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Question-Driven Design Process for XAI in Active Video Watching

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Abstract: Designing explanations for Artificial Intelligence (AI) systems continues to be a challenge due to AI's black-box nature. Among the solutions developed to help in designing explanations in AI technologies is the Question-Driven Design Process for Explainable Artificial Intelligence (XAI) User Experience. In this paper, we report on our experiences using the question-driven design process for XAI in active video watching. We used Active Video Watching (AVW)-Space, an AVW platform developed at the University of Canterbury, as the context for AVW. We conducted a survey to elicit questions from users on the AI features of the system. In the question analysis process, three human raters categorized the user questions into the different XAI bank categories. Results show that most users tend to ask "how" and "why" questions about the AI-enabled features in the platform. The results of the question analysis will be used in mapping the determined question categories to potential XAI techniques. This can help in deciding the types of explanations to provide to users of AVW in future works on XAI in active video watching.

Keywords: Explainable Artificial Intelligence, User Experience, Active Video Watching

1. Introduction

Providing explanations about how Artificial Intelligence (AI) systems make decisions continues to be a critical and pervasive design issue in AI. Works related to XAI show a more algorithm-centered view, focusing on the researcher's intuition of what a good explanation is, based on the algorithms used in the AI system (Miller, 2019). However, explanations are often demanded by users who might not have a technical understanding of AI (Liao et al.,2020). This is also true for most end-users of data-intensive educational systems and innovations (Khosravi et al., 2022). Khosravi et al. (2022) present different design approaches for providing explanations in Artificial Intelligence in Education (AIED) systems. Among these are *Participatory design and co-design*, which are aimed at giving an active voice to the end users of the AIED systems.

An example of a participatory design and co-design is the Question-Driven Design Process for XAI User Experience (UX) by Liao et al. (2021). Liao et al. developed a "novel design process to enable designers and product teams to work with a toolbox of AI algorithms, focusing on the design issue of AI explainability." This process helps AI developers and designers to map user questions to current XAI tools. Given the participatory and co-design nature of this process, it also gives an active voice to end-users in shaping the explanations in the system. The process by asking users to provide questions they have about the decisions made by the AI system. This helps in identifying user needs and requirements and, subsequently, the choices of XAI techniques, design, and evaluation of XAI solutions. This process helps users who do not have data analysis experience to effectively convey and communicate their needs when using AI systems and how explanations can address these needs. This process involves four steps: *(1) Question Elicitation, (2) Question Analysis, (3) Mapping Questions to Modelling Solutions, and (4) Iterative Design and Evaluation*.

In this study, we explore the use of the question-driven design process for XAI in active video watching, with Active Video Watching (AVW)-Space as a specific case. AVW-Space is an active video watching platform developed at the University of Canterbury. AVW-Space

utilizes AI in its personalized prompts (called Nudges) and in assessing the quality of comments users make on the provided videos. Machine learning (ML) models were used to assess real-time the quality of user comments and show different prompts to support user engagement (Mohammadhassan et al., 2022). We discuss only the first two steps in the question-driven design process, Question Elicitation and Question Analysis, in this paper. The results show the potential of this design process in identifying user needs and requirements in active video watching. We have developed a streamlined version of the design process, employing an efficient way of collecting user questions, categorizing these questions, and identifying potential key user requirements for XAI in active video watching.

2. Methods and Results

Liao et al. (2021) start the Question-Driven Design Process for XAI UX with the Question Elicitation step, which aims to collect empirical data to help in understanding user requirements for XAI UX. The process is divided into two parts: (1) asking participants to come up with questions they have for the AI and (2) following up with participants to articulate the intentions behind asking a question, and their expectations for answers to the questions. The gathered questions are then analyzed during the Question Analysis step. Liao et al. conducted the question elicitation process by interviewing nine users of an AI system. Participants were asked questions they have for the AI and the intentions behind the participants questions. Elicited questions are categorized into categories indicated in the XAI Question Bank. There are ten categories in the XAI Question Bank: (1) Data, (2) Output, (3) Performance, (4) How, (5) Why, (6) Why Not, (7) How to be that, (8) How to still be this, (9) What If, and (10) Others. The descriptions and sample questions described in the XAI Question bank served as a basis for the human raters in categorizing the questions. Based on the categories, the priorities for which XAI design techniques and key user requirements for XAI UX can be identified and help in the design of explanations by employing the mapped solution prescribed by the Question-Driven Design Process.

