ConfigurAItor – How do you like your explanations?

Bachelor/Master project "Information Systems"

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1: Project Overview

Background: Explanations work differently for each and every person. Some people respond better to visual cues, while others prefer textual explanations, and still others like working with numeric or tabular information. Being able to configure your own explanatory dashboard promises to be beneficial in promoting understanding of artificial intelligence and its application in practice.

Project Goal: Develop and implement a configurable user interface that allows for creating personalized explanatory dashboards. The user interface will operate in a modular fashion, allowing new building blocks tailored to specific use cases to be implemented in the future.

Highlights: Develop the application architecture from scratch; build a variety of interesting modules; freedom to pursue individual solutions; close cooperation with the chair team

2: Project Background

Deep learning (DL) models have set a new state of the art in machine learning. Their possible application domains range from healthcare to transportation and the advertising industry. In many cases, these models surpass the decision quality or prediction performance of human experts. Yet, a significant drawback of DL models is their inscrutability. In contrast to former machine learning algorithms, which generally still allowed humans to understand their reasoning and decision-making process, modern DL models function as black boxes to experts and lay users alike. Since 2015, when the Defense Advanced Research Projects Agency (DARPA) introduced its explainable artificial intelligence (XAI) program, researchers have developed a vast number of techniques to make DL models more understandable, trustworthy, and hence usable (Gunning et al., 2021).

The presentation of such explanations to users is an essential aspect to this problem. There is a push toward developing human-centered user interfaces and involving potential user groups into their development (Ribeira & Lapedriza, 2019; Kim et al., 2023). However, we can not only differentiate between lay users and experts, but inside these groups, we can also distinguish between tasks of different complexity, required domain knowledge, user experience, familiarity with the underlying AI model, and many other factors. To better accommodate these diverse needs, we require interfaces that allow for some degree of personalization. A user interface that allows for the alteration of its components could be used more flexibly and hence better fulfill its purpose. This project will focus on adaptability (user control). However, the user interface being developed needs to allow for the addition of adaptivity (system control) in future projects.

3: Project Objective

The objective of this Bachelor/Master project is to develop an adaptable user interface and to implement a selection of explanation methods that can be dynamically integrated into the user interface. The adaptable user interface should facilitate the modification of its displayed content with minimal effort and in a modular fashion, be compatible with various DL models, and possess future adaptive capabilities. In this project, the underlying DL model will be trained on the SIXray dataset for prohibited item discovery (Miao et al., 2019). It contains 1,059,231 X-ray images from various subway stations. These images contain six categories of prohibited items: guns, knives, wrenches, pliers, scissors, and hammers. Users interacting with the adaptable system should be able to either confirm a model prediction or enter their own prediction after having consulted the available explanations.

