Post-Doc in Computer Science/Human Computer Interaction

Smart and semi-automatic interfaces

Dates reminder

*Sending applications as soon as possible (latest 10th, of September, 2021)

*Interviews: September 2021

*PostDoc start: October 2021

18 months

Location

* ESTIA-Recherche
Bidart, France

*Possible short periods with specific outputs and programme in the partners SMEs of the RUD Project

Keywords

*Human System Interaction
*Post-Wimp Interfaces
*User experiences
*Design of Experimental evaluation system
*Human-Centered AI (HCAI)
* Interactive Machine Learning

Background

The volume of digital data is growing exponentially, and it is expected that in the near future, all the companys' data will be digital (DataAge 2025), and the DataSphere forecast predicts that the volume of data will double each 9 months until 2025. From this digital data, nearly 80% is non-structured, and 50% are industrial data [5]. In manufacturing companies, a huge amount of this data concerns 2D and 3D files and models. These 2D/3D files are created by Computer Aided Design (CAD), for example in order to be printable with a 2D/3D printer. The data contains a lot of important information about the company, such as its processes, products, which, if adequately structured, could be used and thus provide very valuable knowledge. However, a recurrent problem is the lack of transfer of this data from one application to another, and so the available data is poorly or not reused today. In fact, it is nearly impossible nowadays to directly use the data of unstructured files in different software applications.

In the context of exponential data growth, one of the main challenges for companies is to manage, develop and use unstructured data. The RUD project aims at restructuring unstructured data, and in particular at developing and validating innovative integrated technologies capable of performing searches and comparing both unstructured and heterogeneous files (i.e. non-structured data from 2D files/3D models). The expected outcome of RUD tools is to compare pdf documents and 3D models.
The RUD consortium is composed of 2 R&D performing SME (1A3i, French and 3DSEMANTIX, Canadian), one large company (FAMOLADE - Portuguese), and one research entity (ESTIA INSTITUTE OF TECHNOLOGY - French).

Scientific topic

We want to explore an approach combining AI algorithms with user experience design methods. This approach is called "Human-Centered AI" in which Artificial Intelligence (AI) algorithms are combined with human-centered thinking to make Human-Centered AI (HCAI) [1]. This approach combines research on AI algorithms with user experience design methods to shape technologies that amplify, augment, empower, and enhance human performance. Researchers and developers for HCAI systems value meaningful human control, putting people first by serving human needs, values, and goals. More specifically, we will explore a sub domain of HCAI, called "interactive machine learning". Interactive Machine Learning (IML) is the design and implementation of algorithms and intelligent user interface (IUI) frameworks that facilitate machine learning (ML) with the help of human interaction, i.e. it is an interaction paradigm in which a user or a user group refines a mathematical model to describe a concept through iterative cycles of input and review [2,8]. The idea is to go beyond considering AI as a black box and accepting its output, we will refine and adjust the output with the user. Based on experiments on real use cases extracted from the RUD project, our goal is to identify a general process in order to provide semi-automatic indexing and clustering. Taking into account the different interactive machine learning strategies, recent work [3] shows that by giving the user (novice in AI but domain expert) a more proactive role, the performance can be increased. But what about the role of the interaction techniques? How do the interaction metaphors influence the processes? How does the user progress towards the task objectives? Previous work among the RUD partners shows that it is much less expensive and more efficient to get the user to intervene throughout the

Scientific supervisors

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process, and especially at the beginning, rather than at the end to validate or correct errors. Involving users in semi-automatic interfaces [4] may reduce and even cancel the error rate for all tasks [5].

In terms of methodology, it will be explored, and compared by user experiments, WIMP (Windows, Icons, Menus, Pointer) interfaces and post WIMP interfaces [6]. Post WIMP interfaces comprise work on user interfaces which go beyond the paradigm of windows, icons, menus and a pointing device. We will follow existing guidelines for Human-AI Interaction [7]. We will adopt common language and common concepts of [8] as well as the principles based on a common workflow for building effective interfaces for IML. It will be necessary to carefully establish a productive dialog between user and software (framing feedback, capturing input, explaining decision) as well as to produce a rich interaction in order to enhance interactivity. The challenge is to deal with users considered as knowledgeable, but imprecise and inconsistent, and hence to infer user intent from user input. Once the WIMP interface and the post WIMP interface are prototyped, an inspection and user experience will be conducted in order to verify that the new produced versions are better than the existing ones, and also to compare pros and cons of the two paradigms WIMP and post WIMP related to the tasks.

Required profile

Education – The candidate must have a PhD in computer science with HCI and/or AI skills.

Other abilities – The candidate should be highly motivated for this project and have strong analytic skills and must be able to code in the Python language. The candidate is expected to conduct user studies. The candidate should be sociable, curious, autonomous and rigorous. The candidate should be able to speak about his/her project with industrial and academic partners. Also, the candidate should be interested in teaching in English and/or in French.

Application

The application must include a CV and a cover letter. If possible, a letter of recommendation or the name of a reference person could be added to the application. Applications must be sent by email to Pr Nadine Couture as soon as possible and before 2021, 10th of September, n.couture@estia.fr. Selected candidates will be invited to meet the scientific supervisors during an interview, around mid September 2021.

References

[1] Ben Shneiderman, *Human-Centered AI: Reliable, Safe and Trustworthy*, April 13, 2021, ACM IUI'21.

[2] https://iml.dfki.de/

[3] Tegen, A., Davidsson, P. & Persson, J.A. *Activity recognition through interactive machine learning in a dynamic sensor setting*. Pers Ubiquit Comput (2020).

[4] Nicolas Mellado, Patrick Reuter, Christophe Schlick. Semi-automatic geometry-driven reassembly of fractured archeological objects. VAST 2010 - The 11th International Symposium on Virtual Reality, Archaeology and Cultural Heritage. 2010.

[5]Jacques Péré-Laperne. (A)KDD for Structuring Destrured Documents 2018 International Conference on Artificial Intelligence ICAI'18, Jul 2018,Las Vegas, NV.89, USA

[6] Michel Beaudouin-Lafon (2000). "*Instrumental Interaction: An Interaction Model for Designing Post-WIMP User Interfaces*". CHI '00:Proceedings of the SIGCHI Conference on Human Factors inComputing Systems. ACM Press. pp. 446–453

[7] Saleema Amershi, Dan Weld, Mihaela Vorvoreanu, Adam Fourney, Besmira Nushi, Penny Collisson, Jina Suh, Shamsi Iqbal, Paul N. Bennett, Kori Inkpen, Jaime Teevan, Ruth Kikin-Gil, and Eric Horvitz. *Guidelines for Human-AI Interaction*. Proceedings of CHI'19, ACM, Paper 3, 1–13.

[8] John J. Dudley and Per Ola Kristensson. 2018. *A Review of User Interface Design for Interactive Machine Learning*. ACM Trans. Interact. Intell. Syst. 1, 1, Article 1 (March 2018), 37 pages.

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