

Automatic Conflict Analysis

Social Signal Processing for Conflict Detection and Measurement

Alessandro Vinciarelli

University of Glasgow

<http://www.dcs.gla.ac.uk/vincia>

vincia@dcs.gla.ac.uk



Outline



- Conflict
- Data Collection
- Experiments and Results
- Conclusions

Outline



- **Conflict**
- Data Collection
- Experiments and Results
- Conclusions

The Importance of Conflict



“Conflict is important because it can substantially affect the welfare of both individual members and the group as a whole [...]”

Levine, Moreland, *“Small Groups”*, in *“The Handbook of Social Psychology”*, Gilbert, Lindzey (Eds.), Vol. 2, pp. 415-469, 1998.

Conflict



*“[Conflict is a] mode of interaction
[where]
the attainment of the goal by one party
precludes its attainment by the others.”*

Judd, “*Cognitive Effects of Attitude Conflict Resolution*”, *Journal of Conflict Resolution*, 22(3):483-498, 1978.

Conflict



*“[Conflict is a] **mode of interaction**
[where]
the attainment of the goal by one party
precludes its attainment by the others.”*

Judd, “*Cognitive Effects of Attitude Conflict Resolution*”, *Journal of Conflict Resolution*, 22(3):483-498, 1978.

Conflict



*“[Conflict is a] mode of interaction
[where]
the attainment of the goal by one party
precludes its attainment by the others.”*

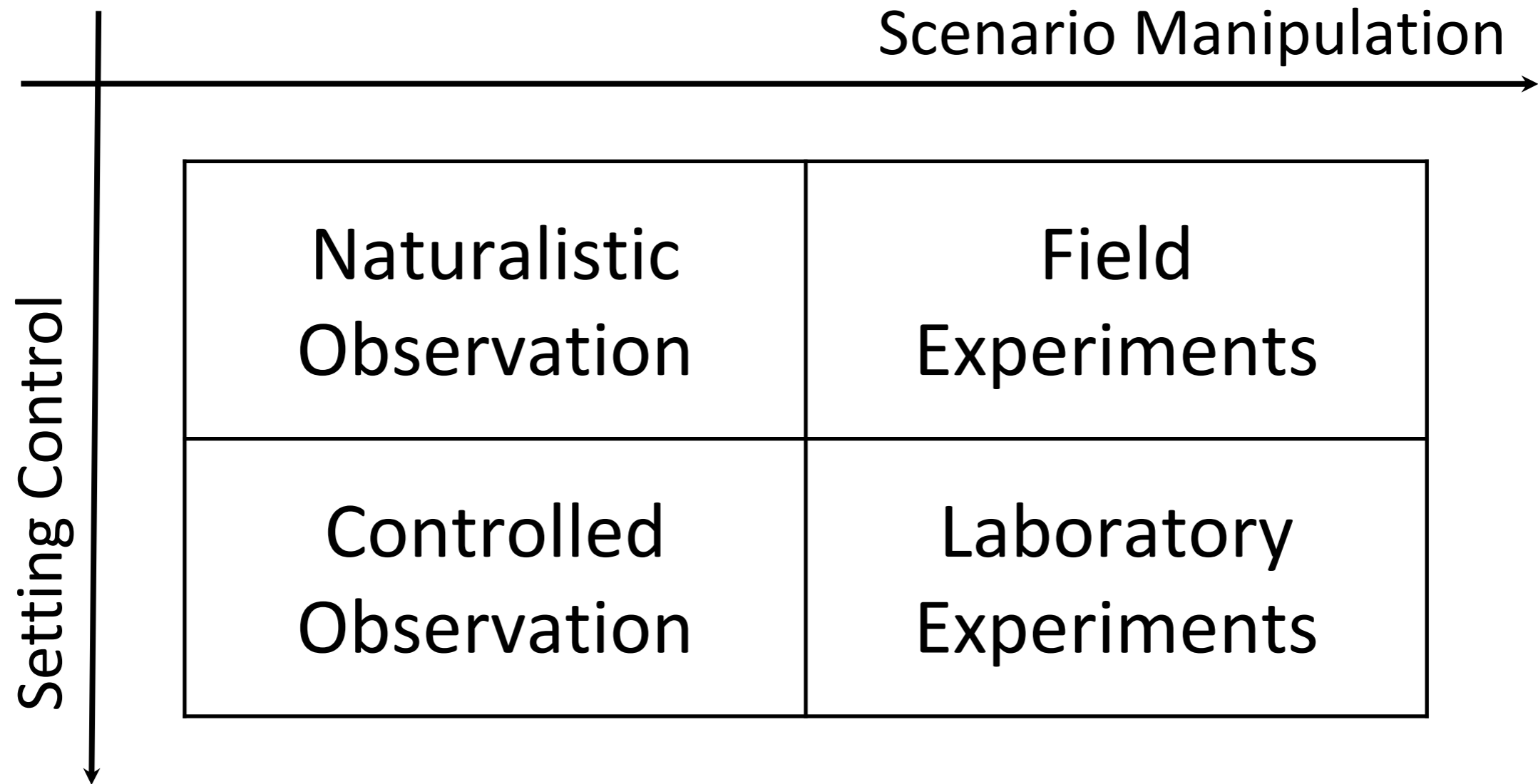
Judd, “*Cognitive Effects of Attitude Conflict Resolution*”, *Journal of Conflict Resolution*, 22(3):483-498, 1978.

Outline



- Conflict
- **Data Collection**
- Experiments and Results
- Conclusions

Experimental Setup



Hecht, Guerrero, *"Perspectives on Nonverbal Research Methods"*, in *"The Nonverbal Communication Reader"*, Guerrero, De Vito, Hecht (Eds.), pp. 24-4, 1999.

Political Debates



Vinciarelli, Dielmann, Favre, Salamin, “*Canal9: a database of political debates for analysis of social interactions*”, Proc. of Social Signal Processing Workshop, 2009

SSPNet Conflict Corpus



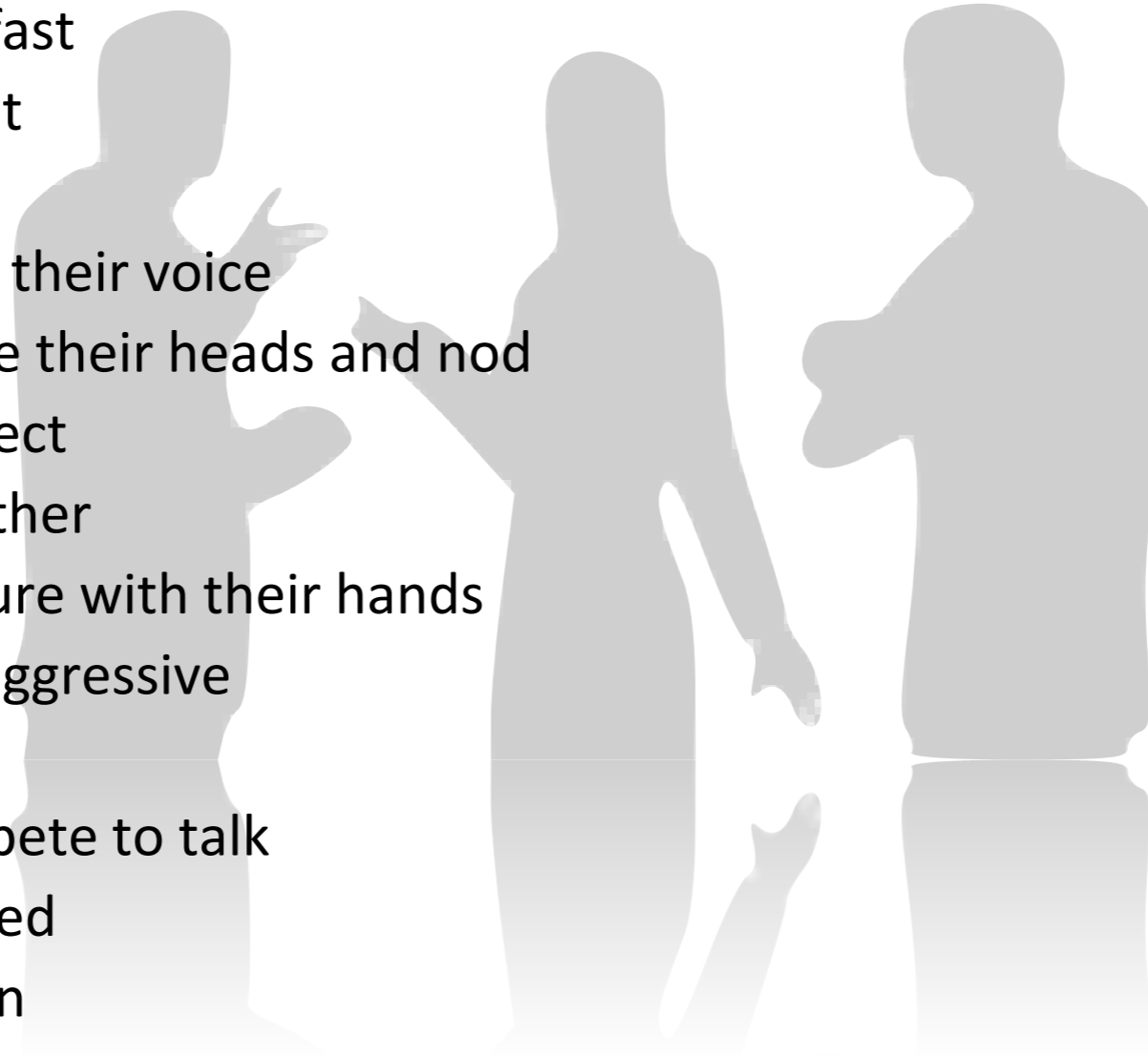
Source	Canal9
Number of Clips	1430
Clip Length	30 sec.
Total Length	11 h 55 m
Subjects	135
Subjects per Clip	At least 2
Assessors	10/clip (MTurk)
Questionnaire Items	15

