Analysis of Joint Inference Strategies for
the Semantic Role Labeling
of Spanish and Catalan

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Abstract. This paper analyzes two joint inference approaches for semantic role labeling: re-ranking of candidate semantic frames generated by one local model and combination of two distinct models at argument-level using meta learning. We perform an empirical analysis on two recently released corpora of annotated semantic roles in Spanish and Catalan. This work yields several novel conclusions: (a) the proposed joint inference strategies yield good results even under adverse conditions: small training corpora, only two individual models available for combination, minimal output available from the individual models; (b) stacking of the two joint inference approaches is successful, which indicates that the two inference models provide complementary benefits. Our results are currently the best for the identification of semantic role for Spanish and Catalan.

1 Introduction

Semantic Role Labeling (SRL) is the task of analyzing clause predicates in open text by identifying arguments and tagging them with semantic labels indicating the role they play with respect to the verb, as in:

[Mr. Smith]$_{Agent}$ *sent* [the report]$_{Object}$ to [me]$_{Recipient}$ [this morning]$_{Temporal}$

Such sentence–level semantic analysis allows to determine "who" did "what" to "whom", "when" and "where", and, thus, characterize the participants and properties of the *events* established by the predicates. This semantic analysis in the form of event structures is very interesting for a broad spectrum of NLP applications.

The work proposed in this paper fits in the framework of supervised learning with joint inference for SRL. We introduce a stacking architecture that exploits several levels of global learning: in the first level we deploy two base SRL models that exploit only information local to each individual candidate argument; in the second level we perform re-ranking of the candidate frames generated by the base models; and lastly, we combine the outputs of the two individual models (after re-ranking) using meta-learning and sentence-level information.

The combination/joint inference models we introduce are not novel in themselves: all state-of-the-art SRL systems (see, e.g., [1–4]) include some kind of combination to increase robustness and to gain coverage and independence from parse errors. One may combine: 1) the output of several independent SRL basic systems [2, 5], or 2) several outputs from the same SRL system obtained by changing input annotations or other internal parameters [4, 3]. The combination can be as simple as selecting the best among