

Prosodic Matching and Turn Competition in Multi-Party Conversations



JAN GORISCH
EMINA KURTIĆ



ELLA PAGE

BILL WELLS

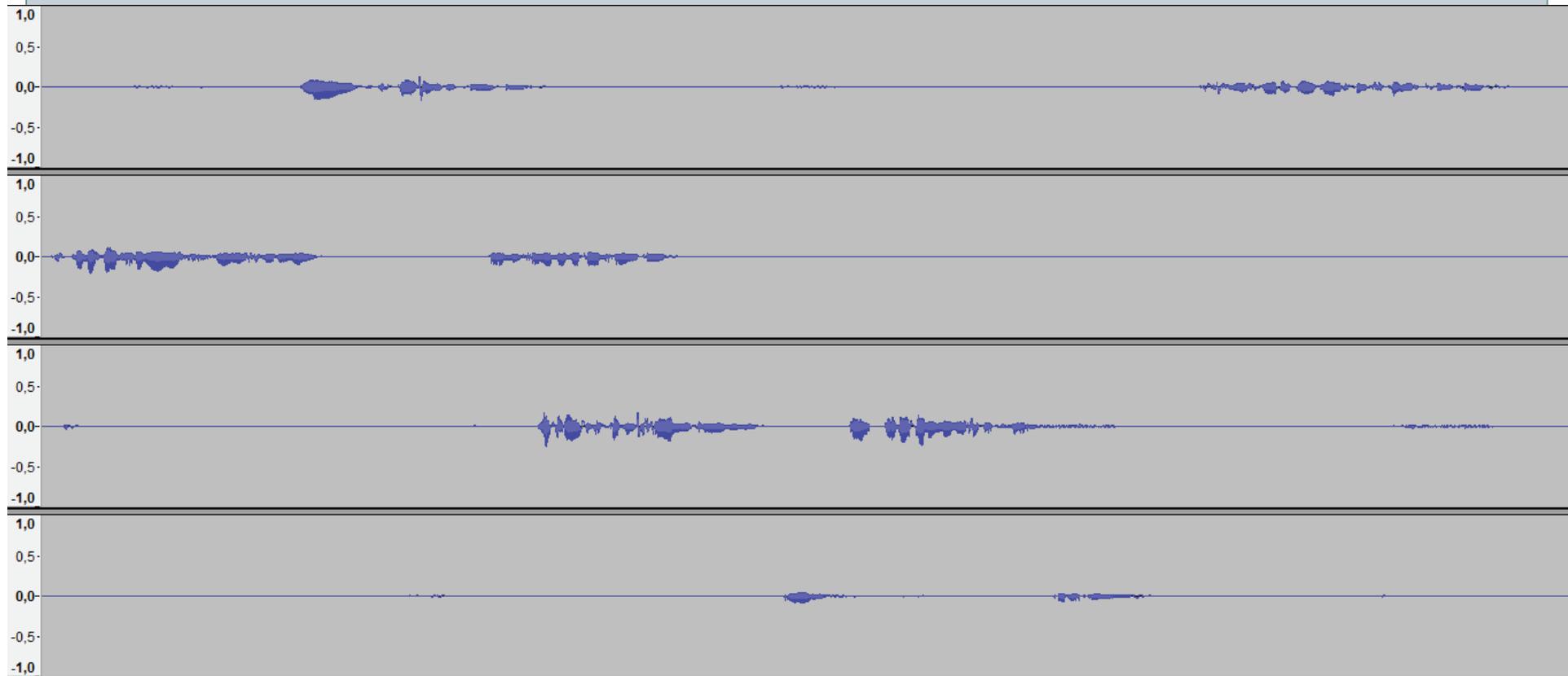
GUY BROWN

LAURENT PRÉVOT



Overlapping talk example

2



Outline

3

BACKGROUND

MATERIAL & METHOD

RESULTS

DISCUSSION & CONCLUSIONS

Background

4

Competitiveness in overlapping speech

5

- Overlapping talk occurs frequently in conversation
- Systematically analysed (French & Local, 1983; Kurtić et al., 2013)
 - Classification into competitive and non-competitive overlap
 - ✦ CA (Conversation Analysis)
 - Sequencing
 - Treatment by participants
 - Prosodic constructions of competitiveness
 - ✦ impressionistic
 - ✦ Automatic
 - Feature extraction
 - Classification

