It's Not You, It's Me: Automatically Extracting Social Meaning from Speed Dates

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Background: Extraction of Social Meaning from Speech and Text

- **Uncertainty** (students in tutoring)
  - Liscombe et al. (2005), Forbes-Riley et al. (2008), Black, Chang, Narayanan (2008)
- **Annoyance** (callers to dialog systems)
  - Ang et al. (2002), Liscombe, Riccardi, Hakkani-Tur (2005)
- **Personality** (extroversion)
  - Mairesse et al., 2007
- **Deception**
  - Newman et al. (2003)
- **Charisma**
  - Rosenberg and Hirschberg (2005)
- **Trauma** (after 9-11)
  - Cohn et al. (2004), Rude et al. (2004), Pennebaker and Lay (2002)
- **Dating interest**
  - Madan et al., 2005, Pentland 2005

Why should we care about extracting social meaning?

- Social computing relies on automatic extraction
  - Cassell (2001), Nass & Brave (2005), Pentland (2008), etc.
  - Better conversational agents
    - Detecting student is uncertain -> more sophisticated educational apps
    - Detection of annoyance -> better dialogue
    - Better matching of style, accomodation, etc
  - Analysis of inherently social data (meetings, conversations, email, text messages, social networks, etc)
    - trauma -> psychological interventions
    - deception -> forensic computing
- Linguistic analysis of social signals
  - Important sociolinguistic and social psych task

Detecting social meaning: our study

- Given speech and text from a conversation
- Can we detect `styles', like whether a speaker is
  - Awkward?
  - Flirtatious?
  - Friendly?
- Can we tell if the speakers like each other?
- Dataset:
  - 991 4-minute "speed-dates"
  - Each participant rated their partner and themselves for these styles

speed dating *noun*

speed dating [uncountable]

an event at which you meet and talk to a lot of different people for only a few minutes at at a time. People do this in order to try to meet someone and have a romantic relationship.

Our speed date setup

Our speed date setup

What do you do for fun? Dance?

Uh, dance, uh, I like to go, like camping. Uh, snowboarding, but I'm not good, but I like to go anyway.

You like boarding.

Yeah. I like to do anything. Like I, I'm up for anything.

Really?

Yeah.

Are you open-minded about most everything?

Not everything, but a lot of stuff-

What is not everything [laugh]

I don't know. Think of something, and I'll say if I do it or not. [laugh]

Okay. [unintelligible].

Skydiving. I wouldn't do skydiving I don't think.

Yeah I'm afraid of heights.

F: Yeah, yeah, me too.

M: [laugh] Are you afraid of heights?

F: [laugh] Yeah [laugh]

The SpeedDate corpus

- **991 4-minute dates**
  - 3 events, each with ~20x20=400 dates, some data loss
  - Participants: graduate student volunteers in 2005
    - participated in return for the chance to date
- **Speech**
  - ~60 hours, from shoulder sash recorders; high noise
- **Transcripts**
  - ~800K words, hand-transcribed, w/turn boundary times
- **Surveys**
  - (Pre-test surveys, event scorecards, post-test surveys)
  - Date perceptions and follow-up interest
  - General attitudes, preferences, demographics
- Largest experiment with audio, text, + survey info

What we attempted to predict

- **Conversational style:**
  - *How often did **you** behave in the following ways on this date?*
  - *How often did **they** behave in the following ways on this date?*
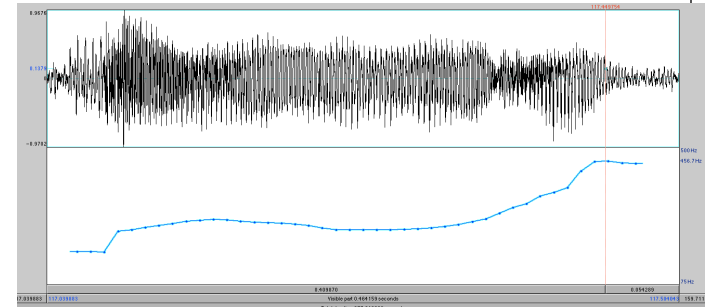   - On a scale of 1-10 (1=never, 10=constantly)
 1. **flirtatious**
  2. **friendly**
  3. **awkward**
  4. assertive