Viorica et al., "[Collecting Data for Socially Intelligent Surveillance and Monitoring Approaches: The Case of Conflict in Competitive Conversations](#)",

Proc. of IEEE Intl. Symposium on Communications, Control and Signal Processing, pp. 1-4, 2012.

Measuring Conflict

- The atmosphere is relaxed
- People wait for their turn before speaking
- One or more people talk fast
- One or more people fidget
- People argue
- One or more people raise their voice
- One or more people shake their heads and nod
- People show mutual respect
- People interrupt one another
- One or more people gesture with their hands
- One or more people are aggressive
- The ambience is tense
- One or more people compete to talk
- People are actively engaged
- One or more people frown



Measuring Conflict

The atmosphere is relaxed

People wait for their turn before speaking

One or more people talk fast

One or more people fidget

People argue

One or more people raise their voice

One or more people shake their heads and nod

People show mutual respect

People interrupt one another

One or more people gesture with their hands

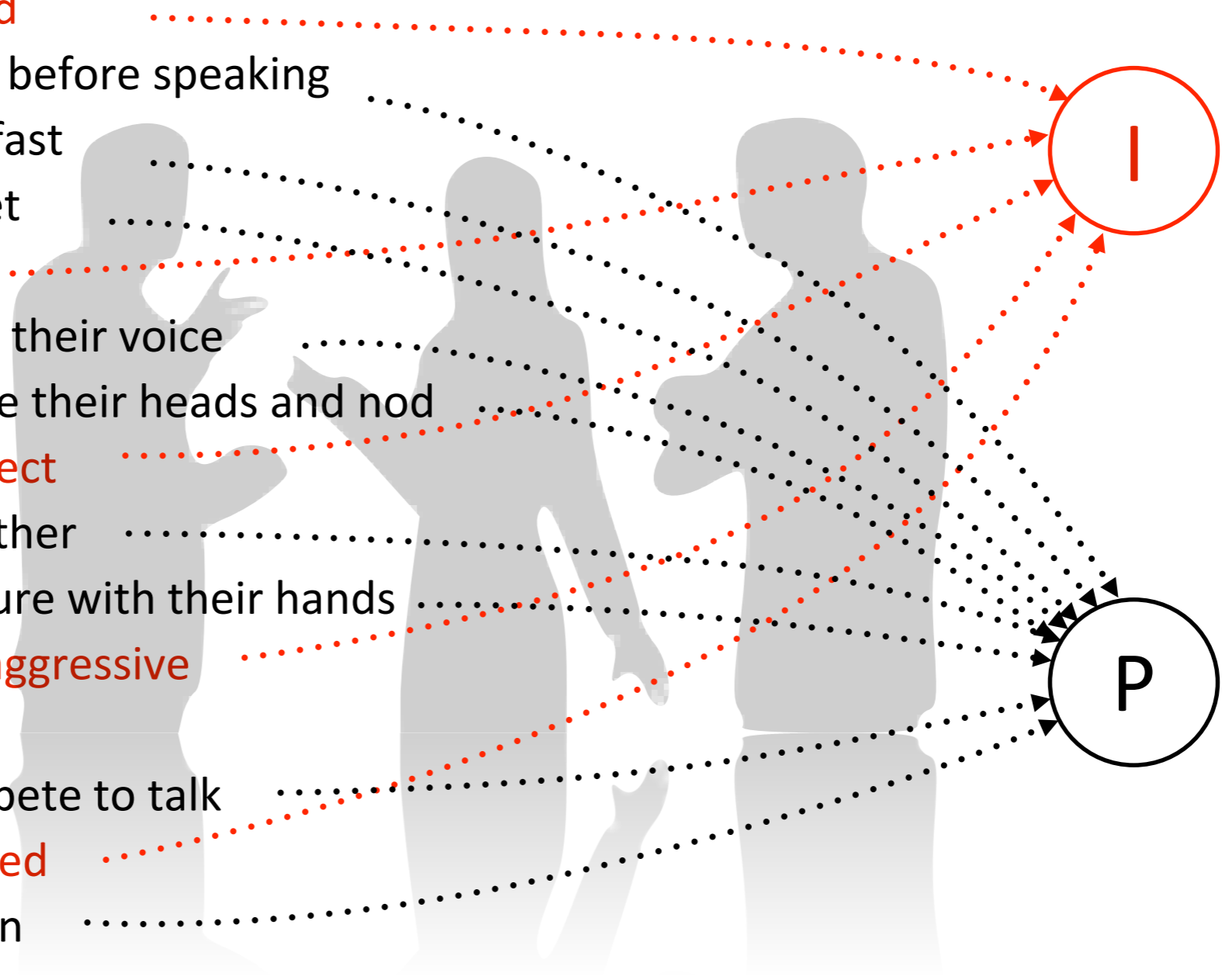
One or more people are aggressive

The ambience is tense

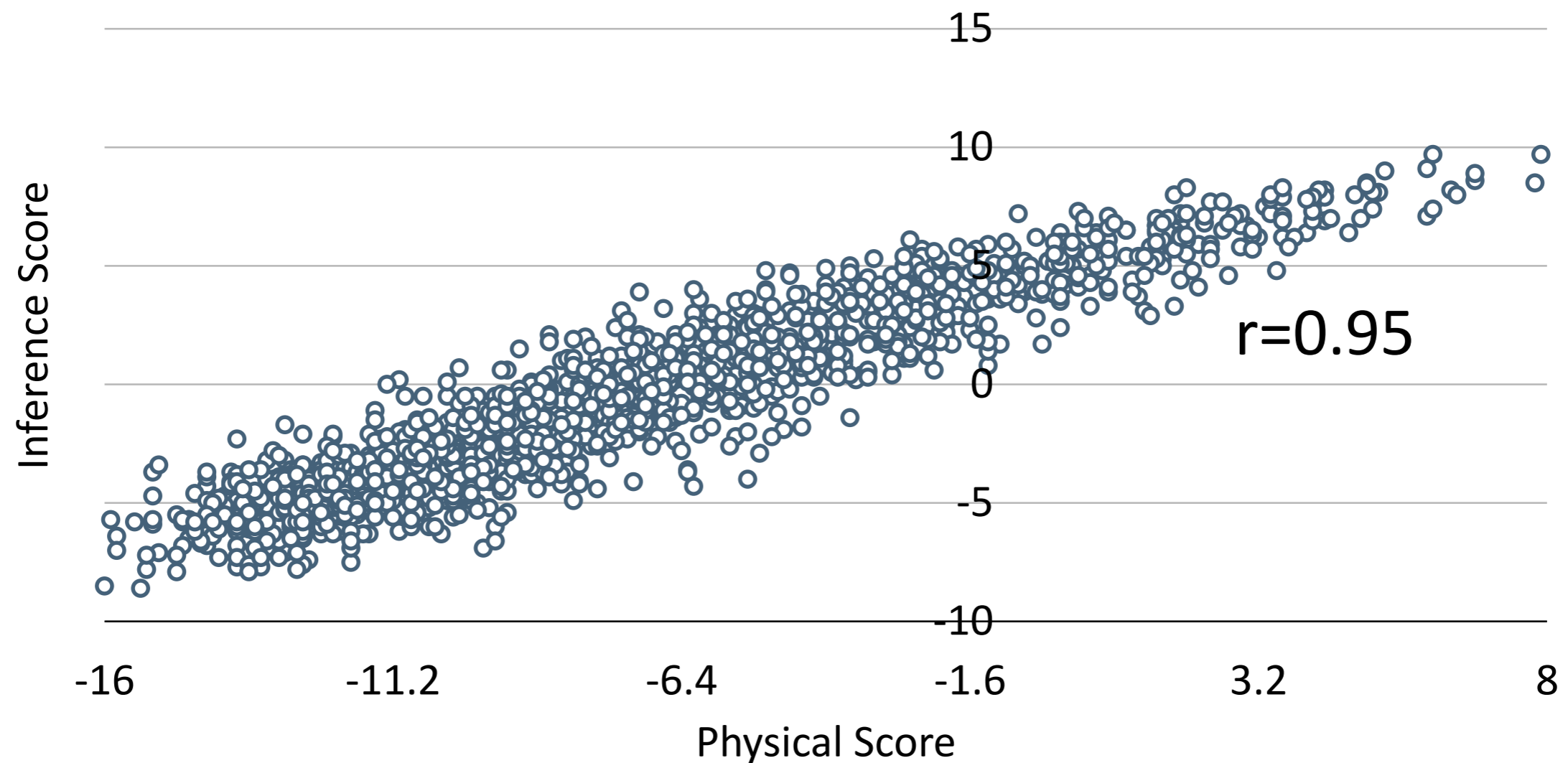
One or more people compete to talk

People are actively engaged

One or more people frown



Inference vs Physical



