Large Language Models in Metaphor Identification: The Case of Presuicidal Interactions

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1 Introduction

According to previous studies in the field of discursive suicidology (Erdős, 2006; Simon et al., forthc), metaphors play an important role in communicating presuicidal ideation. Our project aims at developing an automatic tool for metaphor identification in online posts about suicidal thoughts and intentions, integrating a generative large language model into the procedure. The paper discusses the theoretical and methodological background of the research, provides a detailed overview of the pipeline of our tool, and presents the results of evaluating the performance of different LLMs in the task, as well as demonstrates the demo version of the platform for metaphor annotation.

2 Research questions

What are the most typical metaphorical patterns of talking about suicidal intentions? How can the analysis of linguistic metaphors contribute to the detection and evaluation of potential suicide risk in presuicidal discourse? Within the framework of broader research, we investigate the metaphorical patterns of presuicidal online interactions in order to improve discourse-based suicide prevention and render the automatic evaluation of the seriousness of suicidal intentions possible based on recurring linguistic patterns of metaphorical language use. The more specific questions addressed in our paper are as follows:

1. How can an LLM be integrated into the procedure of metaphor identification?
2. What are those subtasks that can be effectively performed by a model instead of a human annotator?
3. Which LLM performs the best in metaphor identification?
4. How can the performance of a model be improved via more precise standardization and the refinement of prompting?

3 Methodology

3.1 Research infrastructure

For this project, the input material is sourced from a manually annotated, standardized, and curated small-scale corpus of online posts about suicidal thoughts published in a forum for an online support-seeking community (bura.hu). The PsyMet corpus provides a solid ground for testing and improving the effectiveness of the AI model. As a primary lexical database, the "Magyar Szerkezettár" (The Hungarian Constructicon, Sass (2024)) is used for retrieving meaning descriptions and exploring the organization

of multi-word units of Hungarian. The developed platform implements LLM-prompting with the use of available tools, including GPT-4o, GPT-4.1, OpenAI o3. Additionally, the solution is compatible with open source models such as LLama 3.3 70b, Quen 3 32b, which we also plan to use.

3.2 Normalization of the data

The texts in the PsyMet Corpus were normalised for machine identification and unification of metaphorical structures. The principles of normalization are the following.

- Spelling errors were corrected during normalisation to support the accuracy of lemmatisation, as the method is based on the selected dictionary.
- From the dictionary-based aspect, we have also eliminated unambiguous abbreviations.
- Removed the non-standard punctuation patterns and emoticons.
- The character encoding inconsistencies were also corrected.

3.3 Manual and automated analysis of metaphors

Identifying linguistic metaphors requires substantial manual effort, and full automation is still not achieved, particularly for low-resourced languages like Hungarian. Although the adaptation of the most recent procedure of metaphor annotation (MIPVU, see Steen et al. (2010)) to the Hungarian language was achieved (Simon et al. (2023)), only small-scale corpus analyses have been carried out (see e.g., Bajzát and Simon (2024)), due to the time-consuming process of human annotation. The advent of generative AI tools could bring about a major change in this area, since a well-developed AI assistant can enhance the semantic analysis of linguistic expressions in the context of the actual discourse.

The original procedure for metaphor identification is a dictionary-based word sense disambiguation process: with the help of a concise dictionary of the target language, the analyst compares the basic meaning (typically more concrete, more specific, and human-related, listed as the first sense of the expression in the dictionary entry) and the contextual meaning (defined by the analyst relying on further senses of the expression provided by the dictionary), and if there is a potential cross-domain mapping motivating the contextual meaning, the given expression can labelled as metaphorical. From this outline of the procedure, it becomes clear that there are two major points where AI tools can support the annotation process: in retrieving the basic and the contextual meaning from the lexical database, and in evaluating their relationship in terms of metaphorical use. Thus, our solution for the challenge of automatic metaphor identification closely resembles the dictionary-augmented sentence disambiguation method used in specific Uralic languages, with the use of ChatGPT (Hämäläinen (2024)).

The steps of the automated analysis are as follows.

1. Segmenting the input text into sentences.
2. Lemmatization and morphological analysis.
3. Querying the lemmata and/or morphological units (i.e., inflections, preverbs, etc.) in the lexical database.
4. Identifying the basic and the contextual meanings of the given lemma/morpheme.
5. Instructing the LLM to decide on a potential metaphorical interpretation.
6. Providing a label of metaphor by the LLM.

The automated identification process considers both the morphological structure of the target expressions and their potential idiomatic nature as multi-word expressions. The tool generates a collection of suggested metaphorical labels, ready for validation by the human annotator.

4 Evaluation

The evaluation of the developed tool consists of two steps. First, the model's performance is tested with few-shot prompting using different numbers of examples, randomly selected from a predefined and PoS-tagged sample of the PsyMet corpus. Secondly, the accuracy of the automated metaphor detection process is evaluated by assessing the precision and recall using the PsyMet database as a gold standard reference corpus.

5 Preliminary findings

5.1 Model Performance

As for preliminary results, the precision of different LLMs in the task of metaphor identification ranges from 58.84% (LLama3) to 62.24% (GPT-4o-mini) and 82.78 % (GPT-4o), evaluated on a small set of the original corpus. Diagram 1 demonstrates the performance of the most effective model.

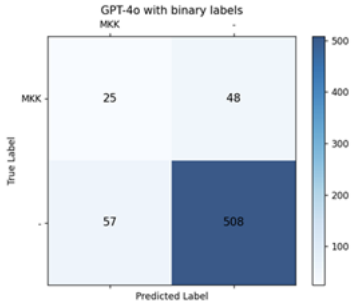

Figure 1: The performance of teh best model.

5.2 Impact

The project lays the foundation for a general automatic metaphor identification tool that (i) can manage linguistic metaphors at various levels, ranging from morphemes to lexical units and multi-word expressions, and (ii) can expand the process of semantic annotation to include figurative language use. The project focuses on a specific area of mental health communication, investigating the key metaphors of presuicidal syndrome and distinguishing them from more general metaphors of crisis. Thus, it demonstrates the application of an LLM-supported linguistic analysis in psychological research, making it possible to create large-scale databases of metaphorical language use in mental health issues. Although the developed tool does not evaluate the identified metaphors themselves from the perspective of suicide risk, it can contribute to grounding future research on presuicidal interactions in a rich set of systematically processed linguistic data. As a result, the project fosters collaboration among linguistics, NLP, and psychology, enabling real-time detection of suicide risk through the analysis of linguistic metaphors in online discussions.

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