Prosody in Conversation

6

individual prosody	coordinated prosody across participants
<ul style="list-style-type: none">• single speaker, single turn: e.g. specific pitch → specific actions• within speaker coordination: e.g. increase in pitch → specific actions	<ul style="list-style-type: none">convergence (Kousidis et al. 2008)entrainment (Levitan et al., 2011)repetition / shadowing (Tannen, 1987)mirroring, synchronization (Lee et al. 2010)matching / non-matching (Szczepek-Reed, 2006)

- Pitch contour matching co-occurs with interactional alignment (Gorisch et al. 2012)
 - Current speaker continues if the second speaker matches the pitch contour
 - ✦ e.g. with a response token (“uh huh”)

Research Questions

7

- RQ1: How is competitiveness in overlaps organised prosodically?
 - Replication attempt of Kurtić et al. (2013)
 - ✦ Expect similar results
- RQ2: Is there a link between competitiveness in overlap and interactional alignment?
 - We know: interactional alignment is performed with matching
 - ✦ competitive overlaps → non-matching prosody
 - ✦ non-competitive overlaps → matching prosody

Material & Method

8

Corpus

9

- **Recordings (Kurtić et al., 2012)**
 - 2 hours
 - multi-party (four friends)
 - face-to-face
 - conversations
 - British English
- **Segmented manually into Turn Constructional Units (TCUs) (Sacks et al. 1974)**
- **Detected automatically overlap instances**
 - start and end time of TCUs
- **Selection**
 - Only two-speaker overlaps
 - 3092 instances



CA annotation

10

- **Definition of turn competition:**
 - *An instance of overlapping speech is competitive if either party, overlappee or overlapper, or both demonstrates the aim to prevent the other party from either keeping or taking over the current turn.*
- **Annotators' decision:**
 - Level of competitiveness (1-to-5 scale)
 - ✦ 1= totally non-competitive
 - ✦ 5=totally competitive
- **Two annotators**
 - Same experience in conversation analysis
 - Annotators agreed in 2012 out of 3044 instances (66.1%) on either “1” or “5”.

Method

11

- Automatic classification
 - Data
 - ✦ Instances where both annotators agreed
 - ✦ 52 extracted and annotated features
 - Decision Trees using the Weka toolkit
 - ✦ Machine learning technique
 - ✦ Inspection of trees can give indications on how the features are used for classification decisions
 - ✦ Performance evaluated using Cohen's Kappa (Japkowicz & Shah, 2011)

Features

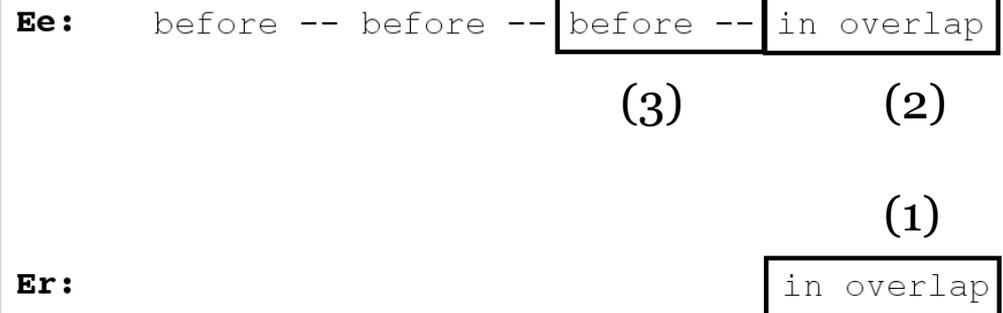
12

- Manually annotated feature

- Position: Where in the TCU does the overlap start? (following Kurtić, 2011)
 - ✦ 6 positions: simultaneous start, terminal, blind spot, mid-turn, recognitional, progressional

- Extracted features

- Extraction at 3 Locations
 - ✦ (1) overlappEr in overlap
 - ✦ (2) overlappEe in overlap
 - ✦ (3) overlappEe before overlap
- Duration
- Periodicity/Aperiodicity
 - ✦ average aperiodicity
 - ✦ NaN-ratio (between valid and missing Fo values)
- Fo features
 - ✦ 6 pitch features: slope, minimum, maximum, standard deviation, span, height
- Speaker
 - ✦ overlappEe
 - ✦ overlappEr



