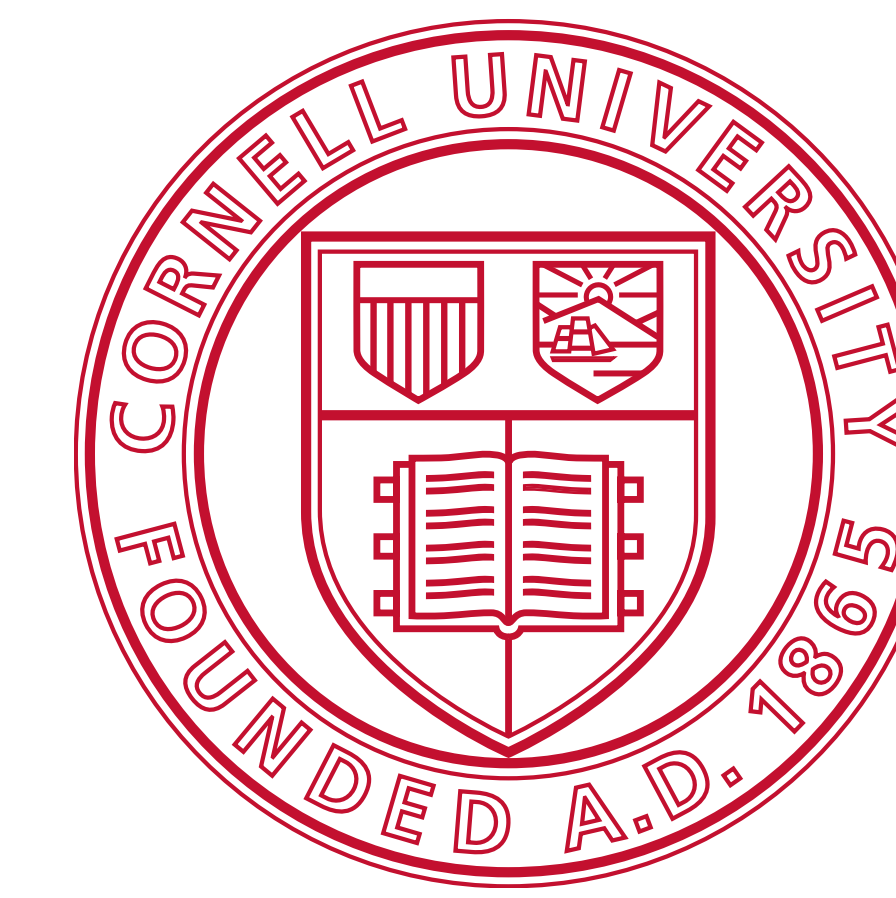


# A corpus search methodology for focus realization



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## Project Goals

- Study phonetic realization of focus in cases where formal semantic theories make predictions
- Develop and apply methodology for accessing controlled and quantifiable, but diverse and naturally occurring speech data

## Focus in Comparative Clauses

- Coherent syntactic-semantic theory about focus placement
- Possibilities constrained: main clause usually antecedent for focus interpretation in comparative clause

