THE LOGIC OF OT RANKINGS

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Standard OT learning algorithms such as RCD or GLA use a single total ordering or partial ordering (stratified hierarchy) of constraints as the hypothesis about the grammar. As is well known, this necessarily leads to overcommitment, because certain datasets (think of a comparative row like [W, W, L]) impose irreducibly disjunctive conditions on what a ranking compatible with the data should be. As the result, learning is never conservative, and hypotheses often have to be rolled back even when the data are perfectly consistent.

At the same time, it is clear that we could in principle use the set of all total rankings compatible with the data as a conservative hypothesis, but no method for working with such sets was developed other than brute force ones. And those are both computationally heavy, and unintuitive: it is not easy for humans to work with amorphous sets of total rankings. As the result, even most basic facts about sets of rankings which constitute faithful, non-overcommiting grammar hypotheses for tableaux, were not known: for instance, which sets of rankings can be such hypotheses, and which cannot correspond to any tableau at all.

This paper overcomes the technical problems of working with sets of total rankings, and develops methods which allow to use them as full-fledged grammar hypotheses, and thus enable learning without overcommitment. There are two key components of our approach:

- We conservatively extend OT compatibility conditions from total rankings to partial rankings and sets of partial rankings. A set of partial rankings comes out as OT-equivalent to a set of all of its refinements, and can be used in its place in reasoning, which makes such reasoning both more intuitively accessible and computationally easier.
- We find a one-one correspondence between (equivalence classes of) OT tableaux and (equivalence classes of) sets of OT rankings. The bijection is computable, and thus provides a way to transform the data in the form of a tableau without any overcommitment into the set of rankings containing all and only the information which was present in the data.

Thus OT tableaux and sets of rankings turn out to be two sides of the same coin. Thus there is no actual choice between using (objects based on) rankings or (objects based on) tableaux (cf. the position of [Prince, 2010]) as grammar hypotheses: they are just different ways of expressing the same information.

Methods for manipulating tableaux and extracting information from them about the ordering of certain constraints are well-known. As an addition to them, the paper develops methods for manipulating rankings as well. For instance, we define an operation of pairwise ranking-union $\Cup$ on sets of partial rankings which corresponds to the union of tableaux, and equivalence-preserving transformations on sets of rankings simplifying them, which constitutes an analogue on the tableau side operations used in algorithms such as Fusional Reduction of [Brasoveanu and Prince, 2005].

References

[Brasoveanu and Prince, 2005] Brasoveanu, A. and Prince, A. (2005). Ranking and necessity, part i. ROA 794.

[Prince, 2010] Prince, A. (2010). Ot without ranking. Handout for Harvard Linguistics Colloquium, February 2010.