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Studying French mapping of syntax to prosody in natural speech

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Background
- Standard definition of the French Accenual Phrase: any lexical word and all dependent words at its left side [3, 5, 7].
- In general, a rising pitch movement (H*) marks its right edge [3, 5, 7].
- Factors contributing to the AP’s formation [6, 8, 2]:
  - # of syllables (3/4 on average)
  - Articulation rate
  - Rhythm (balance of APs in terms of # of syllables)

Goals
- Studying the syntax to prosody mapping to analyze the formation of APs in French by using large corpora & semi-automatic analysis
- Analyzing whether syntactic information is a good predictor of the AP’s formation
- Analyzing the contribution of:
  - Constituent length (# of syllables / phrase)
  - Constituent type
  - Temporal cues

Corpus
- Subset of French ETAPE corpus [4]
  - 25 speakers
  - 1.5 hours
  - 16,377 words

Grammatical Annotations
- French Spoken Treebank [1]
  - 25 POS labels
  - 12 Constituent labels
  - Several Function labels

Methods

Linguistic Information Extraction
- Focus on the most frequent constituents observed in the corpus:
  - Noun Phrases (NP)
  - Verbal Nuclei (VN)
  - Adjectival Phrases (AdjP)
- Automatic alignment to the signal as Praats’ TextGrids

Prosodic Analysis
- Rising pitch: an AP was marked if its rightmost syllable carries a rising movement >2 st
- Normalization of constituent durations: duration of constituent /number of phones

Mapping
- Predictions: Any lexical word and its function word(s) at the left side (in non-final positions) calls for a final prosodic boundary (rising pitch)

Results, Analysis and Discussion

Successful predictions across the 3 constituent types

General observations
- Identification of 4,415 potential APs:
  - 2,528 Noun Phrases
  - 1,713 Verbal Nuclei
  - 428 Adjectival Phrases
- 43% success rate: relatively weak match of syntactic and prosodic information
- The syntactic-prosodic predications are less accurate with VN

Possible Explanations
- 40% -> monosyllabic constituents -> too small for an AP
- Prosodic patterns in VN constituents:
  - Rising pitch movements are less frequent than in the rest of the categories
  - Durations are shorter

Conclusion
- Best match for AdjP: Adj. tend to follow NP
- Worst match for VN: (i) Tend to precede NP & (ii) short durations
- Future: consider phrase merging (NP+AP, VP+AP…) & length conditions

References