### Subject focus

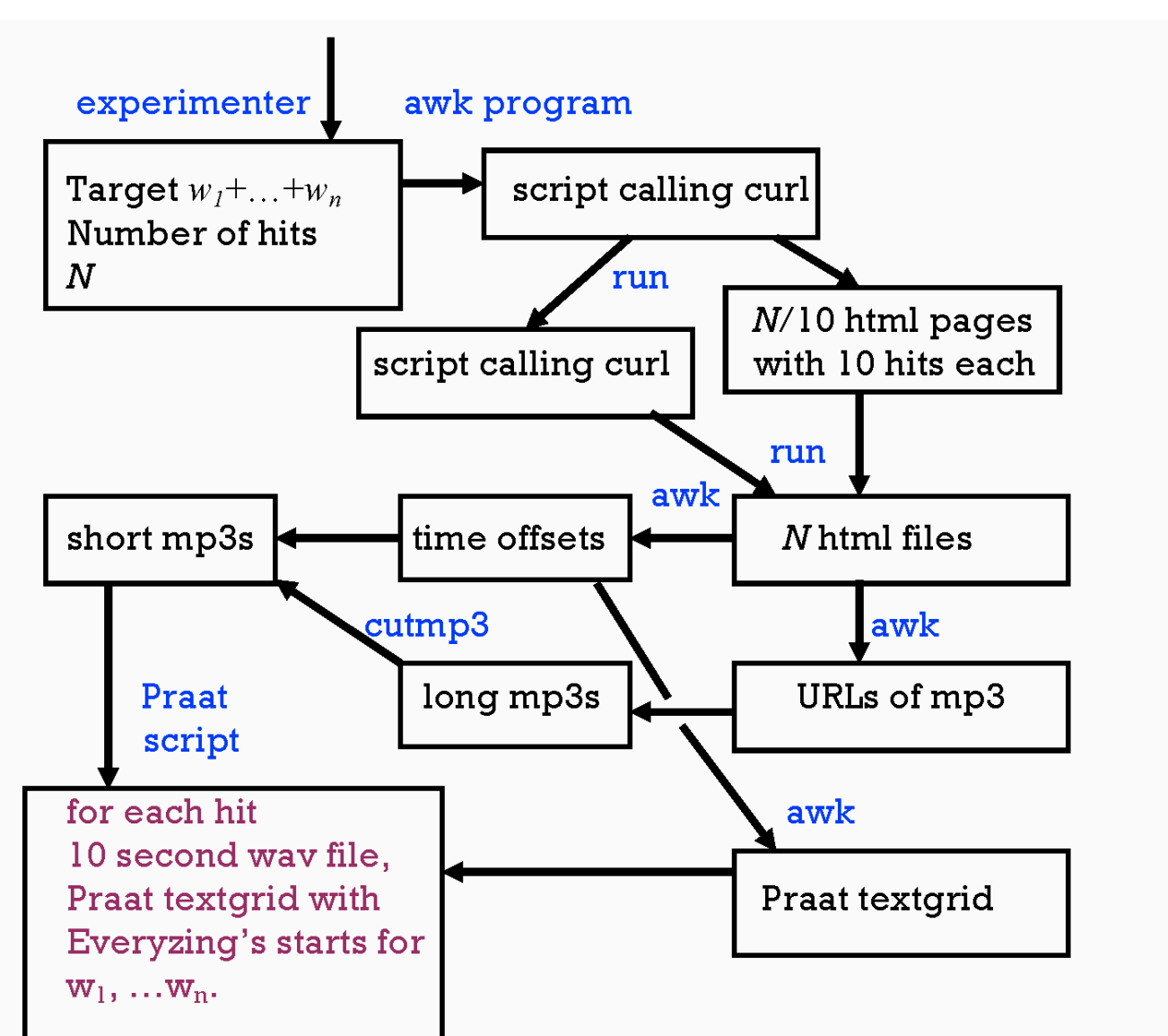
- (1) He stayed longer than [I]<sub>F</sub> did.  
-er [[he stayed x long]<sub>2</sub> than [I stayed x long] ~2

### Non-subject focus

- (2) I should have like that song more than I [did]<sub>F</sub>.  
more  $\lambda x$ [[should  $\lambda w$ [I like that song x well in **w**]]<sub>3</sub>  
than [I like that song x well in **w**<sub>0</sub>]
- (3) I understand even less than I did [before]<sub>F</sub>.  
even less [[I **pres** understand x much]<sub>4</sub>  
then [I understood x much **before**]]~4