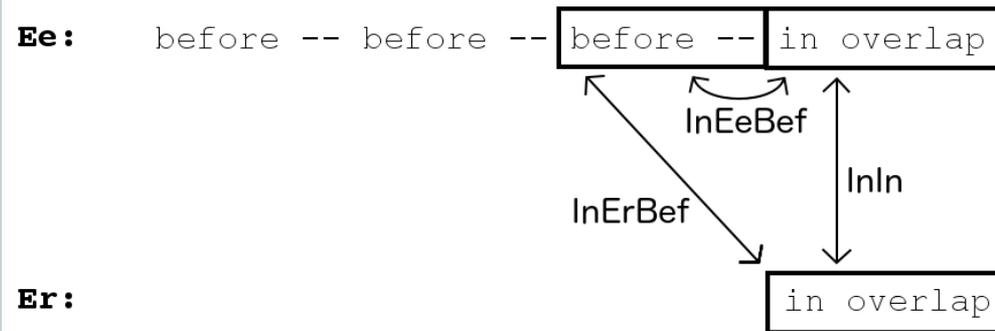
“coordinated” features

13

- Comparison across participants

- Measure in three contexts

- ✦ InIn
- ✦ InErBef
- ✦ InEeBef



- absolute differences, e.g.: $|\text{slope}_{Ee} - \text{slope}_{Er}|$
- pitch contour similarity: “simScore” (Gorisch et al. 2012)

Results

14

RQ1: classification of competitiveness

15

Feature set	# features in set	Cohen's kappa
Duration	3	0.50
F0	45	0.35
Positional	1	0.51
Speaker	2	0.00
Duration + F0	48	0.46
Duration + Positional	4	0.56*
F0 + Positional	46	0.45
Duration + Speaker	5	0.50
F0 + Speaker	47	0.32
Positional + Speaker	3	0.51
All	52	0.57

Duration and Position features add more than F0 when used alone

irrelevant who the features overlap or Overlapper are 1, the Kappa decreases

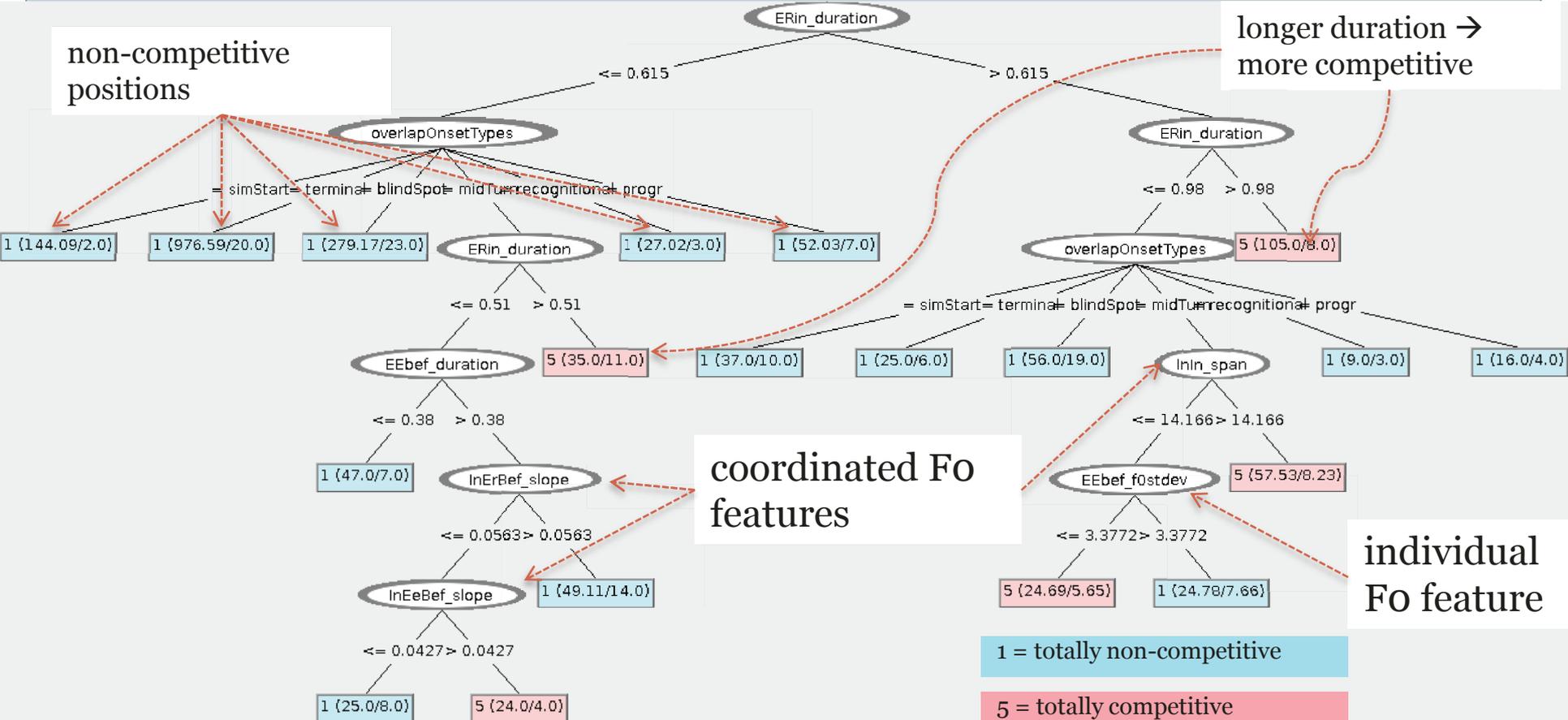
best classifier: moderate agreement with human annotators

