



[www.amiproject.org](http://www.amiproject.org)

# Agreement Detection in Multiparty Conversations

---

FEAST,  
21st October 2009

Sebastian Germesin  
Theresa Wilson



# Motivation



- Growing interest in extracting and summarising information from meetings
- One important type of information are agreements / disagreements

⇒ Development of an automatic detection system!

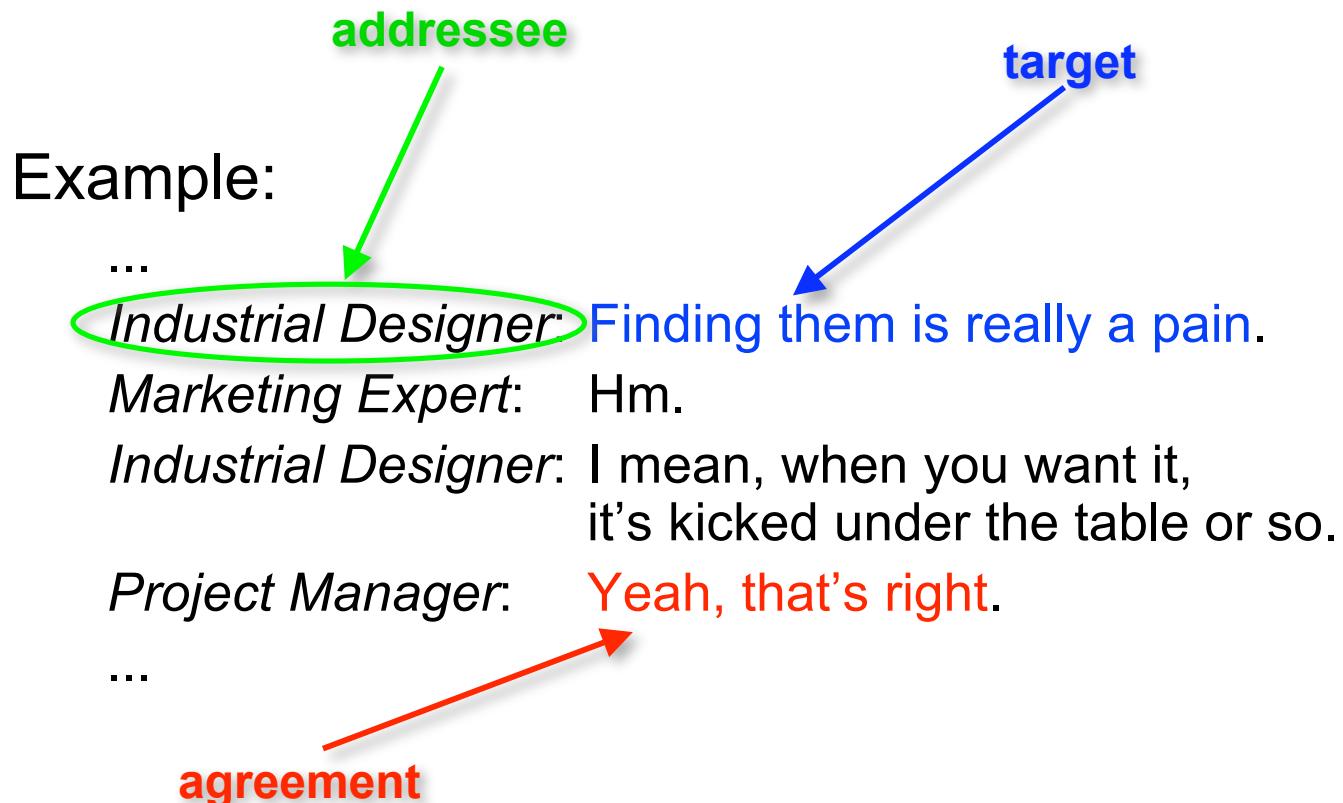
# Agreements in this work



- What do we mean by “(dis)agreements”?
  - Utterances where a speaker agrees/disagrees with an idea/opinion/sentiment of another speaker [Wilson, 2008]
- Agreements in the context of multi-party conversations



# Example





# Data (AMI Corpus)

## AMI meeting corpus

- 100 hours of audio and video recorded meetings
- 4 participants
- (guided) task:  
*“Design a remote control!”*
- Variety of annotations, e.g.:
  - Transcribed speech, ASR output, ...
  - Dialogue Acts, Disfluencies, ...
  - Head- & Hand-Gestures, VFOA, ...
  - and...