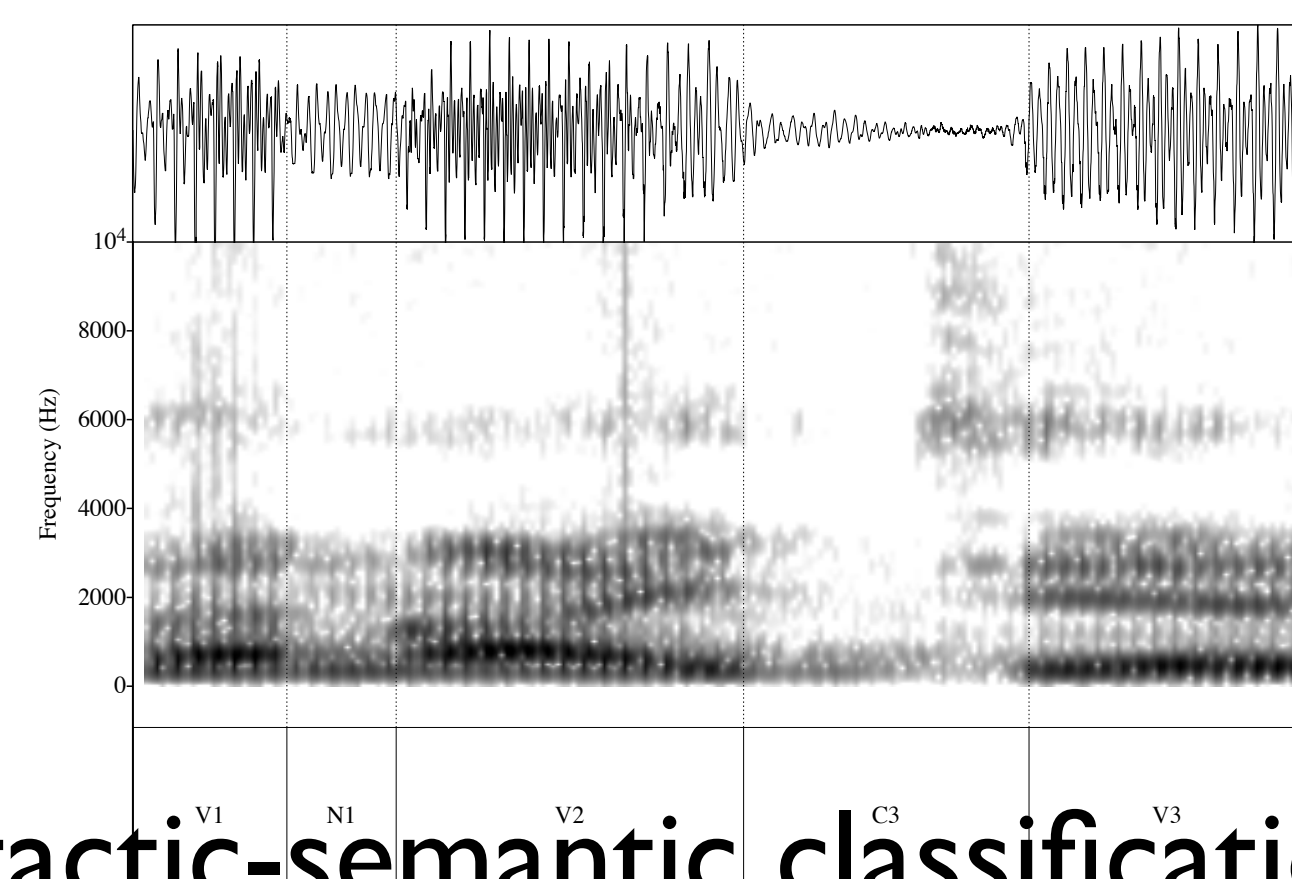
## Corpus search methodology

- **everyzing.com**
- commercial search engine
- corpus of podcasts in mp3 format
- transcription and indexing with BBN speech recognition
- **Web harvest**
- Retrieval workflow



## Experiment: "than I did"

- **Web harvest**
  - 179 alleged tokens of "than I did"
  - of which 91 unique correct tokens (56%)
- **Subphonemic annotation**
  - Experimenter annotation using landmarks



### Syntactic-semantic classification

- Transcription into English prose
- Experimenter binary classification into subject focus condition "s" and non-subject focus condition "ns"

Transcription	Class
[The aquarium got more attention] than [I did].	s
[I damn sure paid more for the Apple] than [I did this Toshiba].	ns

### Phonetic feature extraction

- automated with Praat scripts
- 308 acoustic measures
- *Quantity*: F0, amplitude, intensity, power...
- *Quality*: formants, bandwidth, tilt, jitter...
- *Duration*: for vowels, stops, syllables
- Measures taken: mean, extrema, range
- Locus of measure: regular intervals, time of other extrema (e.g. f0 max, intensity max)

