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Linguistic Framing of Artificial Intelligence : What Language to Use When Talking about Artificial Intelligence

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Linguistic Framing of Artificial Intelligence: What Language to Use When Talking about Artificial Intelligence

Svenja Lammers* and Alexander Lasch

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A psycholinguistic study was conducted to assess the level of trust in different fictional products with varying framing. It was found that the product type has the greatest influence on the level of acceptance, while the expert or layperson status of the participants has the least influence. The second most relevant influencing factor is framing. The level of trust is estimated higher by all groups when a product description using the frame SUPPORTING rather than the frames DECIDING or CONTROL is presented.

Keywords: Framing, Linguistic analysis, Trustworthy artificial intelligence

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1 Introduction

This linguistic study is based on the fundamental principles of cognitive linguistics. Accordingly, a language community is a community of practice. Such a community has shared knowledge, which is reflected in a group-specific use of language. In order to understand certain things, people rely on shared knowledge. Our knowledge is organized in the human brain in the form of information networks called frames. A specific lexical item – a word or phrase – evokes a particular frame. This automatically calls up associated empirical knowledge. With the help of a comprehensive discourse analysis, the knowledge structures underlying linguistic utterances can be uncovered. Conscious framing can then be used to prevent misunderstandings and unwanted communication effects and to counter misconceptions about artificial intelligence (AI). Based on the results of three analysis steps, tangible recommendations for action for the external and internal communication of KEEN can be given.

The aim of this linguistic study was to examine and optimize the internal and external communication processes of the KEEN joint project. At the end of the project term, the results were used to develop a framework of recommendations for communicating scientific findings to the public, which ensures the comprehensibility and acceptance of those results. This manual with concrete recommendation is published in [1].

2 Linguistic Analysis

In the course of linguistic analysis of the KEEN communication, a three-staged study was conducted. The individual analyses and their results build on each other.

2.1 Analysis of KEEN Corpus

For the first focus of the investigation, the documents of the project-internal Nextcloud platform were structured and prepared. With the help of the available data, deep-seated meanings of the project-internal communication about artificial intelligence were revealed. The key question was: Which basic conceptualizations of AI can be derived from the written communication of the project partners?

The necessary data for the investigations were taken from the project-internal Nextcloud platform. The collection of texts includes different types of written communication, which have been combined into a linguistic corpus. In the Nextcloud, documents of the internal exchange between the project partners as well as the external communication with the public can be found. The collection of documents thus includes, among others, (lecture) presentations, project descriptions, and press articles. The different texts provide a

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representative image of the project-internal conceptualizations of AI.

The aim was to use corpus analysis to discover patterns in language use. These patterns, in turn, can provide information about the dominant language in the discourse. This allows us to uncover the conceptualizations of AI underlying the KEEN internal communication.

Several different conceptualizations of AI were developed from the corpus. With the help of categorization, the most important of these were selected: 1) function, 2) information, 3) communication, 4) verification, 5) intelligence, 6) awareness, 7) change, 8) automation, 9) control, 10) decision.

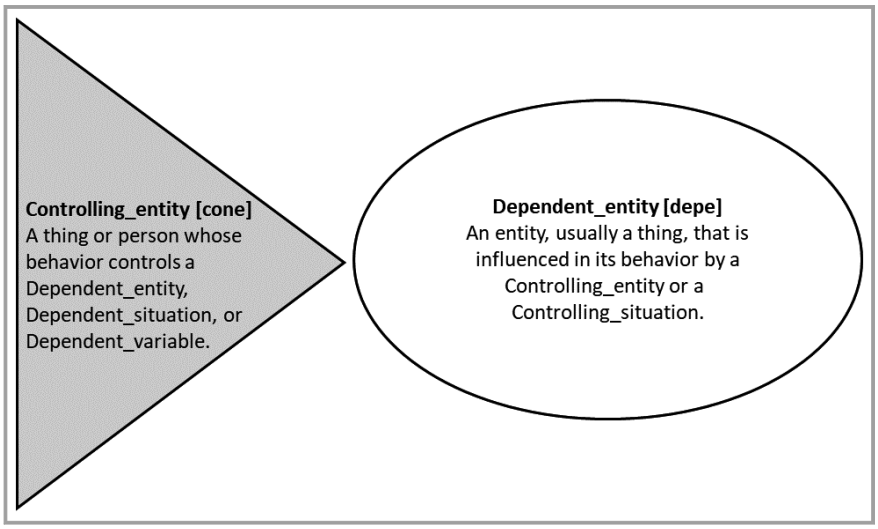

Figure 2. Framesetting CONTROL (visualization: Alexander Lasch CC-BY 4.0 International).

