

The Difference that matters for Semantic Information

Session 1: What is information?

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Bateson (1972: 457–9) proposes that “what we mean by information – the elementary unit of information – is a difference which makes a difference.” The aim of my talk is to describe the difference that makes a difference for *semantic information*. For this I will go back to an insight from one of the founding fathers of modern logic, Gottlob Frege. This is followed by a whistle-stop tour of theories of semantic information as proposed in the fields of formal and computational semantics.

Take the following three sentences: (a) “The Greeks defeated the Persians at Plataea”, (b) “The Persians were defeated by the Greeks at Plataea” and (c) “The Persians defeated the Greeks at Plataea”. Each sentence is different from the others – e.g., in (a) and (b) the words are ordered differently and (b) contains the extra words “were” and “by”, when compared with (a). And yet, (a) and (b) mean roughly the same. In contrast, the semantic information conveyed by (c) is different from that of both (a) and (b).

Almost a hundred years before Bateson’s “the difference that makes a difference”, Gottlob Frege, proposed an answer to the question *What is the difference which makes a difference when it comes to semantic information?* Before looking at Frege’s proposal, we need to introduce some terminology. Frege speaks of *conceptual content* rather than semantic information, and focuses on the role that such content plays in *judgements*. The content of a sentence, such as (a), (b) or (c) is a “mere complex of ideas” in Frege’s words. When we utter a sentence to make a statement that counts as a judgement, i.e., the speaker expressing the recognition of the truth of the content. Now, Frege proposes that:

The contents of two judgements may differ in two ways: either the consequences derivable from the first, when it is combined with certain other judgements, always follow also from the second, when it is combined with these same judgements, [and conversely,] or this is not the case. The two propositions “The Greeks defeated the Persians at Plataea” and “The Persians were defeated by the Greeks at Plataea” differ in the first way. Even if one can detect a slight difference in meaning, the agreement outweighs it. Now I call that part of the content that is the same in both the conceptual content. (Frege, 1879: 2-3 in the original)

Thus, Frege distinguishes two ways in which contents may differ: one which matters and one which does not. The difference that matters leads to a difference in conceptual contents, whereas the one that does not is equated with sameness of semantic content. In modern set-theoretic notation we can express the difference that matters as follows:

The contents c_1 and c_2 of the judgements J_1 and J_2 are *different* IF AND ONLY IF for some finite set of judgements S :

$$\{J \mid J \text{ follows from } \{J_1\} \cup S\} \neq \{J \mid J \text{ follows from } \{J_2\} \cup S\}$$

One of the key notions in Frege’s proposal is that of a judgement following from another set of judgements. In my talk I will describe two alternative frameworks for understanding “follows from”: *Model-theoretic Semantics* for formal languages based on Tarski’s theory of truth and *Inferential Semantics*, which is rooted in the work on Proof Theory by Gentzen, Heyting, Prawitz, Dummett and others.

References

Bateson, G. (1972). *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. University Of Chicago Press.

Frege, G. (1879), *Begriffsschrift*, Nebert, Halle: English Translation in J. van Heijenoort (ed.) *From Frege to Gödel*. Harvard University Press, Cambridge, Mass., 1971, 1-82.