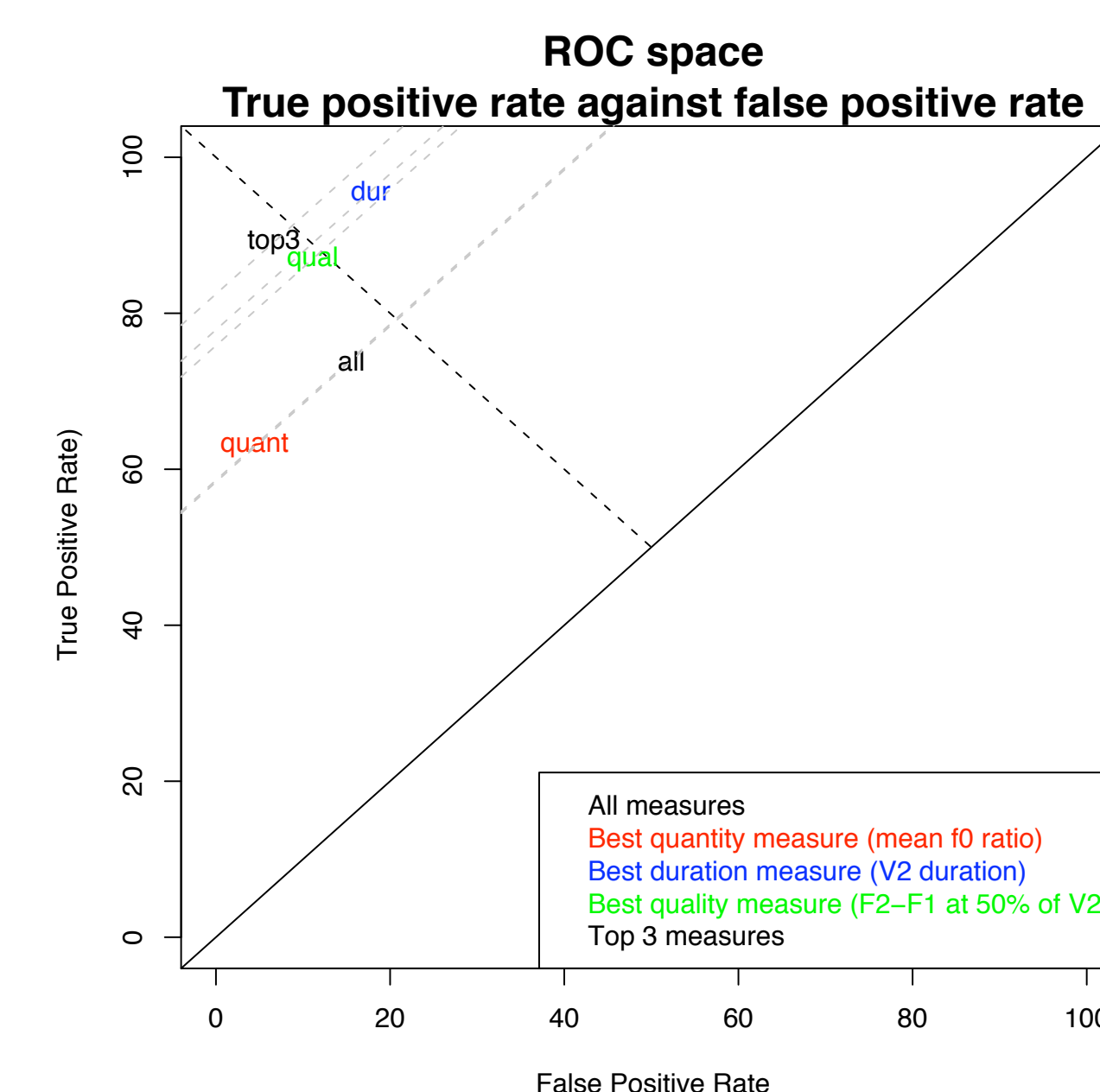
### Supervised machine learning

- many parameters highly correlated (collinearity condition number  $\kappa=127$ )
- want a focus detector for classifying novel/controversial data
- **SVM** (support vector machine) increasingly common in machine learning
- **SVM** uses separating hyperplanes (margins) rather than comparison of mean

### Comparing statistical classifiers

- Classifiers evaluated by one-held-out cross validation (OHOCV)
- Best measures for each category (using feature selection techniques)