* indicates: not significantly different from the best classifier (All)

Decision Tree – all features

16

support Kurtic et al. (2013):
position and duration: more decisive than Fo



contradicts Kurtic et al. (2013)
(RQ2) Coordinated features more decisive than individual features

(RQ2) Pitch contour matching and non-matching is not used as interactional resource for competition

Overlapping talk example

17

duration



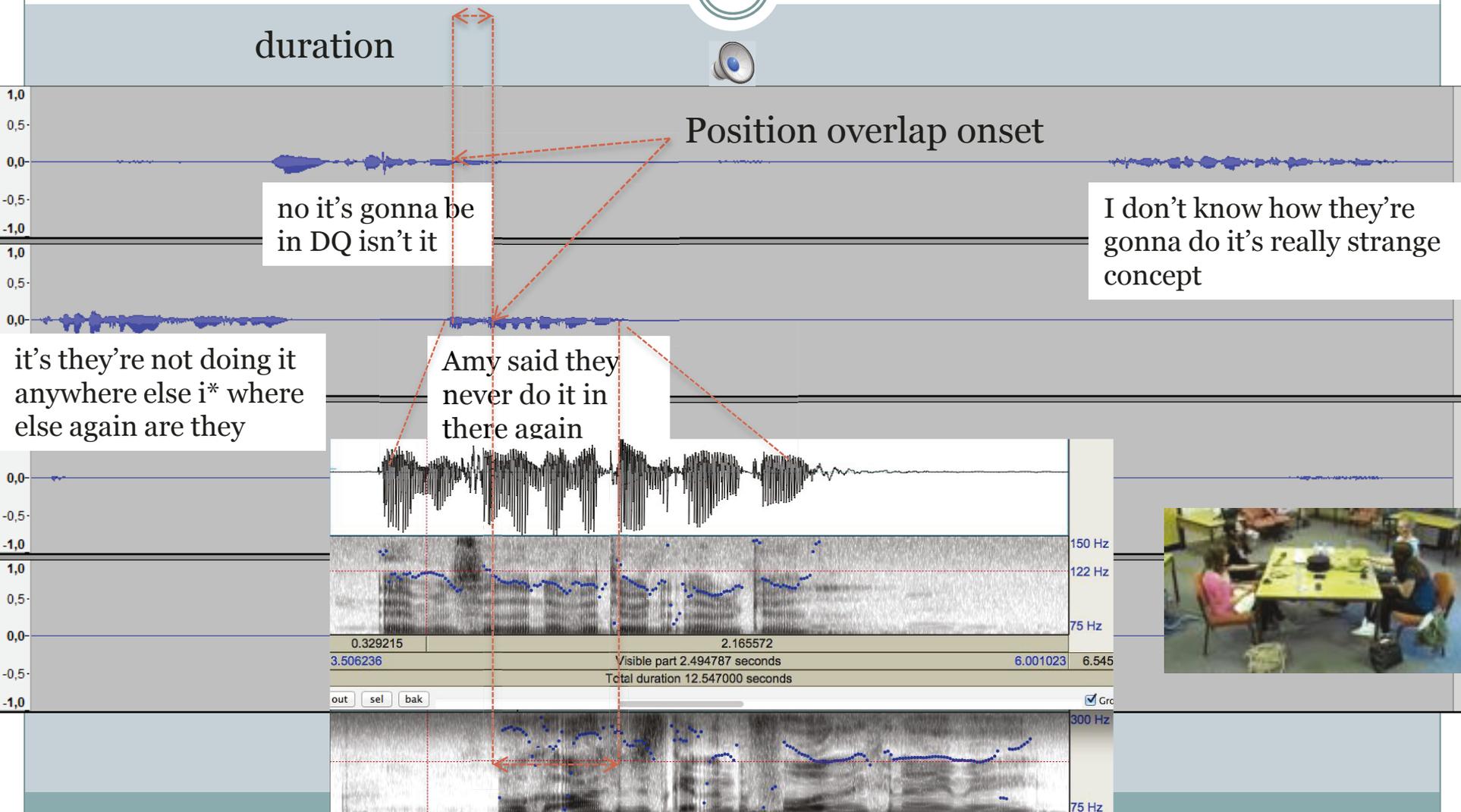
Position overlap onset

no it's gonna be
in DQ isn't it

I don't know how they're
gonna do it's really strange
concept

it's they're not doing it
anywhere else i* where
else again are they

Amy said they
never do it in
there again



Similarities and differences to Kurtić et al. (2013)