# Data (AMI Corpus)



[www.amiproject.org](http://www.amiproject.org)

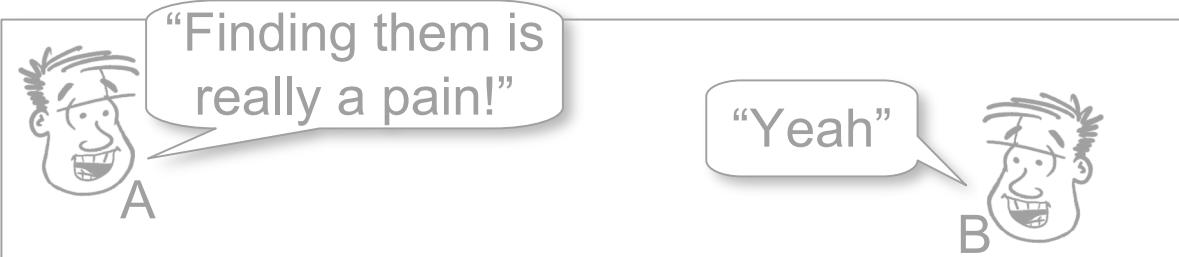


## (Dis)Agreement Annotations

- 20 AMI meetings have been annotated
- Word-based annotation scheme
- 16 for training, 4 for evaluation
- 636 agreements / 70 disagreements
- Aligning to DA segments to preserve comparability with ICSI research ([Hillard 03], [Galley 04], [Hahn 06]):
  - 19,043 segments
  - 876 segments contain agreements
  - 118 segments contain disagreements
- ⇒ 4.6% : 0.6% : 94.8% (agree : disagree : other)