Features

- Prosody/Intonation
  - pitch (min, mean, max, std)
  - intensity (min, max, mean, std)
  - duration of turn
  - rate of speech (words per second)
- Dialog
  - questions
  - backchannels (*"uh-huh", "yeah"*)
  - appreciations (*"Wow!", "That's great!"*)
- Words
  - negative emotion (*bad, weird, crazy, hate*) words
  - storytelling words (past tense) + food words (*eat, dinner*)
  - love and sexual/emotional words (*love, passionate, screw*)
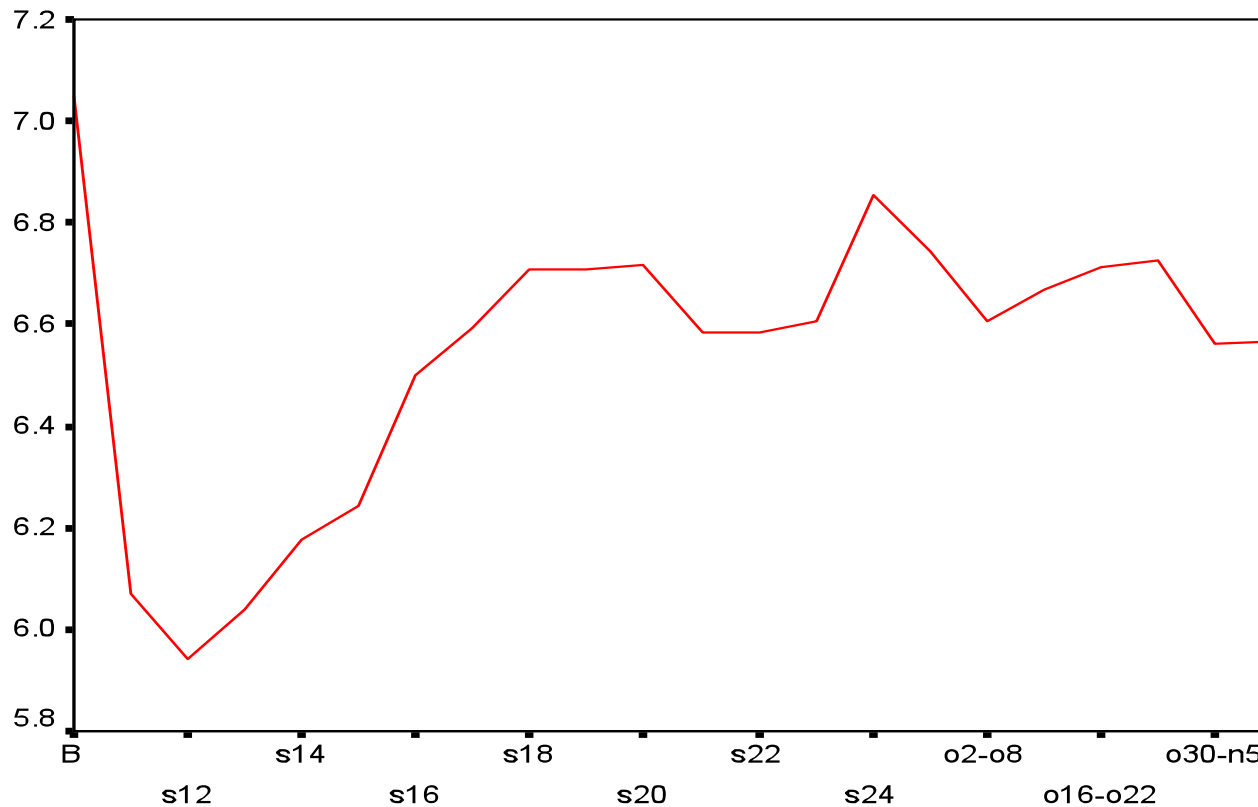 - personal pronouns (*I, you, we, us*)

