What is a "taxonomic network"? On the relationship between hierarchies and networks

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In cognitive-linguistic approaches such as Construction Grammar, Cognitive Grammar and Word Grammar, speakers' linguistic knowledge is modelled as a taxonomically structured network (Diessel 2019; Hudson 2007; Langacker 1987). In this network, abstract constructions and their more specific subtypes are connected via hierarchical relations known as inheritance links (Goldberg 1995). This model raises important theoretical questions about the relationship between hierarchies and networks: are hierarchies a type of network, or are the two systems distinct forms of knowledge representation? How do different network architectures represent constructional generalisations? In our talk, we address these questions from a theoretical perspective, also drawing on insights from formal network science (e.g., Barabási 2016).

We distinguish between two different ways of encoding hierarchical structure in networks: explicitly hierarchical networks and implicitly hierarchical networks. In explicitly hierarchical networks, the nodes represent categories at varying levels of abstraction. Using a simple, non-linguistic example (see Fig. 1a), an individual's network could relate several previously witnessed instances of dogs (dog_1, dog_2, dog_3) to a superordinate DOG node, which in turn is connected to a MAMMAL node. In implicitly hierarchical networks, on the other hand, only specific instances, or "exemplars", constitute nodes, while all higher-level categories are implicit in the linking patterns among these nodes. As shown in Fig. 1b, the network would thus only contain the dog exemplars as nodes, while the concept of DOG is implicit in the (strong) similarity links between these exemplars, and MAMMAL is implicit in the (weaker) links among the dog exemplars and all other exemplars that fall into the category (e.g., cat exemplars). Explicitly hierarchical networks tend to contain more nodes and fewer links, while implicitly hierarchical networks contain fewer nodes but more links, thus relating to the previous distinction between node-centred and connection-centred approaches (e.g., Hilpert & Diessel 2017).

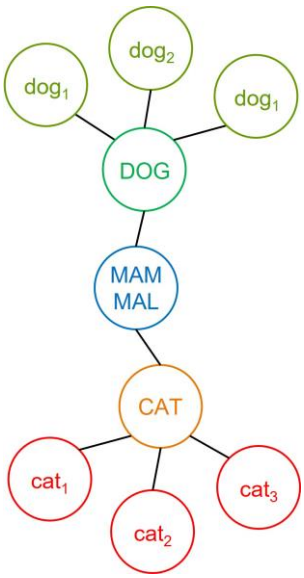

Fig. 1a: Explicitly hierarchical network.

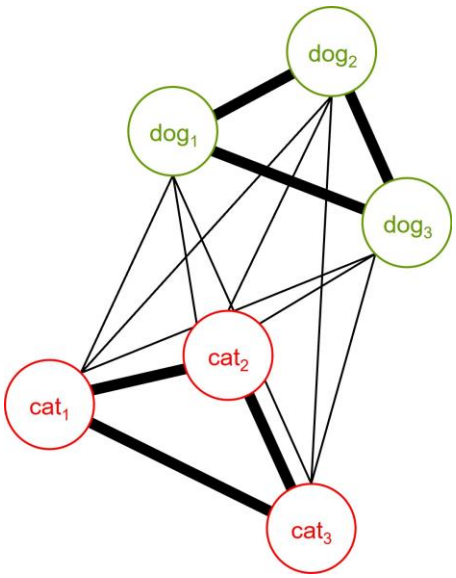

Fig. 1b: Implicitly hierarchical network.

The choice of network type has important consequences for modelling constructional networks. In particular, the networks may express different views about the role of abstraction in language. Explicitly hierarchical networks are often used to argue that speakers store generalisations, such as the double-object construction, as independent parts of their linguistic knowledge. The category nodes in the network are thus interpreted as cognitively real(istic) units. Implicitly hierarchical networks, in contrast, align more naturally with the view that speakers only store exemplars and then analogise across them on the fly (Ambridge 2020). As a result, constructions may merely be heuristic, (meta-)linguistic devices

to describe generalisations that emerge from links between exemplars. Another related question is how much redundancy there is in the network: in explicitly hierarchical networks, the category nodes duplicate information that is also inherent in their subtypes. Implicitly hierarchical networks, on the other hand, do not entail such redundant storage because information is only encoded once at the lowest-possible level.

In sum, we argue that both explicitly and implicitly hierarchical networks can be useful for linguistic analyses, but that their varying interpretations have important theoretical ramifications.

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