# Automatic Detection System



Agree Detection

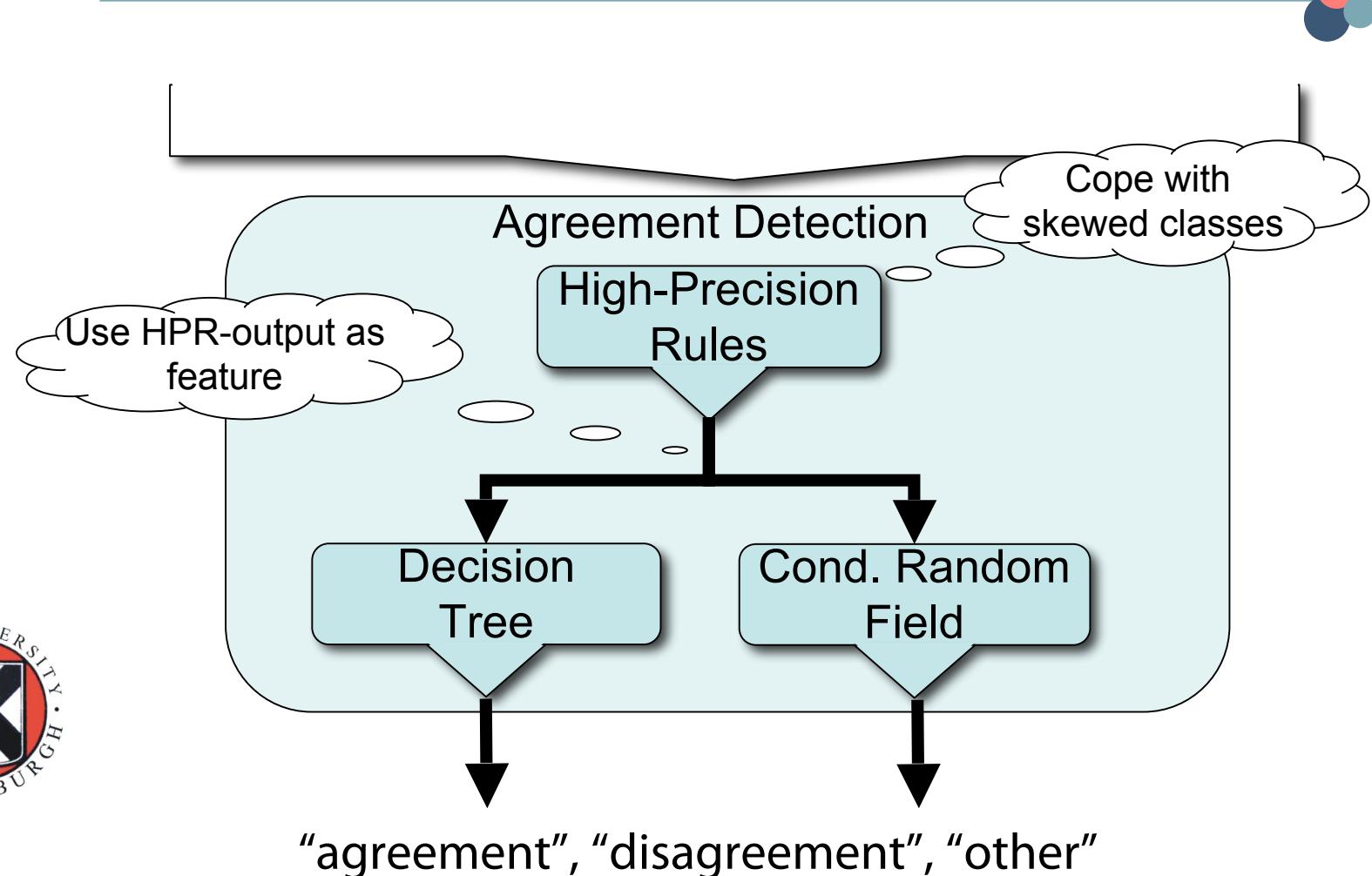
"agreement"

Target Speaker Detection

B agrees with A

# Automatic Detection System

[www.amiproject.org](http://www.amiproject.org)

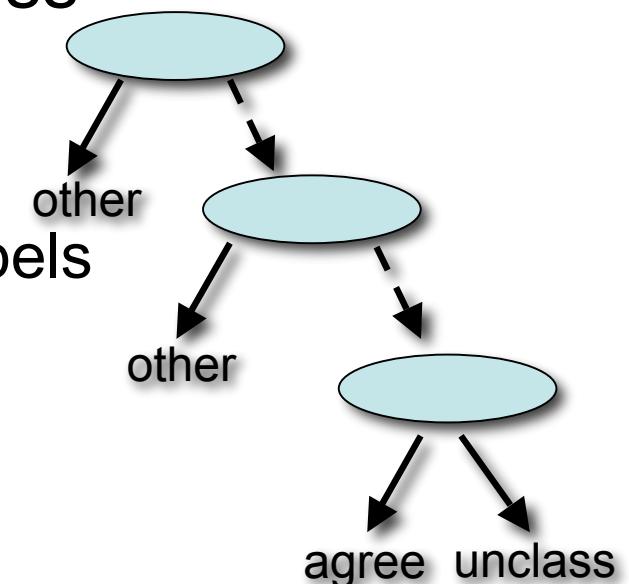


# Automatic Detection System



## HPRs - High Precision Rules

- *Implement prior knowledge in simple set of rules before actual classification*
- Reduce data skewness
- Rule-Types:
  - Target-Content
  - Dialogue Act (DA) Labels
  - Subjective Content
  - N-grams



[www.amiproject.org](http://www.amiproject.org)



German Research Center for  
Artificial Intelligence GmbH



# Automatic Detection System



## Decision Tree

- C4.5 implementation from WEKA Toolkit
- Lexical features
- Prosodic features
- Structural features
- HPR-output
- Contextual features

