

Different language games, different embeddings? How word embeddings could show language games differ in science

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This research will cover theory behind using natural language processing (NLP) word embedding methods to detect differences in language games played in science. Wittgenstein uses 'language games' to explain how words gain meaning through use. Among a group of people, usage of a word often follows certain, unwritten, rules. These rules can differ from those in another group, like house rules for a card game which vary based on the group playing and where they are. At my friend's house playing a 10 in a game of Mau-Mau means everyone hands their cards to the person to their left. Meanwhile, at my aunt's house a 10 means the current player may play another card. The difference in word usage can lead to a difference in meaning between those groups (§65-69 Wittgenstein 1989). For example, to one group of friends 'going to the city' means they meet up and travel together, where another group meets at a cafe in the city. Both groups on their own know what they mean, but if someone from the first group joins someone from the second they may both think they were stood up. In science different disciplines can play their own language games. Similar to the friend groups, this can cause confusion when collaborating across disciplines. Unlike the friend groups, the language games of disciplines often play out in published articles. This can cause misunderstandings when someone reads across different disciplines and make the articles outside their own discipline less accessible (Ellaway 2021).

To those familiar with NLP 'meaning through use' may already sound similar to the idea behind word embeddings. Word embeddings are mathematical representations of how a word is used in text. The exact link between the embedding and the word's use depends on the method, but is often based on which words occur around the embedded term. While the embeddings of words may not cover the entire 'context' of a language game (Skelac and Jandrić 2020) I argue they can be used to detect differences between language games of different groups. In this case word embeddings can be used to detect differences between disciplines' language games around that word. This work therefore offers a new view of embedding distance to show differences between language games. Distance between group's word embeddings can then be used to help those crossing

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between the language games know which words may lead to miscommunications.

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