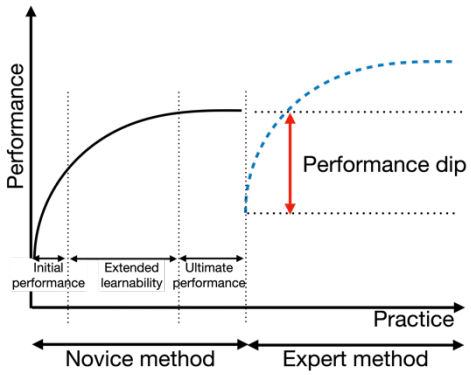
Date limite de dépôt de la candidature : 1 Juillet 2023

Description du sujet

Context

The figure illustrates a common phenomenon in Human-Computer Interaction (HCI) where users have the choice between two ways to accomplish a task. The beginners' one (e.g. Menu) is easy to learn, but only allows a low level of performance. The experts' one (e.g. shortcut) is more difficult to learn but provides a higher final level of performance.



A major problem in HCI is that most users stick to the beginners' mode due to the performance dip they experience when attempting to switch to the experts' mode: They continue to use the beginner's mode and do not adopt the expert mode. This is true at the command level (e.g., using Copy & Paste instead of Duplicate), at the method level (using menu instead of shortcut) or the application level (e.g., using a simple software instead of the corresponding powerful one).

The team has proposed a first computational model [1], based on reinforcement learning techniques commonly used to study decision-making in neuroscience [3,7]. It identified a number

of essential characteristics (explicit and implicit learning, memory decay, planning and behavioral persistence) to explain the learning dynamics of human subject using a GUI with menus and shortcuts. It did not, however, model the automatization of behavior into habituals [6].

Project description

The objective of this project is twofold. First, it consists of understanding why and when users switch or do not switch to expert methods. To achieve this, the candidate will build a computational model of user behavior to explain and predict expert methods adoption, extending the already published one.
Second, it consists of designing interventions (feedback, feedforward, notifications) to motivate and assist the users in the transition from beginners to experts behavior. To achieve this, the system will use the actual user behavior as well the computational model to trigger the best intervention at the right time.
One originality of this project is to build on existing theories, models and methods in computational neurosciences (e.g., computational rationality) to address challenging problems in HCI.

Required profile and required skills

Applications with a strong academic record in HCI and/or Cognitive sciences/Neuroscience.
Interest and/or experience in computational user modeling; Reinforcement Learning (RL)

Thesis environment

The project is part of the ANR NeuroHCI involving researchers both in HCI and Neuroscience. The Ph.D. candidate will integrate a multi-disciplinary environment that provides a unique and healthy research environment, with many other fellow Ph.D. students working in a wide variety of topics, including: robotics, HCI, machine learning, perception, cognitive science, haptics and social interaction. We strive to provide fertile ground for personal and academic growth through regular team and individual meetings, giving students the chance to explore their own interests and exchange freely with fellow students. The development and the success of our students from bachelor to Ph.D. is our highest priority. Through regular and personal guidance, we ensure that students lead successful research projects and are prepared for a future academic or industrial job.

References

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