Vinciarelli et al., "[Collecting Data for Socially Intelligent Surveillance and Monitoring Approaches: The Case of Conflict in Competitive Conversations](#)",
Proc. of IEEE Intl. Symposium on Communications, Control and Signal
Processing, pp. 1-4, 2012.

Examples (Low)



Vinciarelli et al., “[Collecting Data for Socially Intelligent Surveillance and Monitoring Approaches: The Case of Conflict in Competitive Conversations](#)”,
Proc. of IEEE Intl. Symposium on Communications, Control and Signal
Processing, pp. 1-4, 2012.

Examples (Medium)



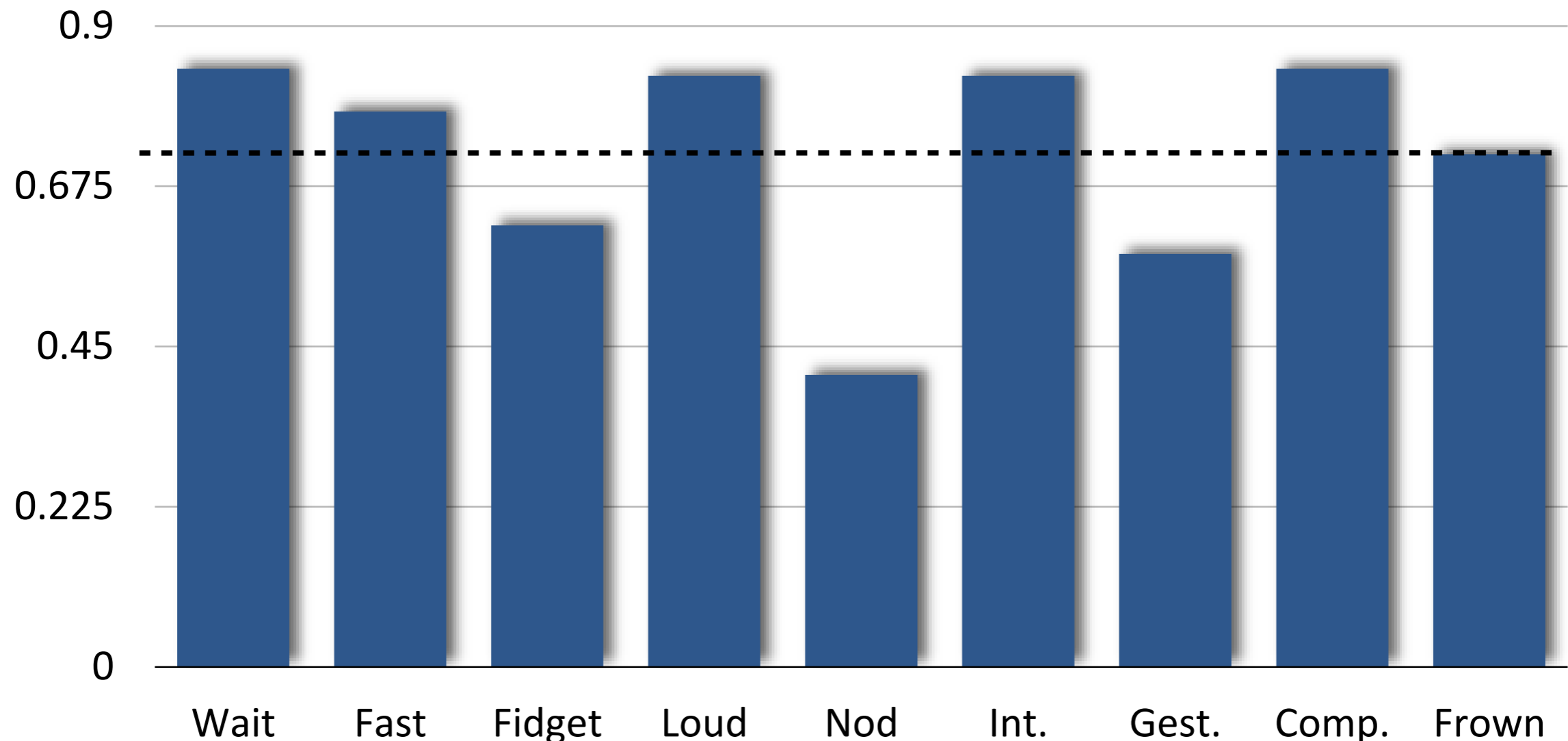
Vinciarelli et al., “[Collecting Data for Socially Intelligent Surveillance and Monitoring Approaches: The Case of Conflict in Competitive Conversations](#)”,
Proc. of IEEE Intl. Symposium on Communications, Control and Signal
Processing, pp. 1-4, 2012.

Examples (High)



Vinciarelli et al., [“Collecting Data for Socially Intelligent Surveillance and Monitoring Approaches: The Case of Conflict in Competitive Conversations”](#), Proc. of IEEE Intl. Symposium on Communications, Control and Signal Processing, pp. 1-4, 2012.

Nonverbal Cues



Vinciarelli et al., [“Collecting Data for Socially Intelligent Surveillance and Monitoring Approaches: The Case of Conflict in Competitive Conversations”](#),

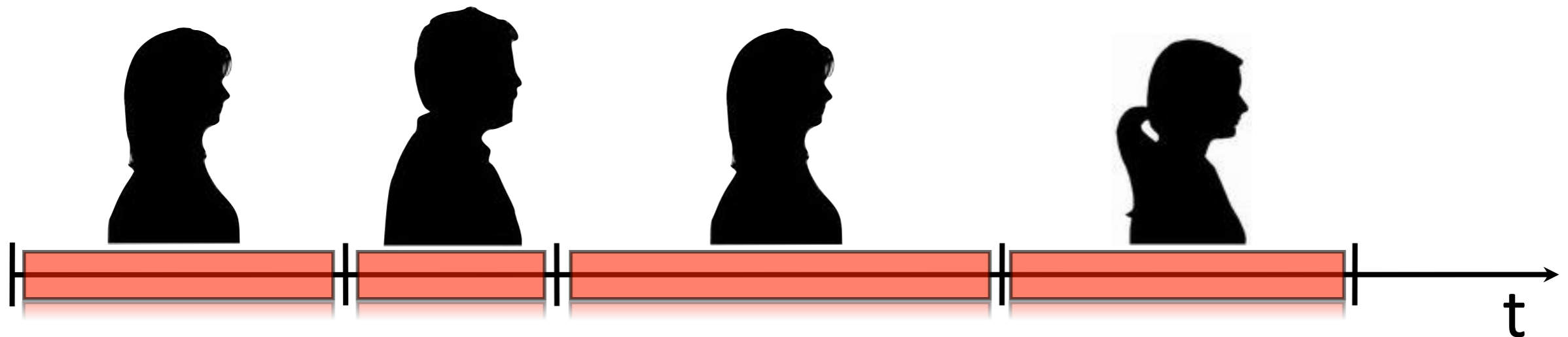
Proc. of IEEE Intl. Symposium on Communications, Control and Signal Processing, pp. 1-4, 2012.

