

# Language specificity and ASD

Ani Nenkova

Computer and Information Science

University of Pennsylvania

# Balancing details in communication

- General statements
  - difficult to check their truth value
  - leave open questions
- Specific statement
  - difficult to integrate the details
  - significance of details may be unclear

He said he spent \$300 million on his art business this year. A week ago his gallery racked up a \$23 million tab at a Sotheby auction in New York buying seven works, including a Picasso.

The 40 year old Mr. Murakami is a publishing sensation in Japan. A more recent novel, "Norwegian wood", has sold more than forty million copies since Kodansha published it in 1987.

# Expressing content both ways

- Crucial for comprehension
- In discourse analysis of American news (PDTB)
  - A general/specific pair occurs every 250 words

# Quantifying sentence specificity

John is a great guy. [general]

John is a marine biologist. [specific]

Louis and Nenkova, IJCNLP 2011

Li and Nenkova, AAI 2015

# Sentence specificity classifier

- (Logistic) regression for sentence specificity
- Training data comes from the PDTB
- Testing: PDTB, WSJ, AP, NYT
  - 75--78% accuracy in binary classification
  - Even better when predicting real-value specificity
- Testing on human-written summaries
  - Accurately infer what instructions were given (G/S)

[Louis and Nenkova, IJCNLP 2011]

# Features

Non-lexical

Lexical

- Named entities, numbers
- Likelihood under language model
- Word specificity
- Adjectives/adverbs, length of phrases
- Polar words
- Sentence length

- Each word in sentence

# A simple, accurate and practical tool

- Relies only on
  - features that are fast to compute
  - Unlabeled data

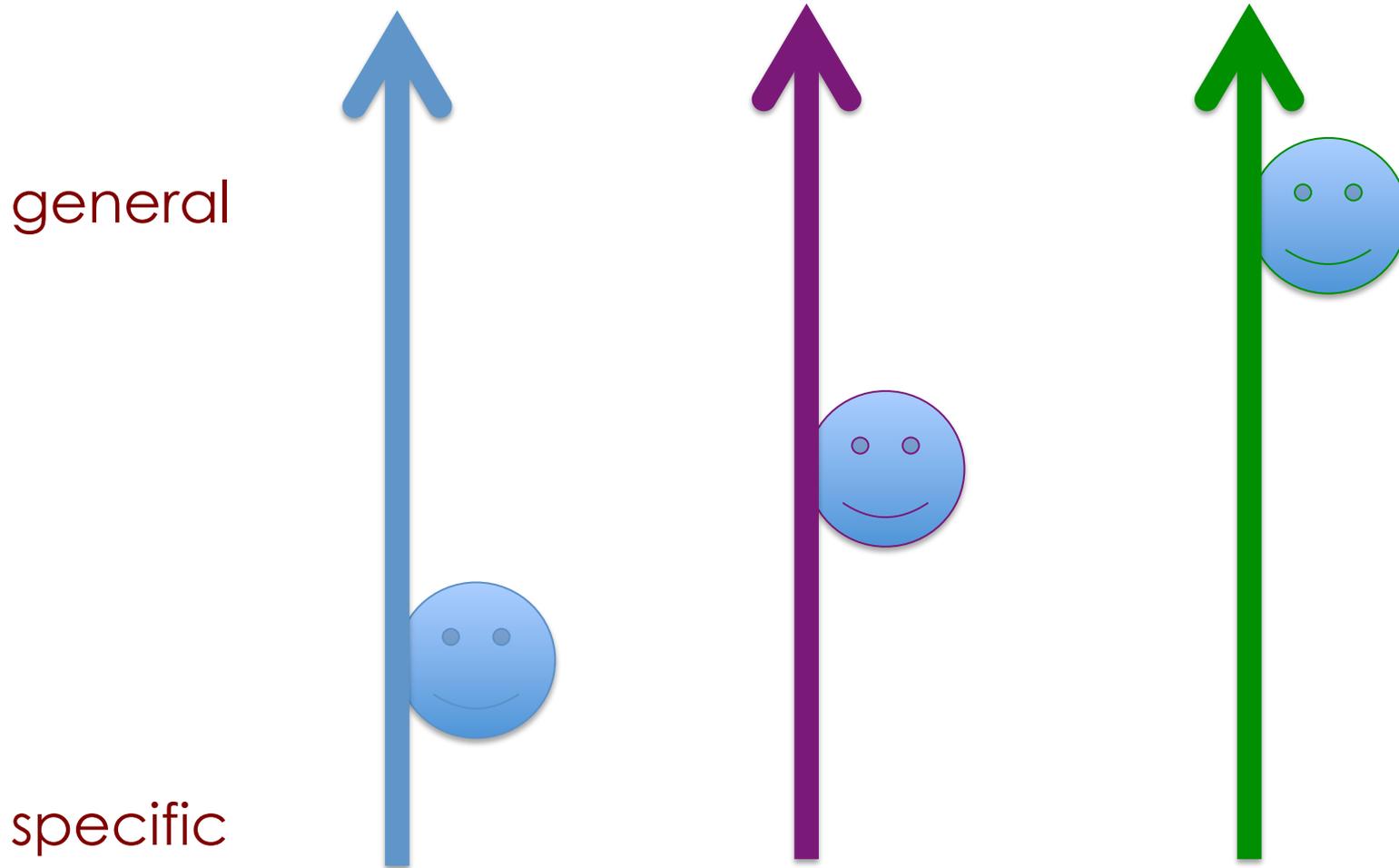
Classifier	Accuracy	Precision	Recall
Shallow	80.45 (+6.89)	79.74 (+10.30)	76.37 (+1.74)
Word rep	79.55 (+7.91)	77.42 (+7.39)	77.61 (+11.94)
<b>Combined</b>	<b>81.58</b>	<b>80.56</b>	<b>78.36</b>
Louis & Nenkova	77.40	74.40	76.62
Word Identity	69.83 (+6.44)	65.10 (+6.62)	72.39 (+5.47)

