

# Towards a cognitively plausible compositional model for natural language quantification

Natural language is among the basic tools of human cognition. Advances in modeling the meaning of various types of expressions contribute therefore directly to a better understanding of some of the peculiarities of our cognitive activity. Our research proposal revolves around the notion of linguistic quantification, as expressed by quantifier words such as *every*, *some* or *most*. The goal of the project is to develop a cognitively plausible model for linguistic quantification, satisfying three main desiderata: (i) direct compositionality: the model should not posit any structures that go beyond the overt syntax; (ii) incrementality: the model should reflect the incremental process of natural language understanding on a left-to-right basis; (iii) empirical adequacy: the model should capture the range of readings available for sentences involving interacting quantifier expressions and also account for the intricate pattern of interpretative preferences seen in natural language users.

The central claim of the project is that a particular hitherto largely unnoticed structure — dependent type — underlies a great number of quantificational phenomena.

I. Dependencies are responsible for inverting scope, as in the example below:

- (1) A representative of every country.

The construction in (1) is naturally understood to mean that for every country there is a different representative from that country. We assume that the relational noun *representative* introduces a dependency between each of the countries and the representatives of that country; quantifying over this dependency yields the preferential inverse reading, where *every country* scopes over *a representative*.

II. Dependencies are also needed for tracking anaphoric reference, as in the following example:

- (2) Every farmer who owns a donkey beats it.

The sentence in (2) is naturally read as meaning that every farmer beats every donkey he owns. We assume that (2) quantifies universally over the dependency between each of the farmers and the donkeys owned by that farmer.

To develop a cognitively plausible compositional model of the phenomena in hand, we propose to combine modern type-theoretic tools (dependent types, monads) and experimental methods. If the empirical implications of the model are borne out, then this will make a strong argument in support of the psychological reality of dependent types.