Outline



- Conflict
- Data Collection
- Experiments and Results
- Conclusions

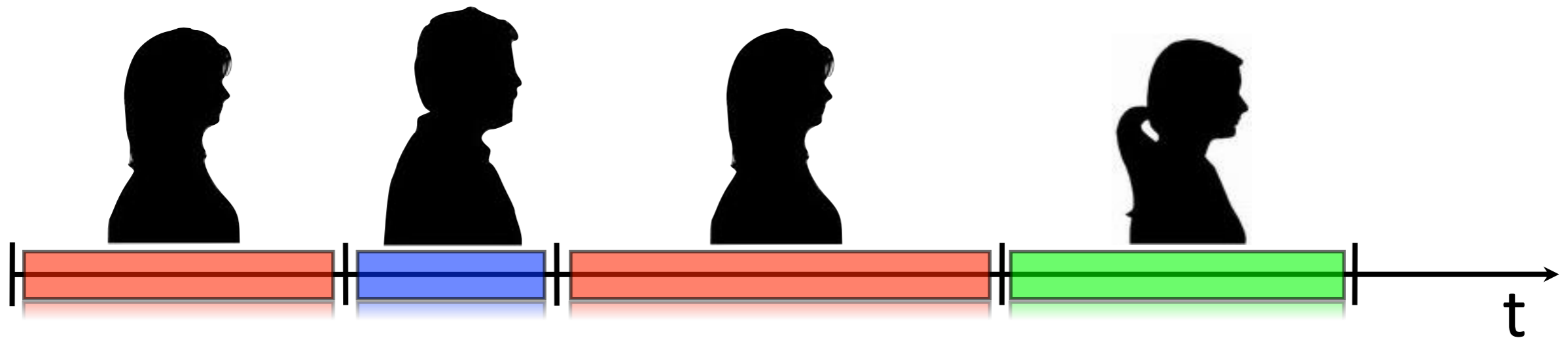
Turn-Duration Statistics



- Number of Turns, Length Mean, Median, Standard Deviation, Minimum, Maximum
- Questions 2 and 13

Schegloff, "[Overlapping Talk and the Organization of Turn-Taking for Conversation](#)", *Language in Society*, 29(1):1-63, 2000.

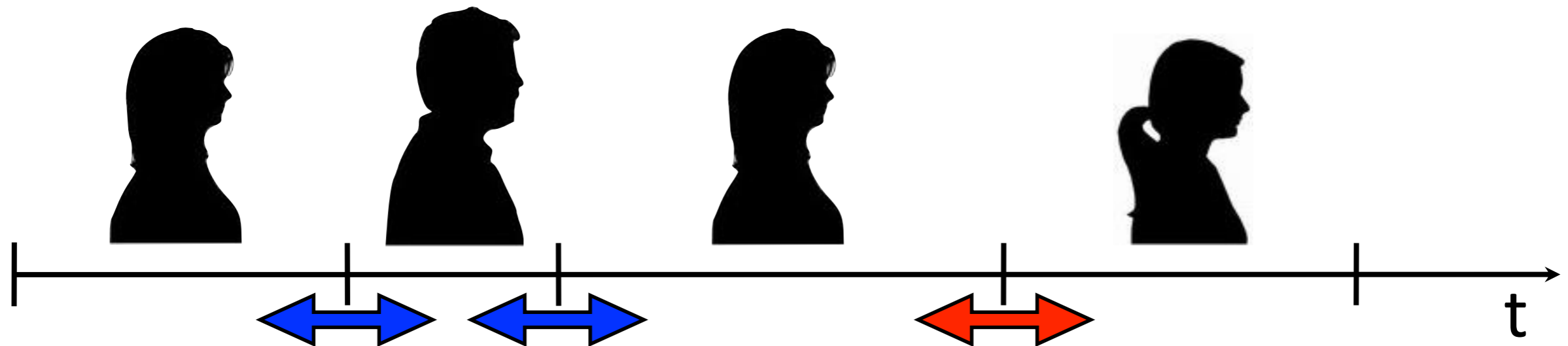
Speaking Time Statistics



- Number of speakers, Mean, Median, Standard Deviation, Minimum, Maximum
- Questions 2, 3 and 13

Yule, "[*Pragmatics*](#)", Oxford University Press, 1996.

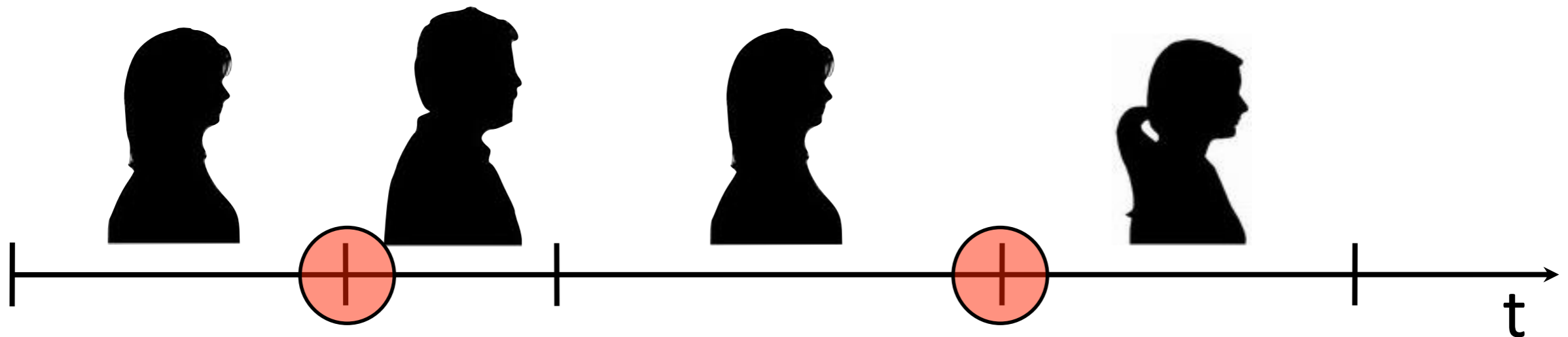
Speaker Adjacency Statistics



- Probability of “*role*” bigrams (moderator, group 1 and group 2)
- Questions 9 and 13

Bilmes, “[*The Concept of Preference in Conversation Analysis*](#)”, *Language in Society*, 17:161-181, 1988.

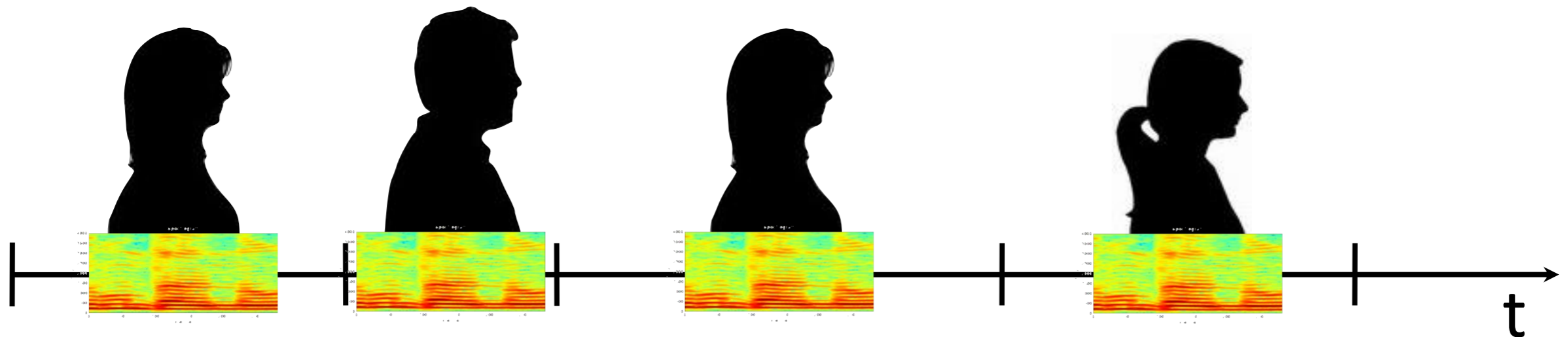
Overlapping Speech Statistics



- Percentage Overlapping accounts for (w/o moderator, same group or different group members), turn keeping/stealing
- Questions 2, 9 and 13

Schegloff, "[Overlapping Talk and the Organization of Turn-Taking for Conversation](#)", *Language in Society*, 29(1):1-63, 2000.