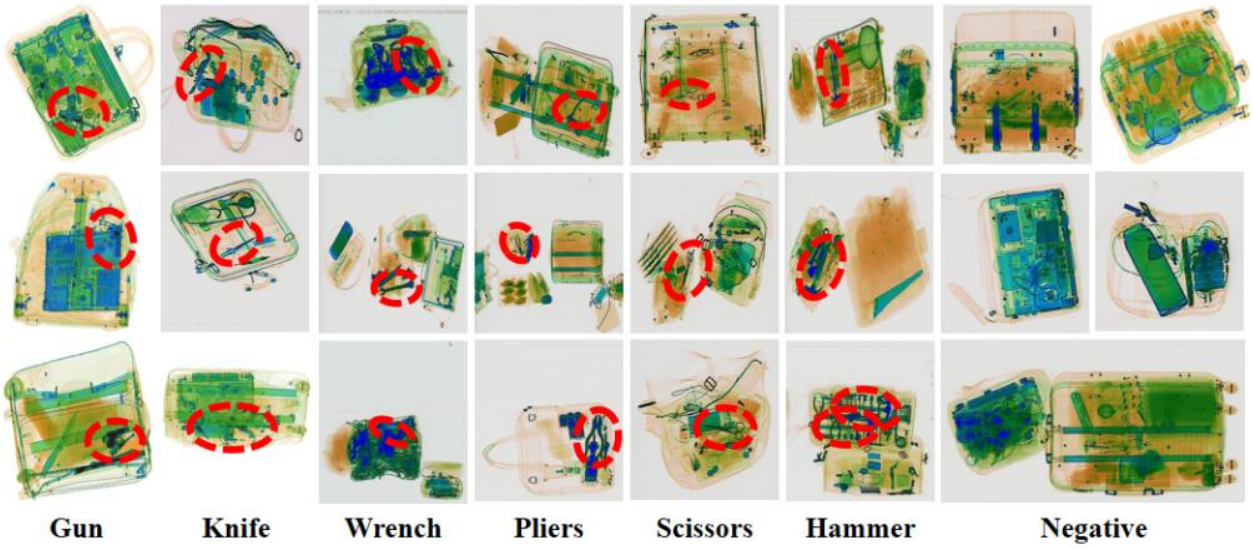


Figure 1: Example images from the SIXray dataset.

To evaluate the quality of the different explanatory techniques and their adaptable arrangements, the participating students will conduct a qualitative study, consisting of twelve think-aloud sessions followed by semi-structured interviews. Participants can be recruited via LinkedIn, XING, or any other platform suitable for contacting professionals, as well as from personal contacts. These interviews have to be recorded, transcribed, and subsequently analyzed. Additionally, task performance during the think-aloud sessions will be evaluated. The results from the qualitative study will be discussed in a project report, which serves as the final project milestone.

The objectives of this specific project are the following:

- **Developing** an architecture for the adaptable user interface
- **Implementing** an image classification model for the SIXray dataset, a selection of corresponding XAI methods, and a prototype of the adaptable user interface
- **Evaluating** the adaptable user interface

Depending on group size, adjustments to the project scope can be made. This will be announced at the kickoff and in subsequent milestone meetings.

Each finished artifact has to be properly documented to facilitate understanding and further development by students in follow-up projects.

4: Project Registration and further Information

Bachelor and Master students interested in this IS-project may apply via our online application form (Online Application). This application needs to include:

- Your current **transcript of records**
- A short **letter of motivation**

The deadline for the application is **Tuesday, 07.10.2025, 23:59.**

You can apply as a group. To do so, each person in that group has to submit an individual application. The group members have to decide on a group keyword to be used in the application form, in order to unambiguously identify each group.