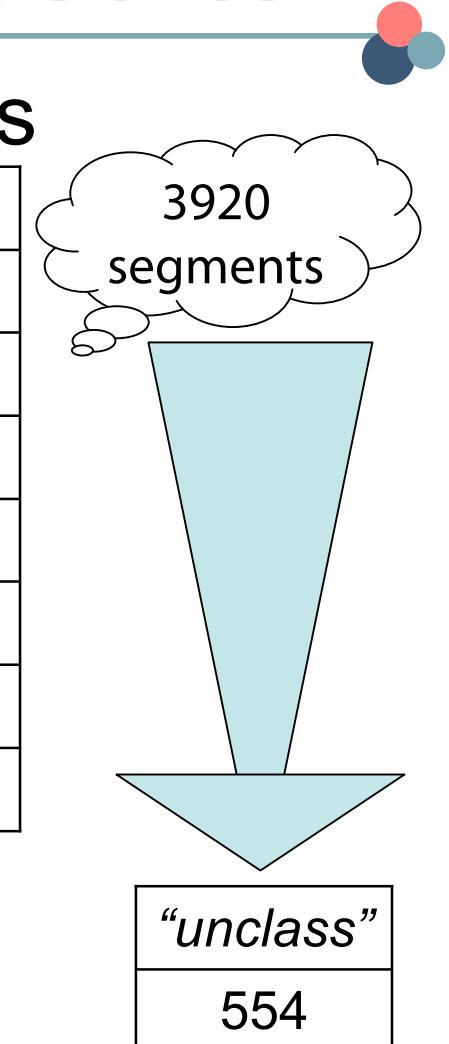
## Conditional Random Fields

- CRF implementation from Stanford NER
- Lexical features
- Prosodic features
- Structural features
- HPR-output

# Experimental Results

## High-Precision-Rules

<b>name</b>	<b>correct</b>	<b>wrong</b>
No-Target	740	12
DA-Label (src)	295	2
DA-Label (tar)	274	2
Silence	1	0
Length	141	5
Pre-Class.	1890	0
Agreement	4	0



agree  
4

other  
3362



# Experimental Results

## Agreement Detection

	<b>Baseline</b>	<b>CRFs</b>		<b>DTs</b>	
		w/ HPRs	w/o HPRs	w/ HPRs	w/o HPRs
Acc [%]	97.8	98.0	98.1	97.8	97.8
Prec [%]	0.0	57.6	58.8	45.0	48.5
Rec [%]	0.0	36.3	34.6	31.1	42.4
F1 [%]	0.0	44.5	43.5	36.8	45.2
Kappa	0.0	0.40	0.39	0.36	0.40
RT Factor	0.0	0.005	0.005	0.01	0.03



# Automatic Detection System



Agree Detection

"agreement"

Target Speaker Detection

B agrees with A



# Automatic Detection System



Agree Detection

"agreement"

Target Speaker Detection

B agrees with A

# Automatic Detection System



[www.amiproject.org](http://www.amiproject.org)



German Research Center for  
Artificial Intelligence GmbH

## Target Speaker Detection:

- *Novelty in agreement detection*
- *Preliminary experiments using Adjacency Pair-Annotation*

# Automatic Detection System



[www.amiproject.org](http://www.amiproject.org)



## Internal Representation:

- Use speaker-dependent (relative) labels
  - 0 for current speaker
  - 1 for previous speaker
  - ...
- *Let's see this in the example:*



# Example

Example:

...  
*Index '1':*

addresssee

*Index '2':*

Finding them is really a pain.

*Index '1':*

Hm.

*Index '0':*

I mean, when you want it,  
it's kicked under the table or so.

Yeah, that's right.