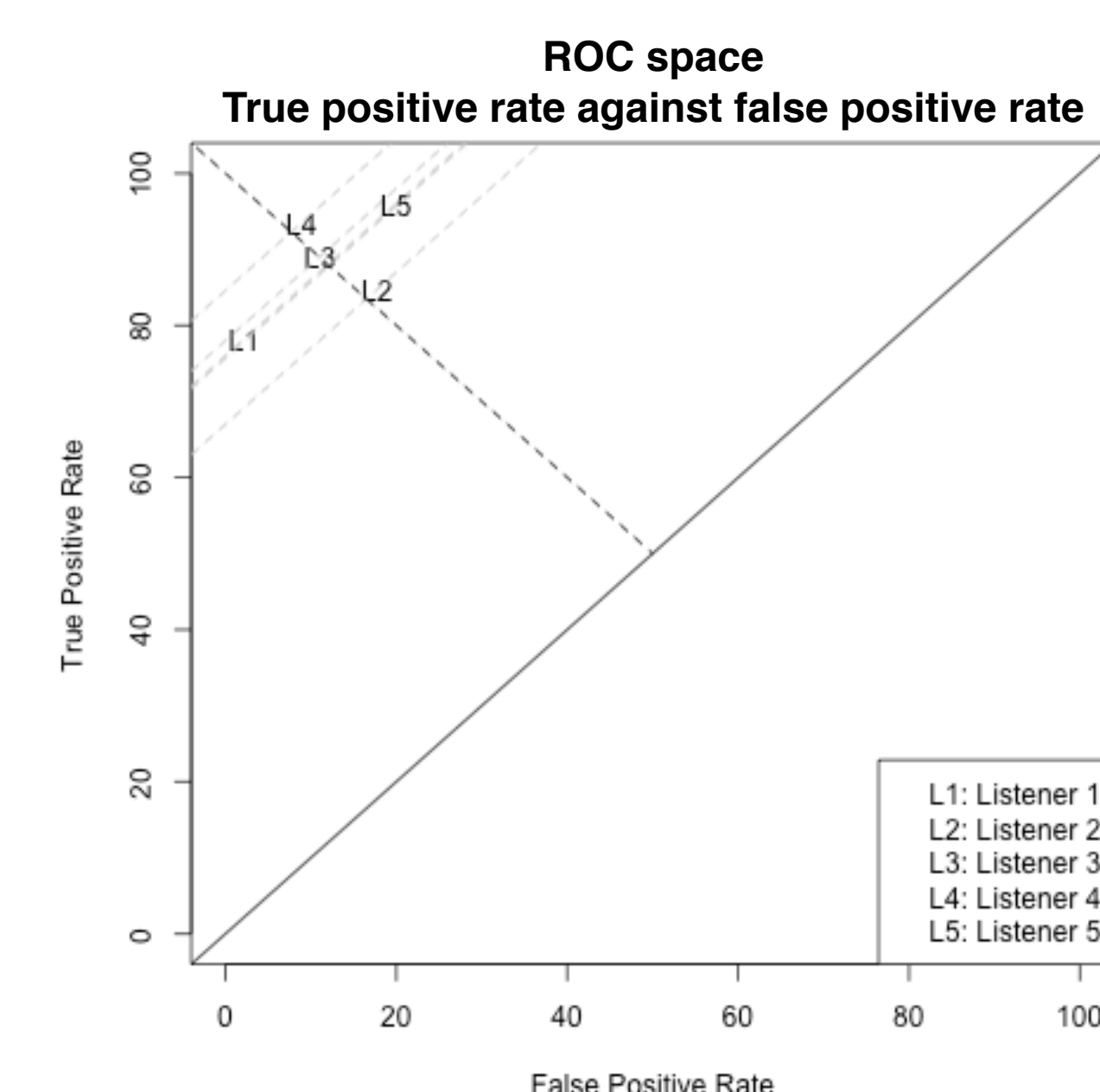
Label	Measures used	Total Accuracy (OHOCV)
All	all 308 measures	89.0%
Duration	duration of vowel "I" [a]	88.9%
Quantity	ratio of f0 mean in "I" [a] and "did" [ɪ]	76.9%
Quality	difference in f1 and f2 at 50% of "I" [a]	87.9%
Top3	Above three measures	91.2%