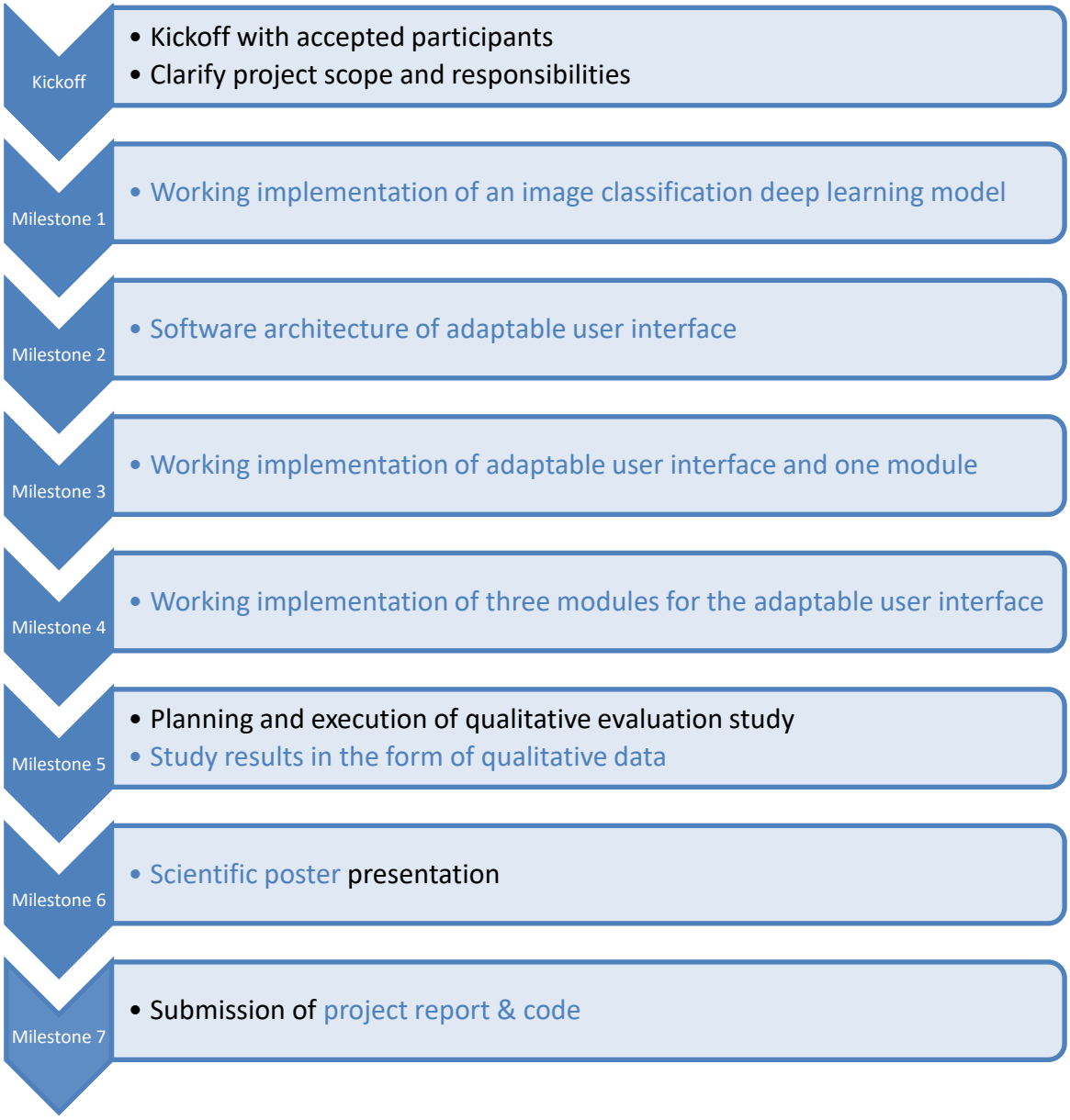
If the number of applications exceeds our capacities, we will select participants based on their prior knowledge and academic performance.

For successful completion of the project, Master students receive 12 ECTS (corresponding to 360 working hours) and Bachelor students receive 6 ECTS (corresponding to 180 working hours)

- Master students will invest 18 hours per week into the project.
- Bachelor students will invest 9 hours per week into the project.

5: Project Schedule (Dates are to be announced)

Deliverables for each milestone are marked in blue.



6: Grading

The final grade will be calculated as following based on the sum of the milestones:

- Milestone 1: 5%
- Milestone 2: 10%
- Milestone 3: 20%
- Milestone 4: 10%
- Milestone 5: 15%
- Milestone 6: 20%
- Milestone 7: 20%

7: Sources

- Miao, C., Xie, L., Wan, F., Su, C., Liu, H., Jiao, J., & Ye, Q. (2019). Sixray: A large-scale security inspection x-ray benchmark for prohibited item discovery in overlapping images. In *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition* (pp. 2119-2128).
- Ribera, M., & Lapedriza, A. (2019). Can we do better explanations? A proposal of user-centered explainable AI. CEUR Workshop Proceedings.
- Gunning, D., Vorm, E., Wang, Y., & Turek, M. (2021). DARPA's explainable AI (XAI) program: A retrospective. *Authorea Preprints*.
- Kim, M., Kim, S., Kim, J., Song, T. J., & Kim, Y. (2024). Do stakeholder needs differ?-Designing stakeholder-tailored Explainable Artificial Intelligence (XAI) interfaces. *International Journal of Human-Computer Studies*, *181*, 103160.
- Miraz, M. H., Ali, M., & Excell, P. S. (2021). Adaptive user interfaces and universal usability through plasticity of user interface design. *Computer Science Review*, *40*, 100363.