...

agreement

target

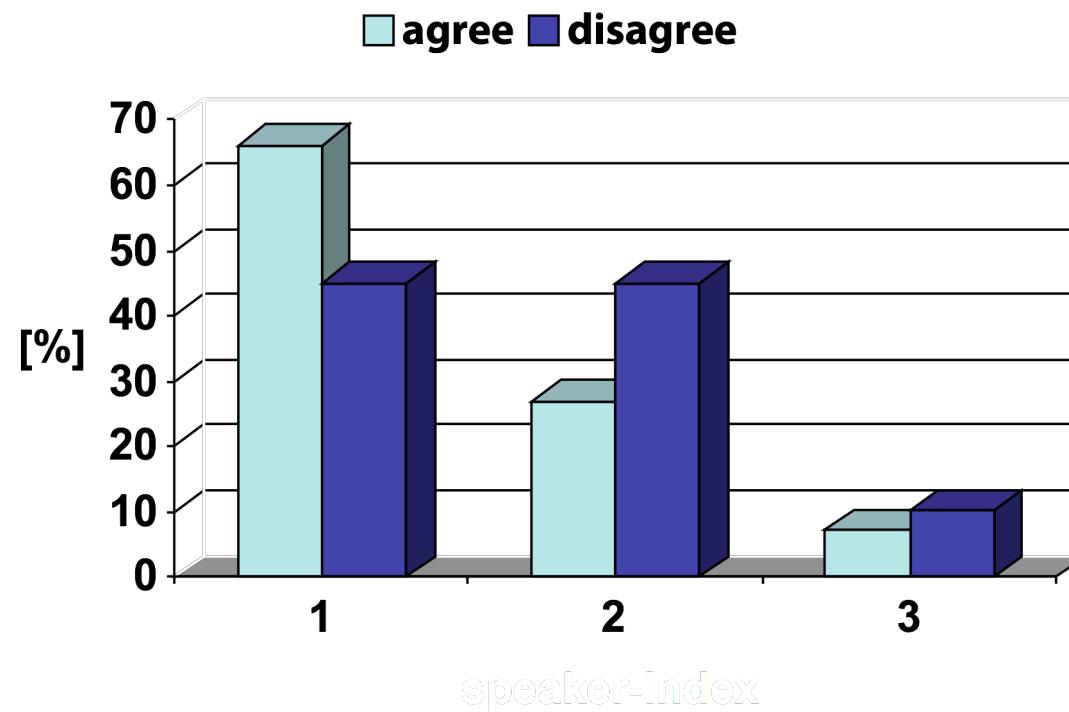
# Automatic Detection System



[www.amiproject.org](http://www.amiproject.org)



German Research Center for  
Artificial Intelligence GmbH



# Automatic Detection System



[www.amiproject.org](http://www.amiproject.org)



German Research Center for  
Artificial Intelligence GmbH

## Target Detection:

- Use structural information from Adjacency Pairs to improve target speaker detection!  
(backward-window of 10 segments)
- Fall back to speaker '1' if no AP is available

# Experimental Results



[www.amiproject.org](http://www.amiproject.org)



## Baseline

		classified as					
		1	2	3	Acc	$F_1$	k
real	1	164	0	0	64.5	78.0	0.00
	2	78	0	0		00.0	
	3	12	0	0		00.0	

# Experimental Results



[www.amiproject.org](http://www.amiproject.org)



## Using AP-Information

		classified as					
		1	2	3	Acc	$F_1$	k
real	1	163	0	1	80.3	86.9	0.52
	2	38	40	0		67.2	
	3	10	1	1		14.2	

56% improvement

# Conclusion



Developed a system for agreement detection:

- Utilized a variety multi-modal, heterogeneous features (e.g., lexical, prosodic, structural)
- Investigated the use of High-Precision Rules to deal with imbalanced class distribution
- Evaluated two different types of machine learning techniques
  - Conditional Random Fields
  - Decision Trees
  - Accuracy: 98.1%
  - Kappa : 0.40
  - CRF: higher Precision
  - DT: higher Recall



# Conclusion (cont.)



## Novelty: Target Speaker detection!

- Introduced preliminary approach, using structural information from the adjacency pairs
- 56% relative improvement over the baseline
- Kappa value of 0.52

# Outlook

---



- Separate detection of agreements and disagreements
- Separate detection of one-word and multi-word agreements
- Use machine learning for addressee detection
- Use automatic annotations
- Use other features (e.g., visual cues)
- Care about data skewness



[www.amiproject.org](http://www.amiproject.org)



German Research Center for  
Artificial Intelligence GmbH

# Thank you!