# Applications scenarios

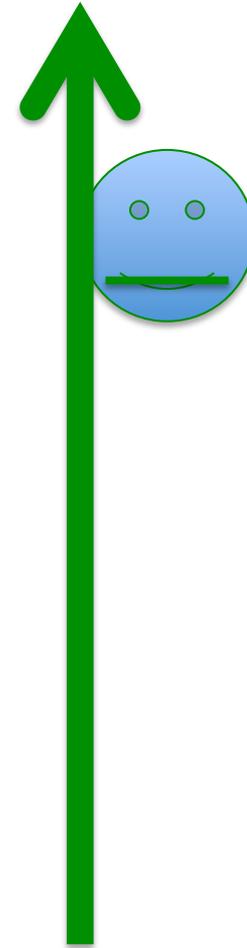
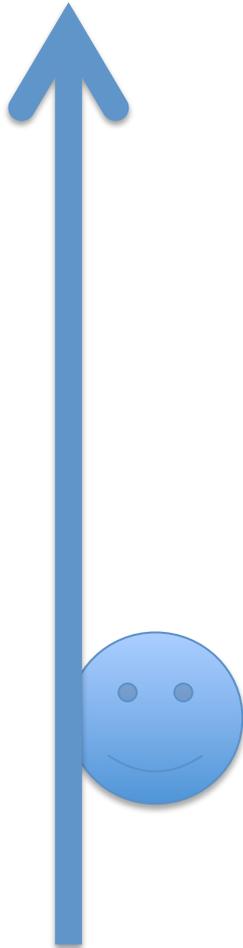
- Best science writing [Louis&Nenkova, Discourse and dialog 2013]
  - significantly more general than typical writing
- Easier to comprehend texts [Li&Nenkova, AAI 2015]
  - significantly more general than harder texts
- Content written for shorter lengths [Louis&Nenkova, EACL 2014]
  - significantly more general than for longer lengths
- Content-dense text [Yang&Nenkova, AAI 2014]
  - significantly more specific than non-dense

# Applications in ASD

# Individual specificity level preference



# Possibility for communication difficulties



Ongoing pilot on language specificity and ASD

with Julia Parish-Morris, Jessy Li, Leila Bateman and others

# Study design

- Take the adult autism spectrum test (AQ)
- Rate news sentences for perceived specificity
- Summarize two texts
  - One with much specific detail
  - One more general

# AQ test: two types of questions

- Endorsement (confirm autistic traits)
  - I tend to notice details that others do not
  - I am fascinated by dates
  - I usually notice car number plates or similar info
- Non-endorsement (disconfirm non-autistic traits)
  - I find social situations easy
  - I enjoy doing things spontaneously
  - I am good at social chit-chat

# Sentences for specificity rating

- Rated by three typical women
  - Ideally will be normed in the future

Success in Iraq means engaging the local populace and that hasn't been their strength even domestically. (4.3)

The two dissenters were Justice Clarence Thomas and Chief Justice William H. Rehnquist, who said that the majority had mischaracterized the Zadvydas decision as applying to the Mariel groups. (3.0)

More than half of all 2005 American military deaths, 427, were caused by homemade bombs, most planted along roadsides and detonated as vehicles passed. (0.6)

# Preliminary findings

- When summarizing a detail-rich article
  - Subjects with higher AQ scores include more specific details
- When summarizing an article without much detail
  - No difference in the summary specificity among groups with different AQ scores
- High scores on non-endorsement AQ
  - Correlates with perception of sentences being more specific

# Confounds

- Gender
- First language
- Gender—first language interaction

The two subjects with highest AQ scores are both female, both with Asian first language

# Immediate future plans

- Collect more data with
  - Only native English speakers
  - Analysis separate by gender
- Collect true sentence specificity norms
- Further examine the variation in endorsement vs. non-endorsement questions
- Complete analysis of summary data

# Conclusions

- Controlling language specificity is crucial ability for effective communication
- Automatic tools for quantifying specificity in (news) text have been developed
- Ongoing work to understand the link between specificity preference and perception and ASD