18

Similarities

overlap placement > prosodic features
longer overlap -> more competitive

Differences

Kurtić et al. (2013)	current study
Competition can be initiated at any point	Competition is classified mainly at mid-turn position
individual Fo and intensity features: more decisive than coordinated features	coordinated features: more decisive in Fo than individual Fo features (intensity not measured)

Discussion & Conclusions

Discussion

20

- RQ1 (prosodic organisation of competitiveness?)
 - Long overlap duration
 - ✦ if people continue speaking in overlap => competitive
 - supports findings by Kurtić et al. (2013)

Conclusions – is there some ‘ecosystem’?

21

- If there is an ecosystem,
 - lexicon of constructions linked to interactional meaning
 - often claimed in the literature (e.g. rising intonation “means” a question)
 - but: many counterexamples when we consider real interaction
- It may be there is no ecosystem, no lexicon.

References

- French, P. & Local, J. (1983), « Turn-competitive incomings », *Journal of Pragmatics* 7, 701–715.
- Kurtić, E., Brown, G. J. & Wells, B. (2013) "Resources for turn competition in overlapping talk." *Speech Communication* 55(5), 721-743.
- Schegloff, E., (2000). Overlapping talk and the organisation of turn-taking for conversation. *Language in Society*, 29, 1-63.
- Lerner, G. H. *Turn-sharing: The choral co-production of talk-in-interaction*. na, 2002.
- Kousidis, S., Dorran, D., Wang, Y., Vaughan, B., Cullen, C., Campbell, D., McDonnell, C., & Coyle, E. (2008). Towards measuring continuous acoustic feature convergence in unconstrained spoken dialogues. *Interspeech. Brisbane, Australia*.
- Levitan, R., Gravano, A., & Hirschberg, J. (2011). Entrainment in Speech Preceding Backchannels. In *Proceedings of the 49th Annual Meeting of the Association for Computational Linguistics: Human Language Technologies: Short Papers - Volume 2* (pp. 113–117). Stroudsburg, PA, USA
- Tannen, D. (1987). "Repetition in Conversation: Toward a Poetics of Talk" *Language*, 63(3), 574-605.
- Lee, C. C., Black, M., Katsamanis, A., Lammert, A. C., Baucom, B. R., Christensen, A., Georgiou, P. G., & Narayanan, S. S. (2010). Quantification of prosodic entrainment in affective spontaneous spoken interactions of married couples. In *Interspeech Makuhari, Japan*. 793-796
- Szczepek-Reed, B. (2006). *Prosodic orientation in English conversation*. Basingtoke: Palgrave Macmillan.
- Gorisch, J., Wells, B., & Brown, G. J. (2012). Pitch Contour Matching and Interactional Alignment across Turns: An Acoustic Investigation. *Language and Speech*, 55(1), 57–76.
- Kurtić, E., Wells, B., Brown, G.J., Kempton, T. & Aker, A. (2012). A corpus of spontaneous multi-party conversation in Bosnian Serbo-Croatian and British English. In Proceedings of the Eighth International Conference on Language Resources and Evaluation (LREC 2012), 21-27 May 2012, Istanbul. European Language Resources Association (ELRA).
- Sacks, H., E.A. Schegloff, and G. Jefferson. 'A Simplest Systematics for the Organisation of Turn-Taking for Conversation'. *Language* 50 (1974): 696–735.
- Japkowicz, N., & Shah, M. (2011). *Evaluating learning algorithms: a classification perspective*. Cambridge University Press.

Potential explanation for differences in results

23

Kurtic et al. 2013	current study
excluded: choral productions, collaborative completions, continuers/response tokens	all instances of overlap
134 features	52 features
ICSI meeting corpus	4 friends having a conversation

Overlapping talk example

24

duration

Position overlap onset

no it's gonna be
in DQ isn't it

I don't know how they're
gonna do it's really strange
concept

it's they're not doing it
anywhere else i* where
else again are they

Amy said they
never do it in
there again

well c* I can just get
them before and
they can owe me

wha* are they
selling normal
tickets as well

oh

I don't
know

