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Proceedings of the Annual Meeting of the Cognitive Science Society

Title

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Permalink

Journal

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Publication Date

Peer reviewed

Refining the cognitive semantic web: The tensor method to represent the topographic emplacement of different word categories

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Abstract: A central problem concerning the organization of the cognitive semantic web is to understand how different categories of words are stored in the brain with a well-defined topographical organization. This topography is a natural construction that plausibly is strongly related with the syntactic and semantic organization of natural languages. An eloquent experimental evidence of the existence of a continuous semantic representation of object and action categories in the human brain has been published by Huth et al (Neuron 76:1210, 2012). One of the ways to explain the emergence of a topographical organization in the brain cortex using neurocomputational models, is by means of Kohonen's self-organizing maps. Here we show that these topographies can be operationally represented with associative memories spatially organized by tensor contexts. We illustrate formally and numerically this fact. In addition, we show that, consistently with evidence from pathology, different semantic categories can be specifically damaged.