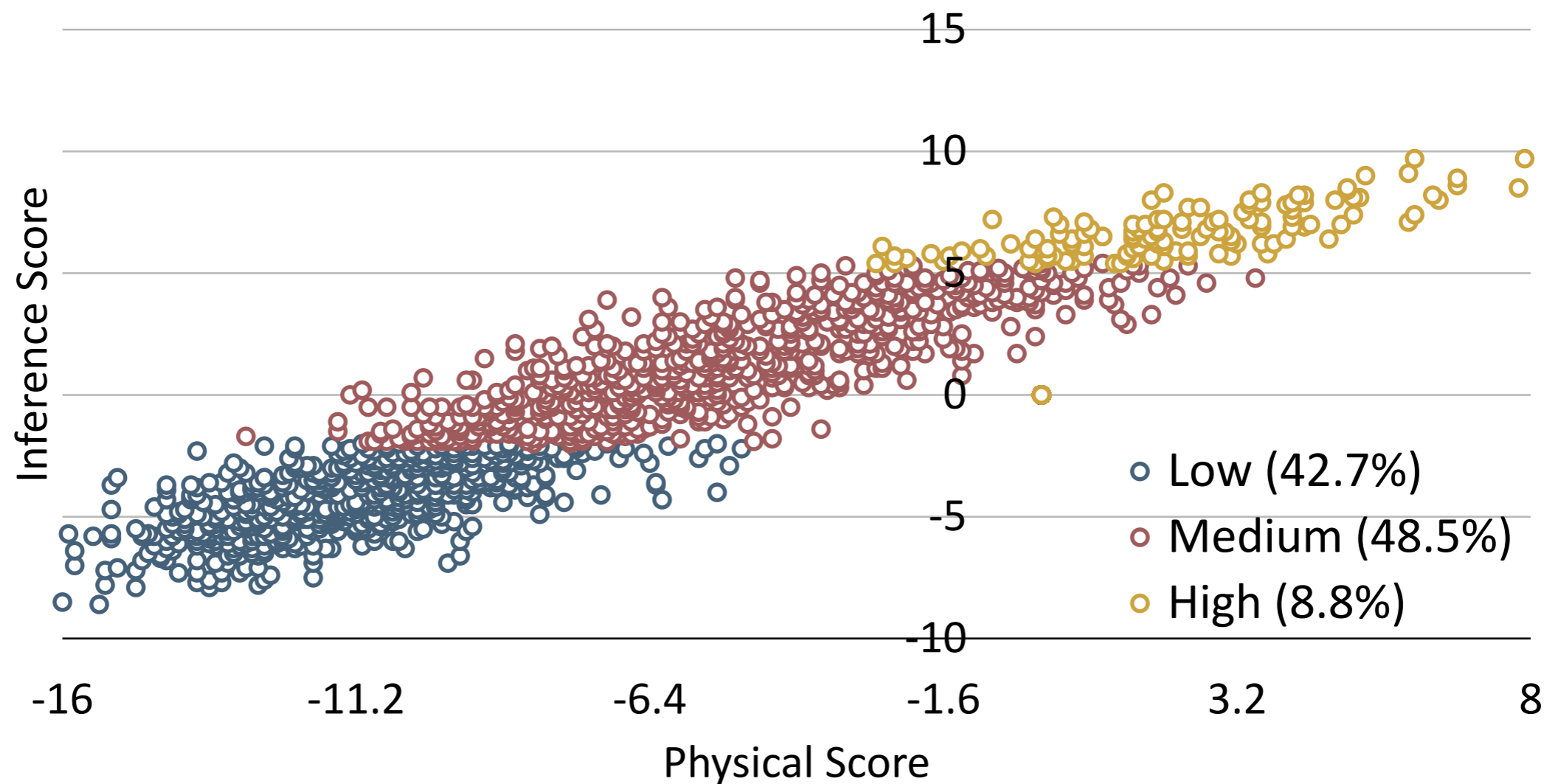
Clip, OS and Turn-Based Statistics



- Pitch and Intensity mean, median, standard deviation, minimum, maximum and quantiles (1%, 25%, 75%, 99%)
- Question Q6

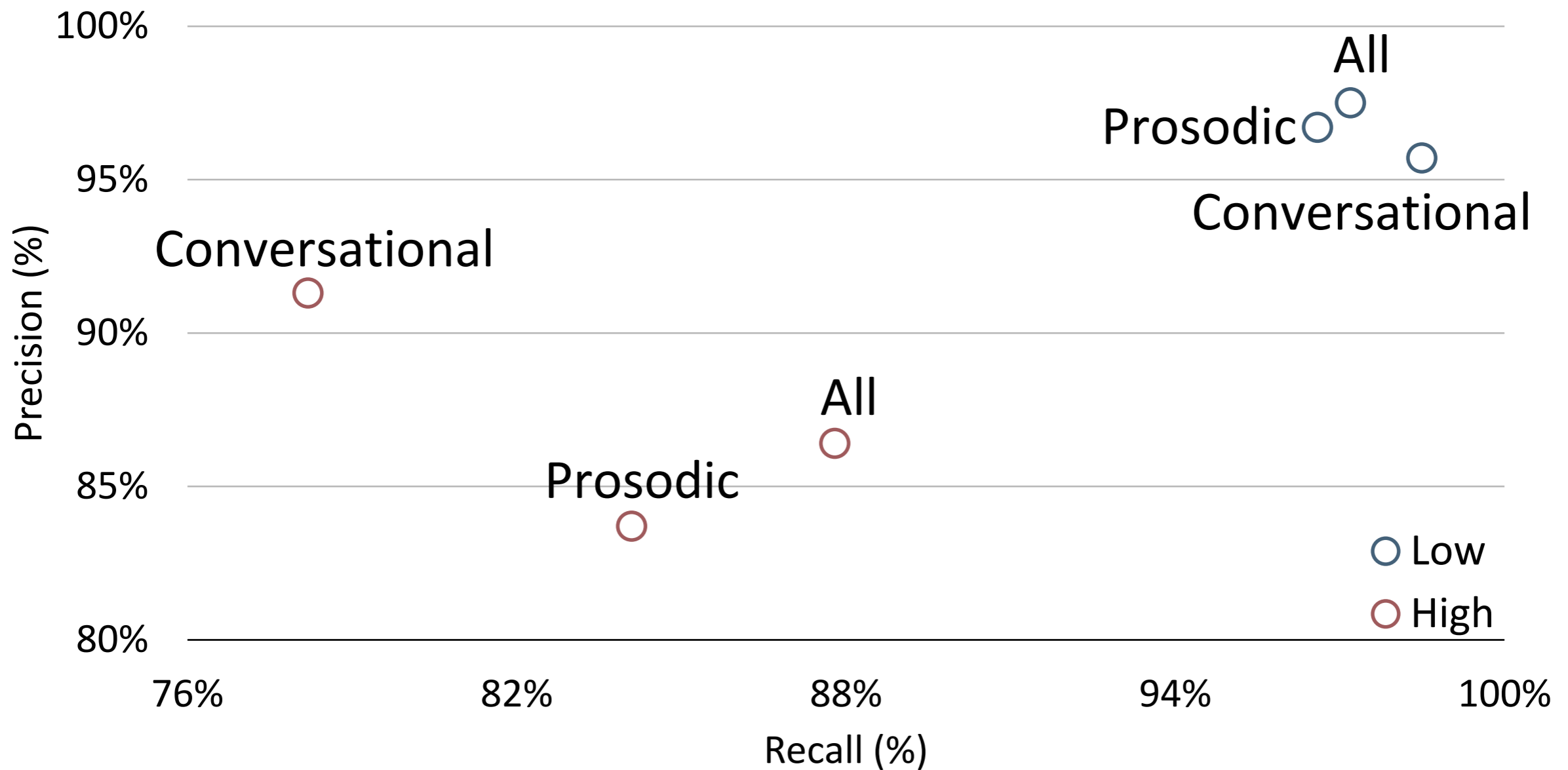
Cooper, "[Participant and Observer attribution of affect in interpersonal conflict: an examination of noncontent verbal behavior](#)", Journal of Nonverbal Behavior, 10(2):134-144, 1986.