We conducted a survey in lieu of the usual interviews done for the process, given that we had many participants, and it was not feasible to interview each one separately. Question elicitation focused on the two AI features of AVW-Space: nudges and comment quality assessment. The survey contained the following two questions: *(1) What questions would you be interested in asking whenever a nudge/comment quality is shown?*, *and (2) Why would you be interested in asking the question/s above*?

We had two groups of participants. The first group were students who have previously used AVW-Space, to learn face-to-face communication skills in SENG202, a second-year software engineering course. In the study, these participants completed the survey, and could also log into AVW-Space to remind themselves of the AI features. The second group were participants who were new to active video watching. They used AVW-Space for 30 minutes before completing the survey. The goal of the survey was to elicit the question related to XAI. Figure 1 provides an overview of the process.

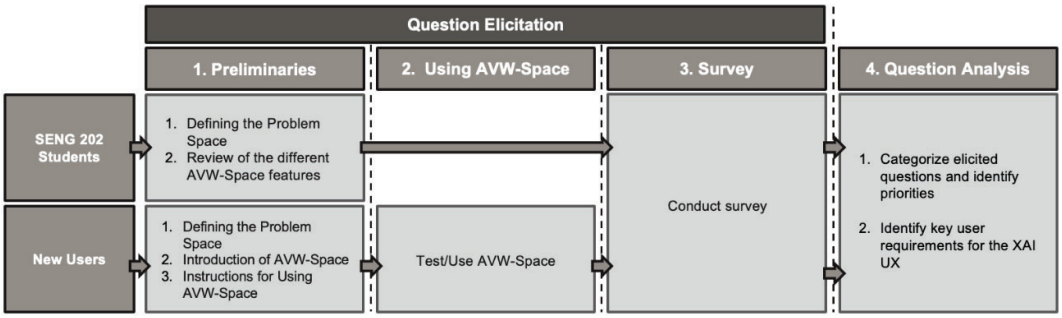

Figure 1. Question Elicitation and Analysis process for Active Video Watching study

There were 16 and 87 participants in the first and second group of participants, respectively. After removing blank responses and completely irrelevant questions (which were not related to the AI features and AVW-Space), 135 questions were elicited for the nudge

feature and 138 questions for the comment quality feature. In the Question Analysis step, three human raters categorized the questions. Out of the 135 questions for the nudges, only 72 questions (53.3%) were classified by all the raters in the same category. The three raters agreed on the classification for 89 questions (64.5%) out of 138 questions for the comment quality. Table 1 shows the top four categories where all three human raters agreed on the classification of the questions.

Table 1. Top 4 Categories for Questions on AI Features in AVW-Space

Categories	Nudges	Comment Quality
How	1	19
Why	4	17
How to be that		9
Others	15	12

As there were three raters, the inter-rater agreement was determined using Krippendorff's Alpha. The raters agreed in categorizing questions related to comment quality, having a value of 0.725 which is beyond the acceptable minimum Krippendorff's Alpha value ($\alpha>0.66$) (Krippendorff, 2010). However, there was low agreement when categorizing questions related to nudges ($\alpha= 0.523$). The raters agreed on more questions related to comment quality in comparison to questions related to nudges.

3. Conclusions and Future Work

In this study, we utilized the question-driven design process to identify user needs and potential choices for XAI techniques in designing explanations in active video watching integrated with AI features. Given the high number of participants in our study, it was not feasible to interview them individually. Instead, we conducted a survey to collect user questions on the AI features. Based on the results from the question analysis step, it can be observed that there were more questions categorized into the XAI question categories on questions for comment quality as compared to nudges. Results show that there were more questions categorized in the "how" and "why" categories. This can possibly show that the use of AI in assessing comment quality is clearer than nudges. Therefore, "how" and "why" questions are priorities, and techniques for designing explanations to these questions would benefit most users.

As this study only focused on the first two steps of the design process, future work will explore the next two steps. The results of the question analysis phase will be used to map the question categories to potential XAI techniques in future works. Given that there are multitudes of XAI techniques and tools available, the mapping will help in determining specific XAI techniques and tools appropriate for integrating explanations in Active Video Watching. This will then also help in deciding the types of explanations to provide for users of Active Video Watching in future studies.

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