- Best-performing classifiers use features predictable from formal linguistic theory
- Best-performing **quality** measure outperforms best-performing **quantity** measure

### Comparing human classifiers

- Informal forced-choice discrimination task: "s" condition vs. "ns" condition
- Stimuli: 91 "than I did" snippets
- Non-naïve listeners (n=5)



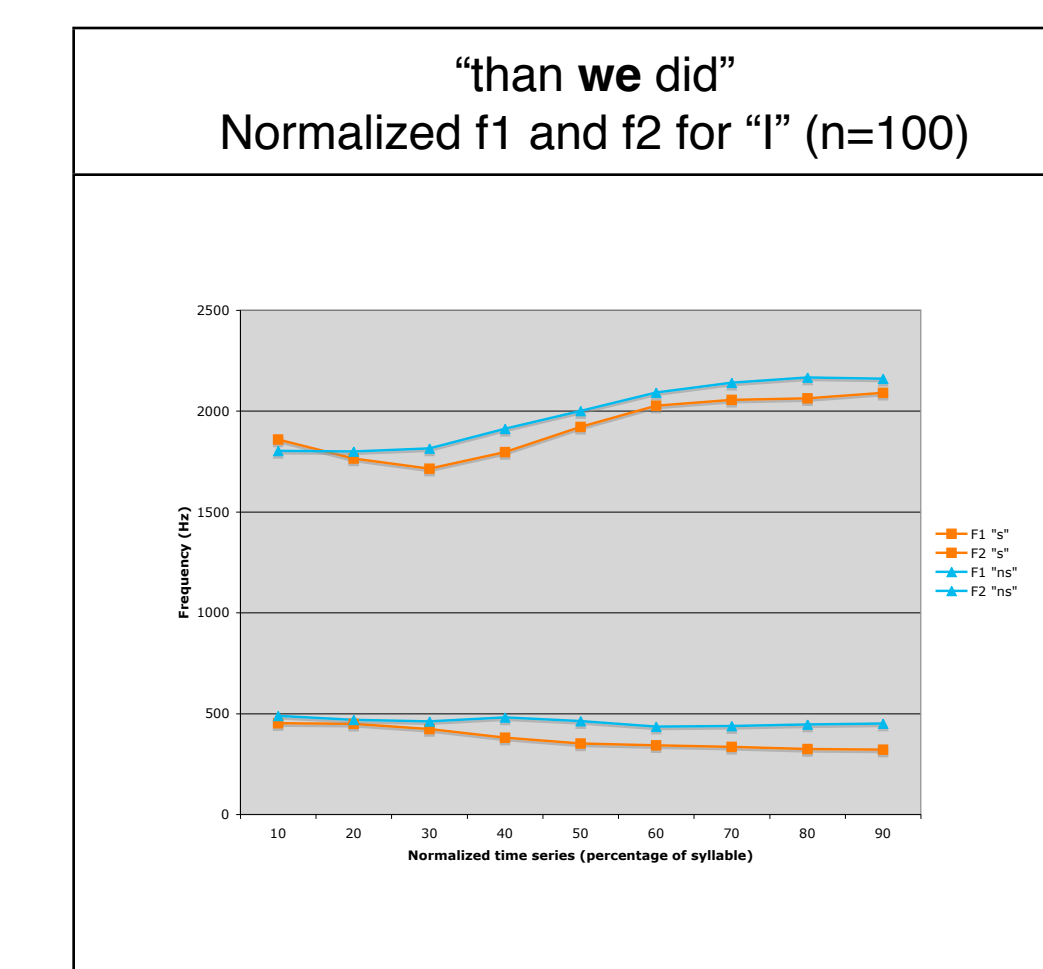
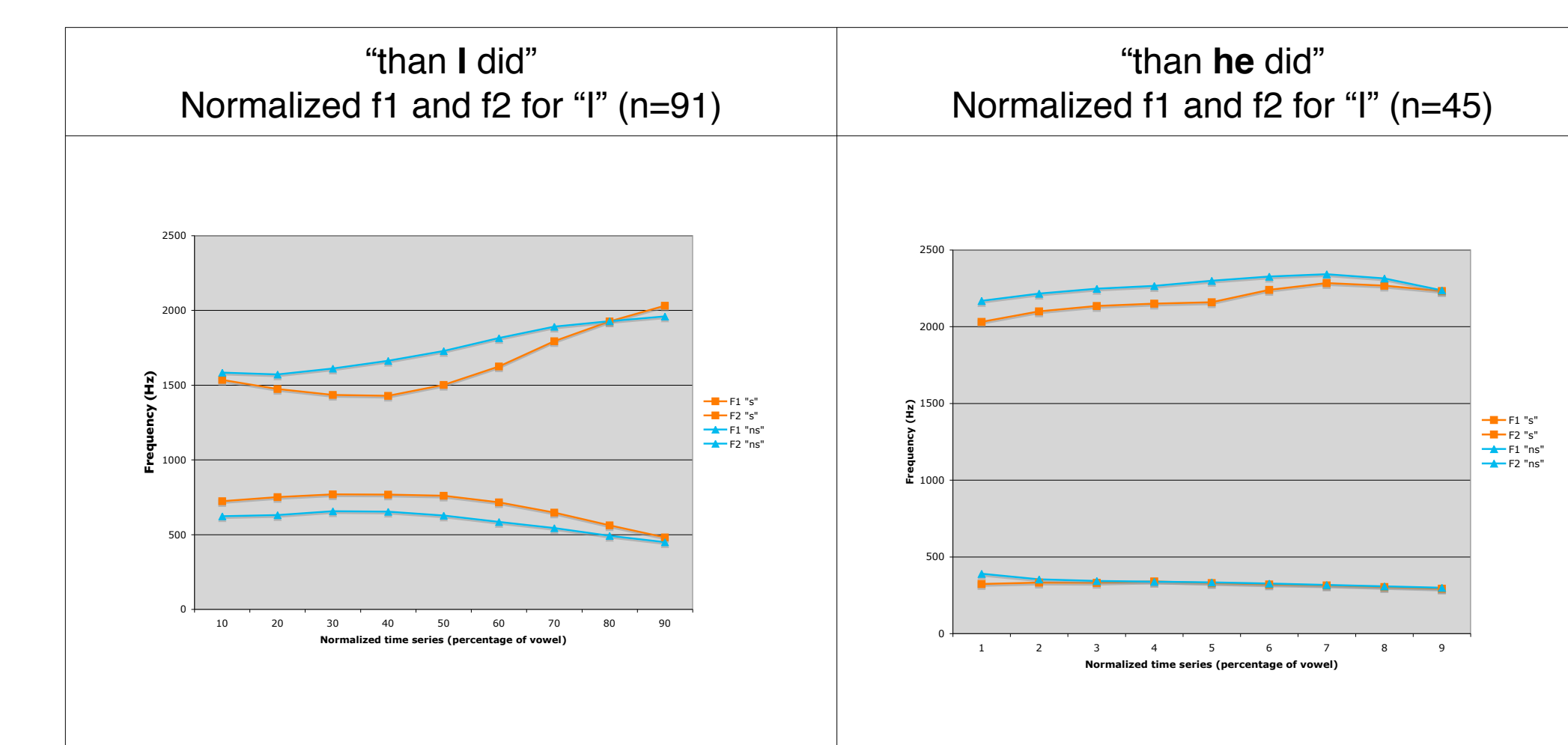
## Phonetic models of accent: hyperarticulation vs, sonority expansion

- Hyperarticulation / featural enhancement e.g. de Jong (1995), Fowler (1995), Cho (2005)
  - vowel features or gestural targets maximized
- Sonority expansion / tongue or jaw lowering e.g. Edwards & Beckman (1988), Beckman et al. (1992), Erickson (2002)
  - lower jaw / more open vocal tract

### Predictions

	Featural enhancement	Sonority expansion
[a(ɨ)]	[low]: higher f1 [back]: lower f2	higher f1
[(h)]	[high]: lower f1 [front]: higher f2 ?	higher f1
[(w)ɨ]	[high]: lower f1 [round]: lower f2 ?	higher f1

- Preliminary results consistent with featural enhancement



## •References