From these conceptualizations, three comprehensive frame settings were formed: DECIDING (Fig. 1), CONTROL (Fig. 2), and SUPPORTING (Fig. 3). The frame settings were compared with the FrameNet of Berkeley University. This project is dedicated to "[…] building a lexical database of English that is both human- and machine-readable, based on annotating examples of how words are used in actual texts" [2].

2.2 Analysis of Public Corpus

The second step is the qualitative investigation of a small section of the public discourse to check the results worked out in Sect. 2.1. Can differences be identified between project-internal communication (between experts) and (mass) media reporting (i.e., with laypeople)?

For data collection, 15 publicly published German online articles were compiled in a corpus (in the following, the German examples have been translated into English for better understanding). The articles all reported on a current event in AI development: the auction of a self-portrait of the humanoid robot Sophia in 2021. The "Robot Sophia" corpus thus offers an excerpt of the current public discourse on AI.

The most striking result of the corpus analysis is the humanization of the robot Sophia. These anthropomorphizations can be identified in various word types, which are only listed below as examples. Among other things, the humanizations can be seen on the basis of the nominal

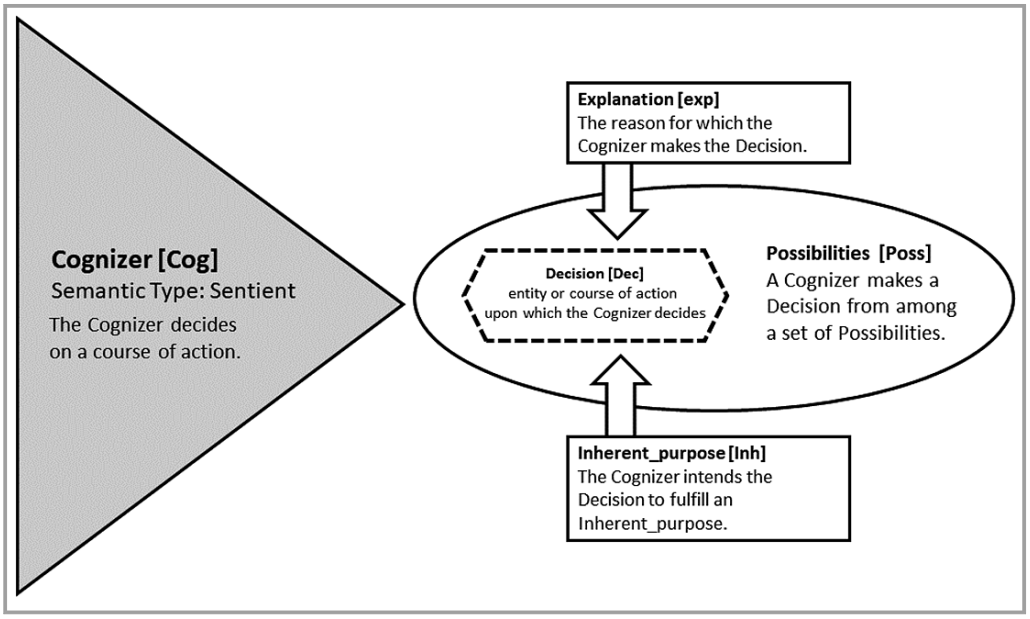

Figure 1. Framesetting DECIDING (visualization: Alexander Lasch CC-BY 4.0 International).