Classification



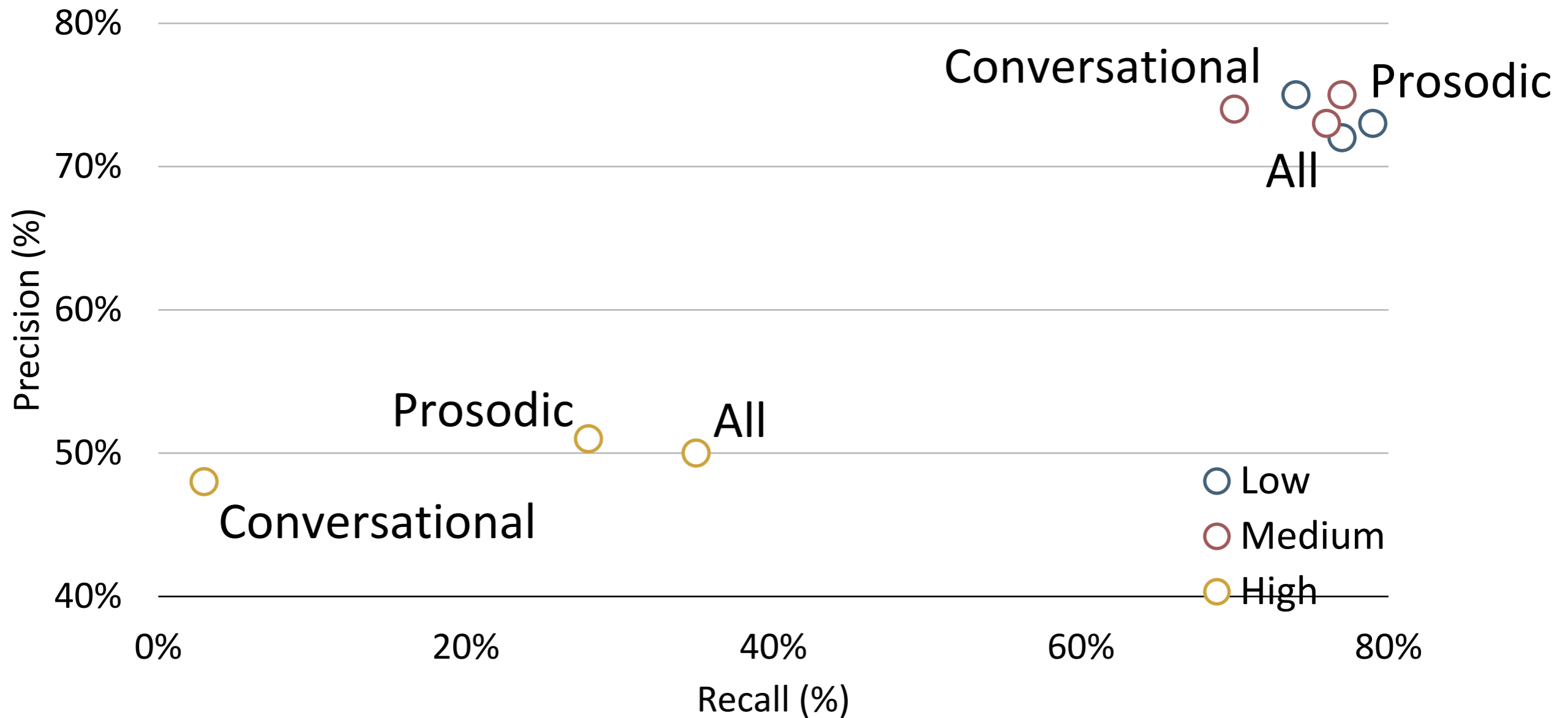
Kim, Salamin, Valente, Vinciarelli, *“Automatic Detection of Conflicts in Spoken Conversations: Ratings and Analysis of Broadcast Political debates”*, Proc. of IEEE Intl. Conf. on Audio, Speech and Signal Processing, pp. 5089-5092, 2012

Binary Classification



Linear Kernel SVM (10 fold validation)

Three-Class Classification



Linear Kernel SVM (10 fold validation)

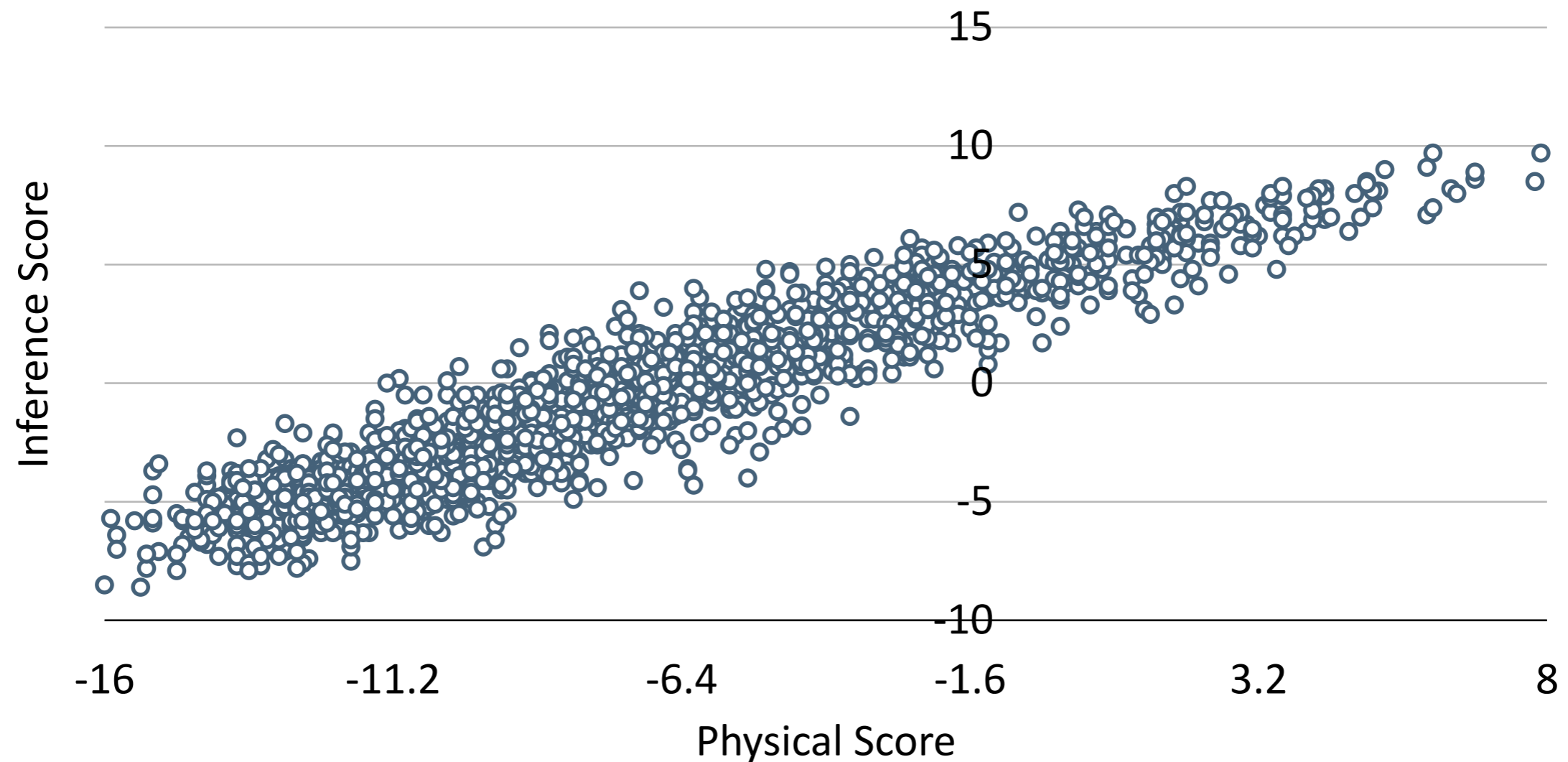
Indications



- An international benchmarking campaign organised at Interspeech 2013 (see below)
- The task is technically meaningful, but the three categories are arbitrary
- Regression approaches can avoid the definition of classes

