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Identifying Context-Specific Values via Hybrid Intelligence

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1. Introduction

Values, e.g., benevolence and self-determination, are abstract motivations that explain and justify human behavior and opinions [19]. Values are instrumental for hybrid intelligence (HI) systems [1, 14, 18, 20, 21] that involve humans and artificial agents. Then, a crucial question to be answered is: what values should an artificial agent align with?

Lists of *general values*, which are applicable across cultures and contexts, have been crafted by ethicists [17, 19], political scientists [6], and designers (e.g., Value Sensitive Design [5]). For example, the Schwartz value list [19], a highly influential list of general values [7], includes values such as self-direction, power, and security. However, context is a crucial factor when reasoning about values. (1) Not all values are relevant to all contexts [8, 15, 19]. (2) The way in which we express value rhetoric differs from one context to another [11]. (3) Preferences over general values may not be consistent across contexts [4] – that is, our interpretation and prioritization of values is influenced by context.

General values help explain broad human behavioral tendencies, such as attitude toward immigration and activism [3]. However, for concrete applications, values must be situated within a context. Thus, we define *context-specific values* as values applicable and defined within a context. Consider, for example, the task of value elicitation [8] – identifying individuals' preferences over competing values – for the intent of decision-making on green energy transition. For this concrete task, we can elicit stakeholders' preferences between two context-specific values such as landscape preservation and energy independence, or between two general values such as security and self-direction. We expect that choosing between the context-specific values is easier for laypeople to justify and more insightful for policy makers than choosing between the general values.

Contribution In this extended abstract, we summarize our work previously published at AAMAS and JAAMAS [9, 10, 12]. Our contribution in these papers is two-fold. (1) We propose Axies, a hybrid methodology for identifying context-specific values. (2) We evaluate Axies in a user study involving 80 human subjects. We compare Axies value lists generated for two contexts to the Schwartz (general) value list (due to its high contemporary influence [7]) in their context specificity, comprehensibility, consistency, and application. We also explore the relation between context-specific and general value lists.

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2. Axies Methodology

Axies is a hybrid (human + AI) methodology where Natural Language Processing (NLP) techniques support a small group of annotators in identifying values relevant to a context. The input to Axies is an opinion corpus, which includes users' *value-laden* opinions within a context. The output is a list of values relevant to the context under analysis. Axies stimulates *inductive reasoning* by inviting the annotators to identify values held by users based on the opinions express by the users themselves. A crucial advantage of this approach is that the resulting Axies values are grounded in data.

Axies is composed of two phases: exploration and consolidation. During *exploration*, annotators are independently guided through the opinion corpus to develop an individual value list. To do so, all opinions present in the corpus are represented as vectors using the Sentence-BERT (S-BERT, [16]) sentence embedding model. Annotators are exposed to one opinion at a time, selected as the farthest opinion from the already visited opinions through the Farthest First Traversal algorithm [2]. Upon reading an opinion, annotators are asked to write down the value(s) underlying the opinion (if present).

During *consolidation*, the annotators in a group collaborate to merge their individual value lists. All values present in the individual value lists are embedded with the S-BERT model. The two most similar values are presented to the annotators, who are asked to discuss and decide whether the two value concepts overlap and thus merge the values, or continue with the following value pair. The final result is a consolidated group value list.

3. Results and Discussion

In our experiments, we asked two groups of three annotators each to perform Axies on two opinion corpora. In each group, one annotator had a technology and policy making background, and two had a computer science background. The opinion corpora were composed of the answers to two surveys conducted on COVID-19 regulations [13] and green energy transition [22]. Examples of resulting values are mental health (COVID-19) and landscape preservation (energy). We then asked two policy-making experts and 72 crowd workers to evaluate the Axies value lists and compare them to the Schwartz value list, reaching the following five conclusions. (1) Axies yields *consistent* value lists for a context, independent of the annotators. (2) Laypeople deem Axies values *comprehensible* (that is, easy to understand and distinguishable one from another). (3) Values yielded by Axies for a context are more *specific* for that context than general values. (4) When put to the concrete *application* of value annotation, laypeople annotate Axies values more often and with higher agreement than general values. (5) Only a few general values have a clear correspondence to Axies values (i.e., only the general values that are relevant to the context), and general values with a clear correspondence are often related to multiple Axies values that describe them in a more fine-grained manner in the context.

Value alignment is recognized as a research priority for achieving beneficial AI [18]. Identifying the relevant values that an artificial agent ought to align with is a remarkable effort. Axies facilitates this process by employing NLP techniques to guide human annotators through a value-laden corpus. This hybrid nature allows annotators to minimize their effort and focus on few high-level actions. A compelling future direction is to investigate the benefits of the AI component on the value identification process (e.g., by comparing Axies to a fully manual baseline).

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