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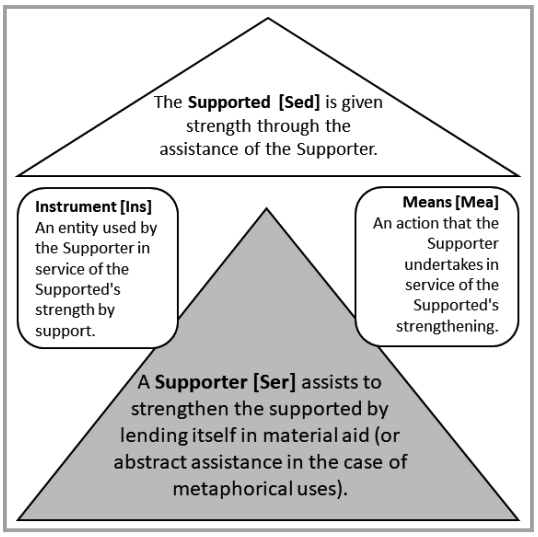

Figure 3. Framesetting SUPPORTING (visualization: Alexander Lasch CC-BY 4.0 International).

assignments: *Sophia* [standalone], *her creative process, AI artist*. In addition, the predicative assignments *painted, tried, thanked* are typical human activities. Furthermore, the adverbial and adjectival assignments such as *human-like, kind*, and *art-loving* are also examples for anthropomorphizations. As an exaggeration, the use of the name Sophia as a proper name in connection with human activities can be cited, e.g., *Sophia paints*.

With regard to the frame settings (see Sect. 2.1), the following can be stated: the frame settings DECIDING (robot as cognizer) and CONTROL (autonomous robot) can be confirmed by the lexical units that have been worked out. These two frame settings are also present in combination with strongly anthropomorphizing attributions. This can be explained using the visionary understanding of AI as strong AI. The SUPPORTING frame setting (robot as a tool), on the other hand, is not used in the examined corpus.

2.3 Psycholinguistic Survey

The previous focal points of the investigation were qualitative and interpretive. These interpretations should now also be empirically tested, taking various influencing factors into account. Can the findings derived from Sects. 2.1 and 2.2 be empirically proven? What influence does framing have on the subjective assessment of the level of trust in AI? What other factors influence this assessment? Is there a difference between AI experts and laypersons, e.g., insofar as experts are not influenced by framing?

The aim of the psycholinguistic study was to record the level of trust in the various fictional AI products. The varying framing in the short product descriptions was decisive here. Four products were fictionally developed for this purpose: a refrigerator, a clinical thermometer, an investment app, and a security robot in a production hall. There were three different wordings for each of the individual short product descriptions, which were each assigned to one of the three frame settings DECIDING, CONTROL, and SUPPORTING. During the survey, those descriptions were assigned randomly per product and participant. That means that the participants only saw one possible short description text per product which they used to rate their own willingness to trust the product on a scale of 1–5.

Two runs of the survey were conducted, gathering a total of 2334 participations which were separated into AI experts and laypersons. For this purpose, some personal data was requested at the end of the questionnaire: gender, age, and previous knowledge in the field of AI. In addition, for the run within the KEEN project partners, a query was made as to whether they belonged to "process industry employees", "research institute employees", or "other [specify]".

3 Results

The following table (Tab. 1) shows the results of the last page of the questionnaire that asked for demographic data of the participants.

Table 1. Demography of participants.

		Absolute numbers	Percent [%]
	total	2334	100
Sex	female	1062	46
	male	1215	52
	diverse	36	2
Age	17–30	2007	87
	31–50	282	12
	51 and older	24	1
KEEN partner	not a KEEN partner	2271	98
	KEEN partner	42	2
Role in KEEN	employee process industry	12	29
	employee research institute	29	69
	other [specify]	1	2
Previous professional experience with AI	yes	642	28
	no	1671	72

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Figs. 4 and 5 show the influence of product and frame on the mean trust level, respectively. Fig. 6 shows the mean trust level by frame and product, while Fig. 7 shows the mean trust level by frame and previous experience.

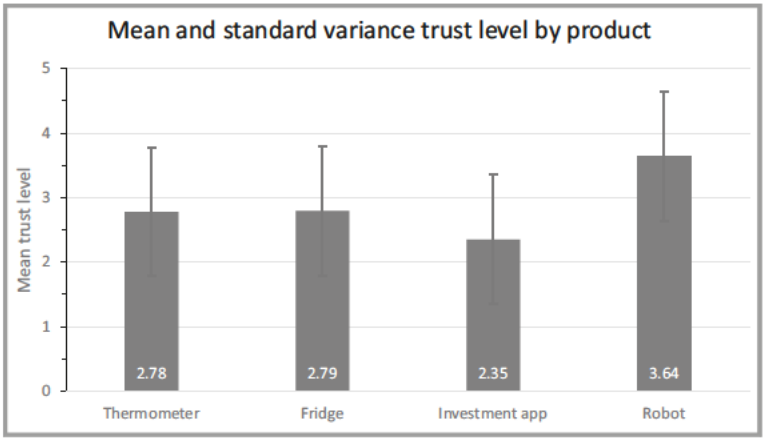

Figure 4. Mean and standard variance trust level by product.

