

Integrated testing of typological hypotheses at scale

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The Grammar Matrix (Bender et al. 2002; 2010) is a system which creates grammars grounded in HPSG (Pollard & Sag 1994) based on users' specifications input via a web questionnaire. The questionnaire is based on the typological literature and covers a variety of phenomena, including word order, case system, information structure, tense, aspect, mood, clausal modifiers, and clausal complements. The Grammar Matrix thus provides a unique platform for testing linguistic hypotheses both at scale, by creating starter grammars for many languages, and in interaction with each other, ensuring that, e.g., the analysis of information structure will be tested along with that of constituent questions even if it is only the latter that the linguist is thinking about.

We present insights which arise from a review of (i) the error analyses performed by the Grammar Matrix developers over the years on genealogically and geographically diverse languages that were not specifically described in the source typological survey or considered during development; and (ii) the Grammar Matrix's validation system. The error analyses include identifying which languages the Grammar Matrix cannot create grammars for. To the extent that the Grammar Matrix libraries faithfully capture the results of typological studies, the error analyses can point to lacunae in the typological literature. Conversely, the Grammar Matrix's success in producing grammars for over 150 diverse languages indicates that the remaining parts of the literature are making robust claims. The validation system checks grammar specifications for consistency before customization. It has been developed both on the grounds of what the typological literature contends is impossible and on the grounds of certain combinations of choices seeming difficult or indeed impossible to implement.

The Grammar Matrix has been developed with the intention of combining the breadth of typological research with the depth of formal syntax. The system is now large enough and has been tested against enough languages – 56 in the regression testing system plus over 100 in a classroom context – that this strategy allows us to discover both specific cases where languages contradict proposed generalizations and specific cases where analyses make predictions in combination that are not apparent when phenomena are considered in isolation.

References: Bender, E.M. & D. Flickinger & S. Oepen (2002). The Grammar Matrix: An open-source starter-kit for the rapid development of cross-linguistically consistent broad-coverage precision grammars. *Proceedings of the Workshop on Grammar Engineering and Evaluation*, CCL, 8–14. Bender, E.M. & S. Drellishak & A. Fokkens & L. Poulson & S. Saleem (2010). Grammar Customization. *Research on Language and Computation* 8(1), 23–72. Pollard, Carl & I. Sag (1994). *Head-Driven Phrase Structure Grammar*.

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