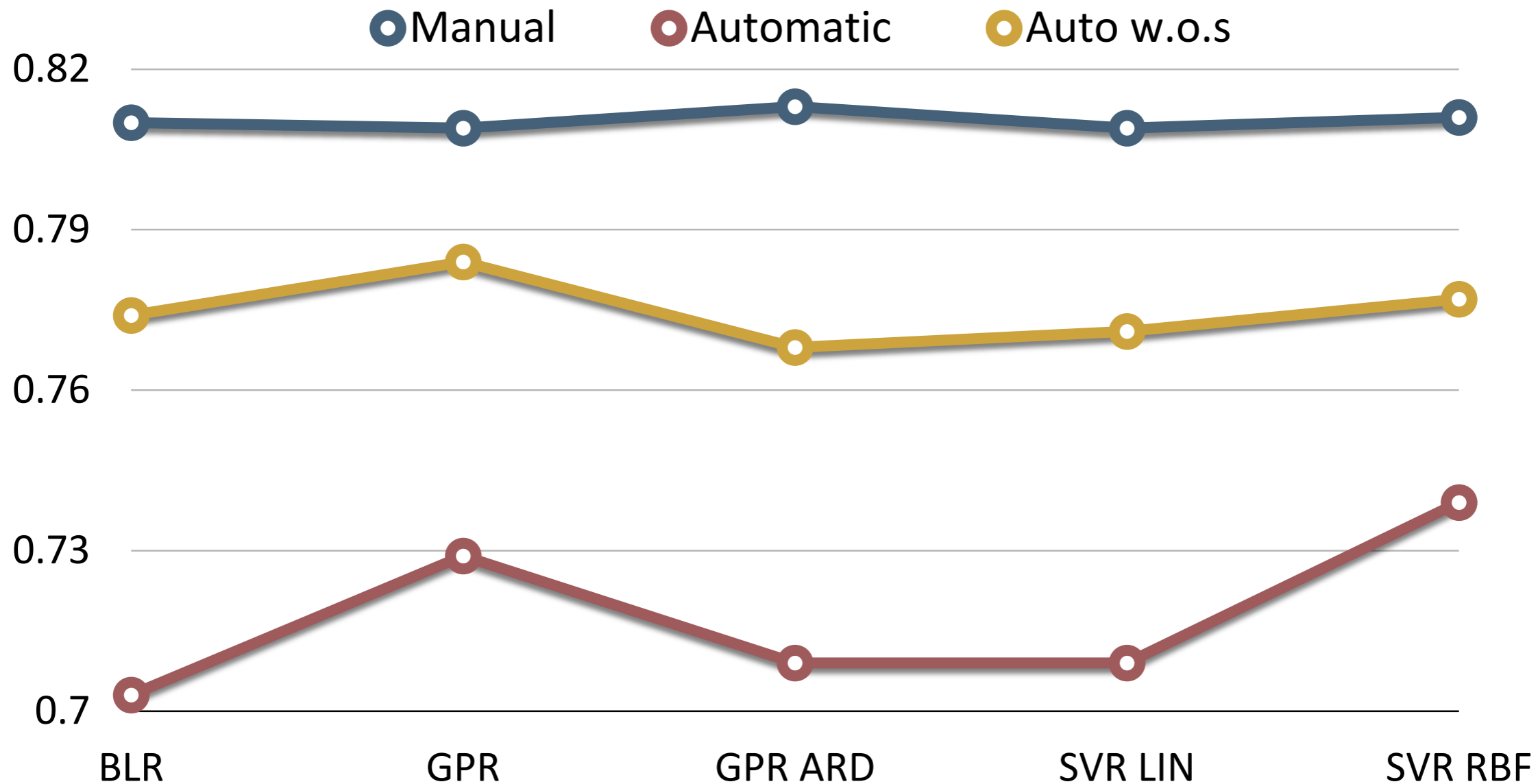
Schuller, Steidl, Batliner, Vinciarelli, Scherer, Ringeval, Chetouani et al., “*The Interspeech 2013 Computational Paralinguistic Challenge: Social Signals, Conflict, Emotion, Autism*”, Proceedings of Interspeech, 2013

Regression



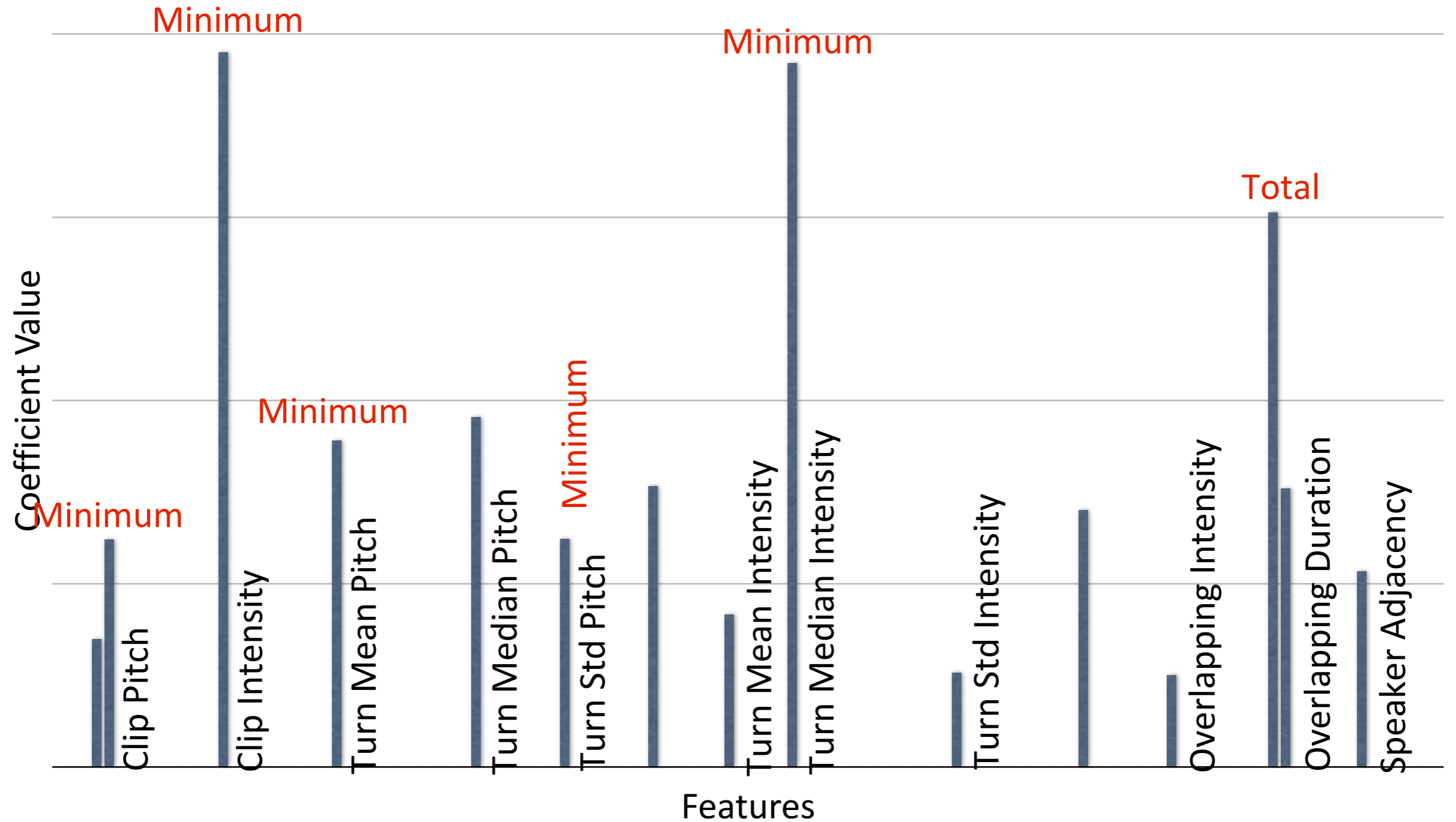
Kim, Filippone, Valente, Vinciarelli, "[Predicting the Conflict Level in Television Political Debates: an Approach Based on Crowdsourcing, Nonverbal Communication and Gaussian Processes](#)", Proc. of ACM Intl. Conf. on Multimedia, 793-796, 2012.