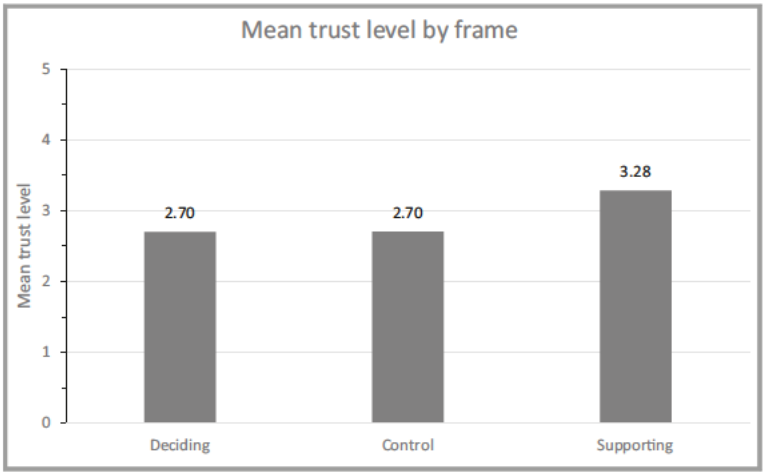

Figure 5. Mean trust level by frame.

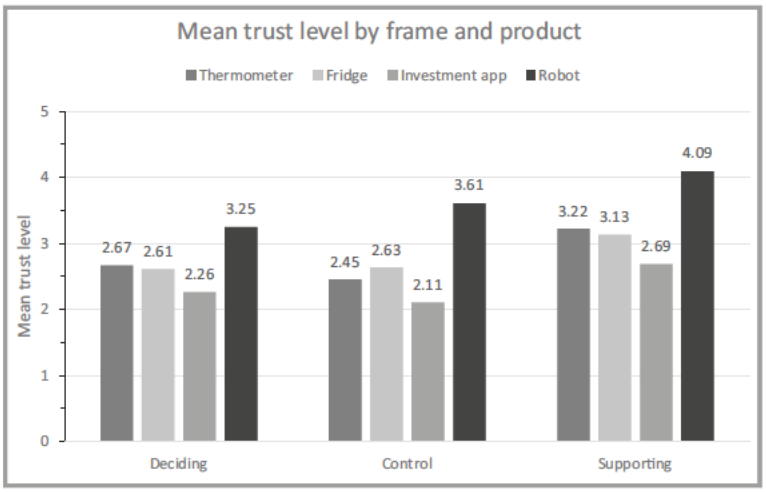

Figure 6. Mean trust level by frame and product.

The survey showed that the product has the greatest influence on the level of trust; the previous knowledge of the participants has the least influence (Fig. 8). The second most relevant influencing factor is framing. This is followed by the gender and age of the people interviewed. Overall, the robot obtained the highest level of trust and the financial app the lowest. In general, the SUPPORTING frame always achieved the highest level of trust.

The frames DECIDING and CONTROL both evoke an association of power, freedom of action, self-determination and thus influence and yes, also potential for development, possibly even the potential to develop oneself. As a result, we see AI entering into a competitive relationship with humans that we could lose (a potential defeat). When using the SUPPORTING frame, we never consider the AI detached from the human being but can only ever describe it in relation to the human being – in contrast to the other two frame settings, which attest a form of self-determination to the AI.

The psycholinguistic study also shows that even before framing, the biggest influencing factor is the product itself. This means that products that affect our everyday lives are given less trust. We can differentiate between the products based on their occurrence in everyday life: a security robot has little to do with our everyday reality, so we are less emotional and would rather trust it. Concerning money or our private space, we are more suspicious of things.

4 Focus of Attention and Entrenchment

The agent (or initiator) performs an action or causes a change in status, while the patient (also undergoer) is subjected to an action or change of state. The instrument is used as a tool for an action. It is important to note that these are semantic concepts. The terms are therefore not to be confused with subject and object. Agent and patient are determined by their relationship to the action expressed by the verb of a sentence: in "The engineers are supported by AI", the engineers are the subject, but AI is the agent.

