Commentary on Daelemans, Gillis, and Durieux

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The article by Daelemans et al. bears on an important question about the adequacy of the "Principles and Parameters" framework as the basis of a *process account* of language learning (exemplified, for instance, by the work of Dresher and Kaye 1990). As Gupta and Touretzky (1991, 1994) have pointed out, a learning system based on a particular linguistic description (of metrical phenomena, for example) can at best learn whatever is describable within that linguistic formalism; however, important aspects of real-world stress data do not appear amenable to parameter-based description, and are therefore unlearnable for a parameter-based system.

In the present work, the authors make a careful examination of main stress assignment in Dutch, showing that the consensus (parameterized) linguistic analysis for Dutch yields correct stress for only 81.1% of the words in a representative corpus. The problem is that when words are represented only by their syllable weights (as required by metrical theory), they can be ambiguous with respect to stress assignment.

A parameter-based procedure therefore can at best learn only the "regular" 81.1% of the data. By assuming certain lexically specified exception markings, the framework can be extended to allow characterization of a further 16% of the data; however, the analysis then loses its principled, parameterized form. Furthermore, it offers no account of how these "irregular" data could be learned, except by rote.

The authors contrast this with results they obtained using *instance-based learning* (IBL); their system was trained on 90% of the corpus and tested on the other 10%. With an input representation encoding only syllable weight, IBL performed at 81.26% correct, which consisted of all the regulars but none of the irregulars, mirroring the descriptive adequacy of the linguistic formalism based on the same representation. When the input representation encoded phonemic information (instead of syllable weight), IBL performed at 88% correct, which included most of the regulars and a substantial proportion of the irregulars. Rote learning would have to be invoked for the remaining 12% of the data. However, this is probably about the best that can be done given the idiosyncracies of Dutch stress, and it is substantially less than the 20% rote learning required in the linguistic scheme. The difference lies in the use of phonemic information.

Choosing between these schemes is largely a matter of preference, and the authors' results do not rule out the linguistic alternative. Rather, the importance of their work lies, first, in highlighting the *inadequacy of a parameter-based framework* for characterizing and learning Dutch stress assignment, and second, in its demonstration of the *utility of phonemic information* in learning about stress. Both these results deserve to be taken seriously by metrical phonologists.

References

Dresher, B. E., and Kaye, J. D. (1990). "A computational learning model for metrical phonology." *Cognition*, 34, 137–195.

Gupta, P., and Touretzky, D. S. (1991). "What a perceptron reveals about metrical phonology." In *Proceedings, 13th Annual Conference of the Cognitive Science Society*, 334–339. Lawrence Erlbaum.

Gupta, P., and Touretzky, D. S. (1994). "Connectionist models and linguistic theory: Investigations of stress systems in language." *Cognitive Science*, 18(1), 1–50.

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