Results

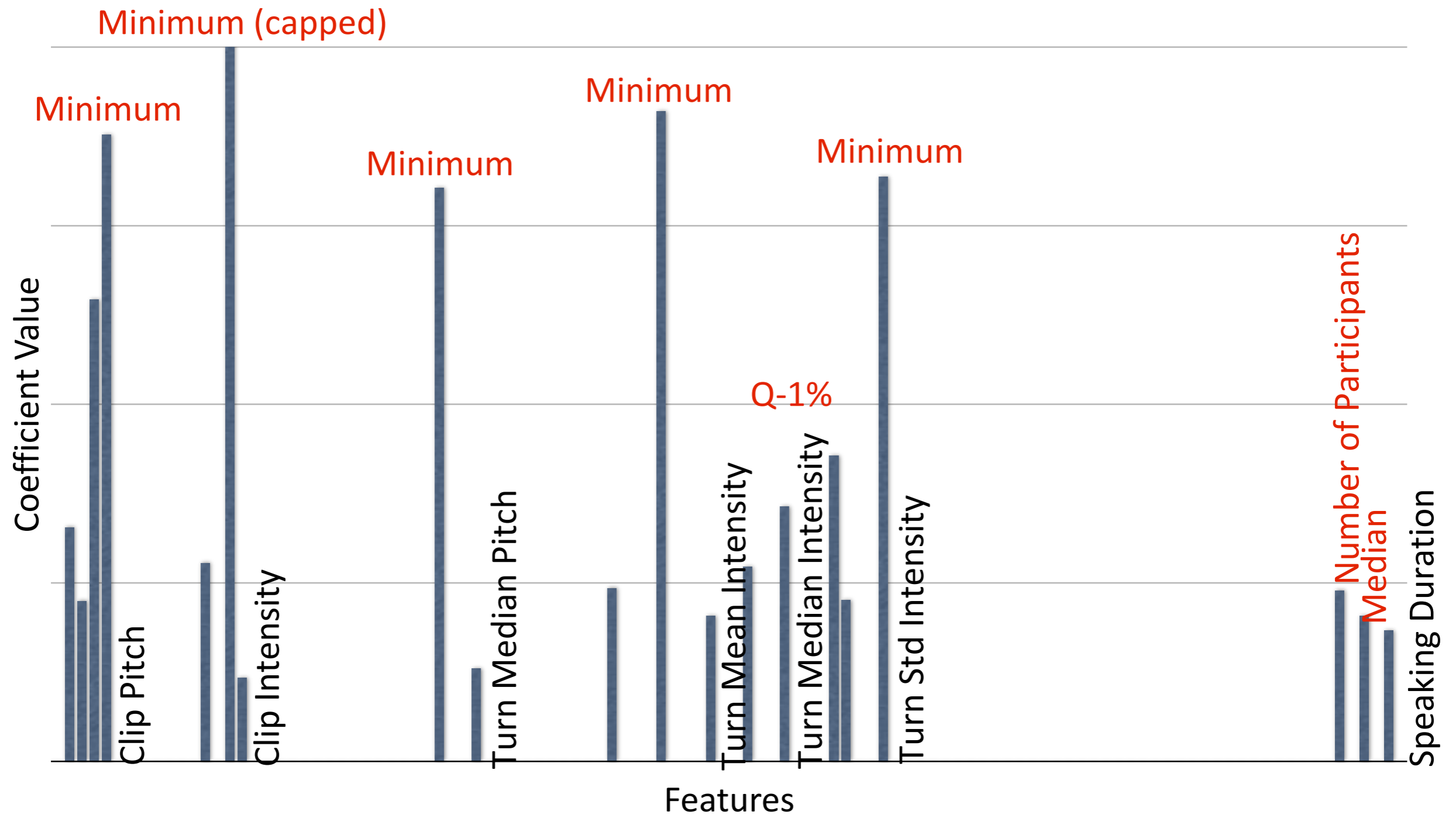


Kim, Filippone, Valente, Vinciarelli, [*Predicting the Conflict Level in Television Political Debates: an Approach Based on Crowdsourcing, Nonverbal Communication and Gaussian Processes*](#), Proc. of ACM Intl. Conf. on Multimedia, 793-796, 2012.

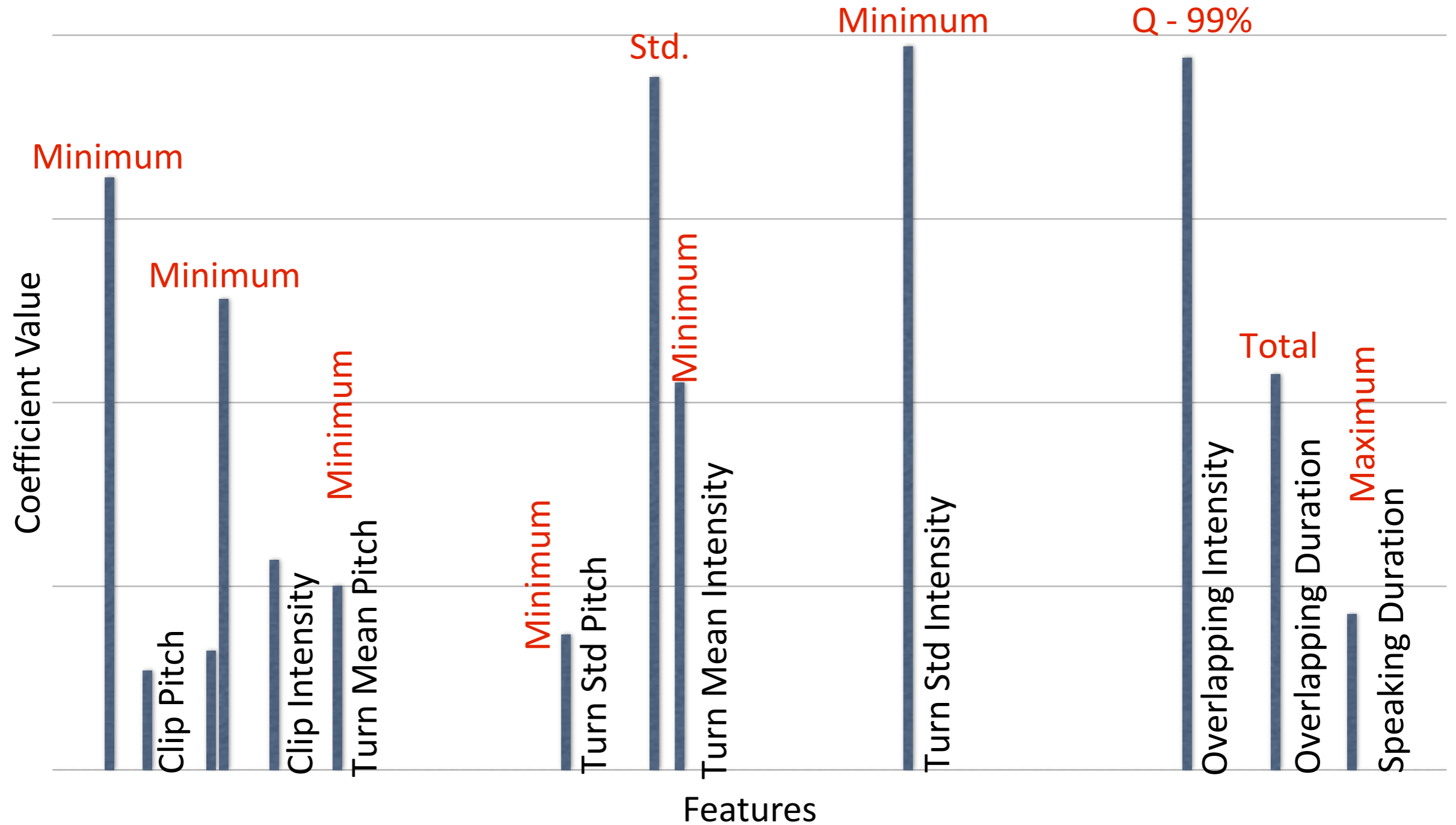
ARD Results (Manual)



ARD Results (Automatic)



ARD Results (Automatic w.o.s.)



Outline



- Conflict
- Data Collection
- Experiments and Results
- **Conclusions**

Conclusions



- Conflict can be measured, both manually and automatically, based on behavioral observations
- During conflict the behavior of one “pushes” the behavior of others (at least in terms of pitch and intensity)
- Overlapping speech appears to be one of the most crucial markers

Thank you!



Many thanks to:

- Fabio Valente (Idiap Research Institute)
- Maurizio Filippone (University of Glasgow)
- Samuel Kim (Yonsei University / Idiap)
- Bjoern Schuller (TU Munich)