Evans defines focus of attention as "[o]ne of the kinds of pattern which serve to govern the distribution of attention in the attentional system" [3].

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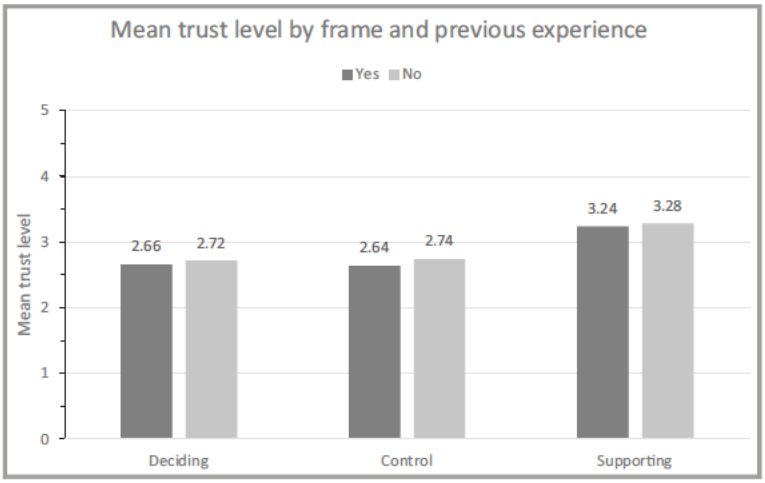

Figure 7. Mean trust level by frame and previous experience.

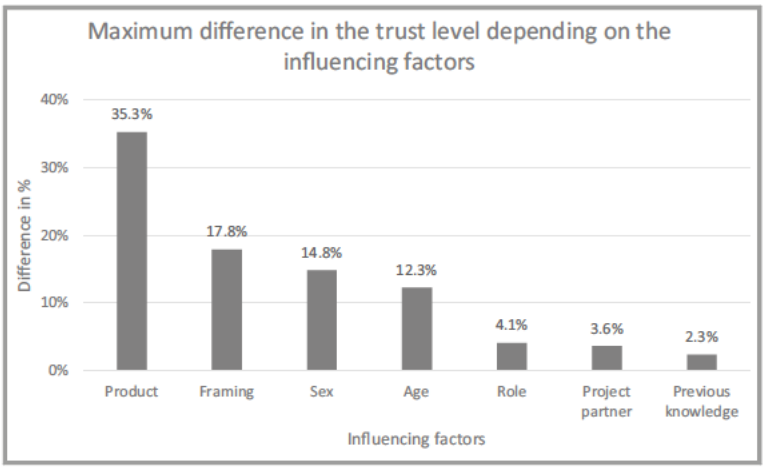

Figure 8. Maximum difference in trust level depending on the influencing factors.

Furthermore, Langacker describes landmark-trajector-organization as a special case of figure/ground alignment [4]. It relates to the roles and prominence of participants in a linguistically encoded situation. There is an asymmetry in the relation between the presentation of the participants: "In the expression *X equals Y, X resembles Y*, or *X above Y, X* is referred to as a trajector, and *Y* as a landmark. This terminology reflects the intuitive judgment that *Y* provides a reference point with respect to which *X* is evaluated or situated: *X* stands out as the entity being assessed, and this assessment takes the form of its relationship to *Y*" [4]. Both concepts demonstrate that in a sentence, our focus of attention is directed to the beginning of the sentence as well as the agent. These findings can be used when communicating about AI (as shown in Fig. 9).

Another important concept to keep in mind at this point is entrenchment which is defined as "[t]he establishment of a linguistic unit as a cognitive pattern or routine in the mind of an individual language user. The greater the frequency of the linguistic unit in the language input the more entrenched the unit is likely to become" [3]. That means that repetitions have a further influence on perception. The more frequently something occurs, i.e., the higher the frequency of a linguistic construction, the more it is remembered. In addition, we are more likely to believe what we often hear and, therefore, have a greater willingness to trust it.

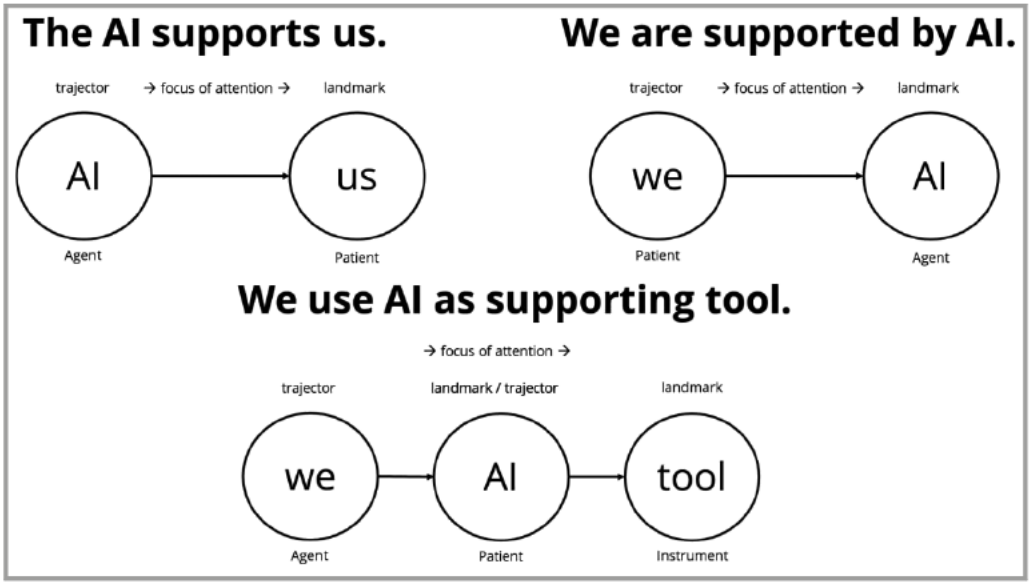

Figure 9. Focus of attention/trajector-landmark-organization (visualization: Alexander Lasch CC-BY 4.0 International).

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5 Conclusion and Recommendations

The previous studies show that language or certain lexical units have a decisive impact on the image of artificial intelligence. If certain lexical items evoke certain experiences in the recipient, the use of language in connection with AI should be chosen precisely and with great care. In connection with these investigations, cognitive linguistics and frame semantics offer a secure and comprehensible theoretical foundation.

The frame settings DECIDING, CONTROL, and SUPPORTING form categories in which linguistic utterances can be summarized and then analyzed. The lexical units that can be assigned to the frame settings DECIDING and CONTROL should be avoided in the future. At the same time, the use of humanizations and humanoid metaphors can be discouraged.

In contrast, lexical units that belong to the SUPPORTING frame setting should be used more in external communication. In this context, the presentation of AI as a tool is also appropriate and is therefore recommended.

The DECIDING and CONTROL frame settings to be avoided are associated with the following ideas, among others: AI with the ability to perform cognitively, AI with power (over humans), and AI in competition with humans. The last two examples in particular call up a chain of experiential data in which people could potentially lose out in competition with AI. This thought in turn triggers fear and distrust, i.e., negative emotions, in the recipients.

The lexical units that are recommended can be found in the SUPPORTING frame setting, e.g.: KI as a tool or KI as a relief for people. Especially the cooperation aspect between AI and humans should be emphasized more. The link with positive emotions should therefore be the focus of communication. As stated above, by using the frame setting SUPPORTING we describe AI solely in its relation to the human being.

To emphasize the prominence and active part of the human being, we recommend to use the human being as agent and at the beginning of a sentence as well as to use the AI as patient and/or instrument and later in the sentence.

Furthermore, these studies also show that we have to deviate from the scientific language in dialogue with the public. We should use fewer passive constructions and refrain from convoluted, complicated formulations and prefer short, clear sentences. In addition, first-person narratives, which are actually undesirable in technical language, generate trust.

To be able to establish a functioning communication, we have to be aware of our own role in the discourse as well as that of the public. We should think about creating a common ground, i.e., a shared knowledge base, which is the prerequisite for a successful dialogue in the first place. And for that you need a common language. One of the goals of the linguistic research in KEEN is a long-term strengthening of awareness for language and language reflection in the scientific discourse regarding AI. For a shift in the way people perceive developments in AI research, it is critical that scientists use the mentioned constructions consistently in communication with the public since the constant repetition is of great importance.

A detailed description of the three-staged study as well as the frame settings and recommendations can be found in the manual we developed, which is published on https://doi.org/10.5281/zenodo.7415549.

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