Features extracted within turns
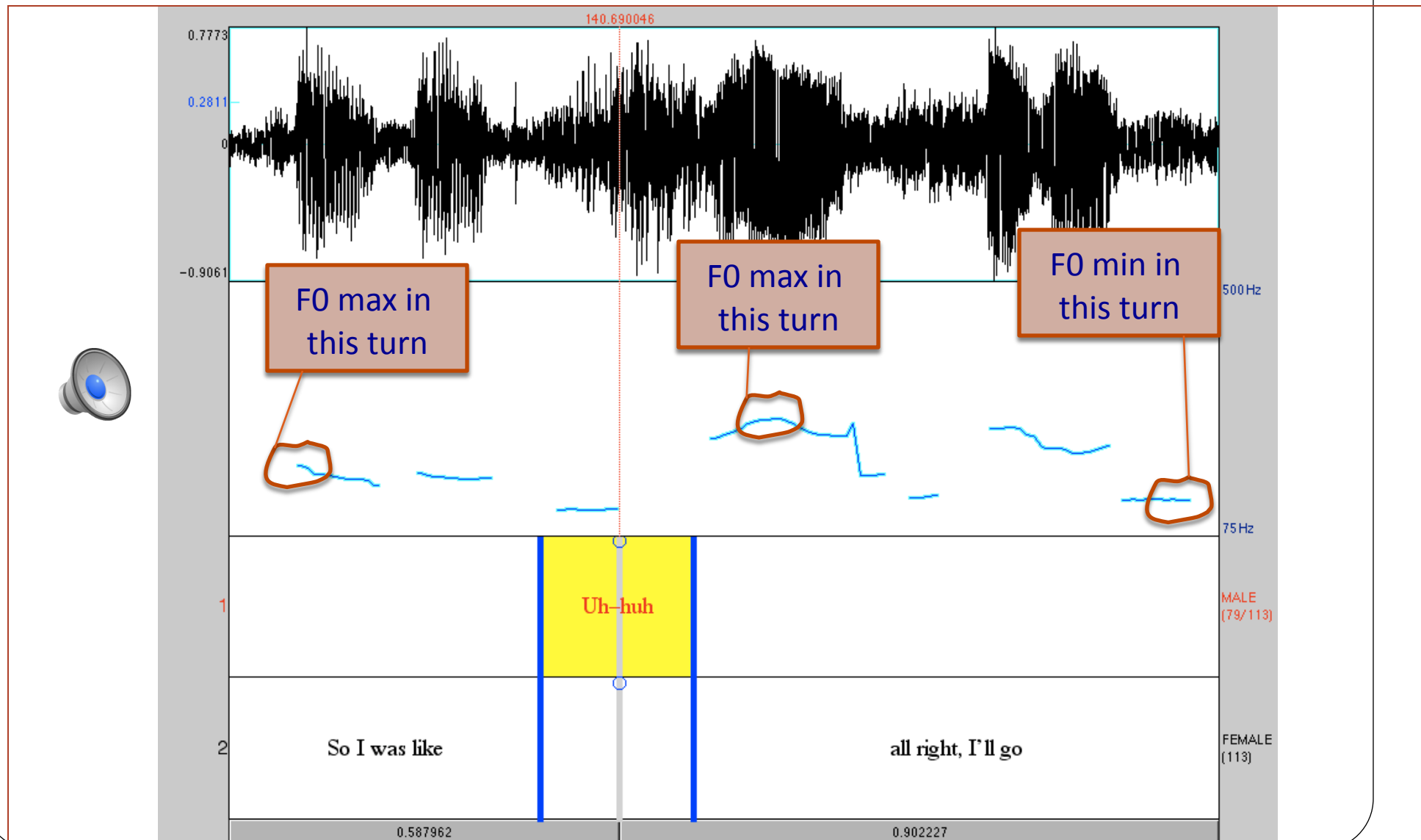
Livejournal.com:
I, me, my on or after Sep 11, 2001

Cohn, Mehl, Pennebaker. 2004. Linguistic markers of psychological change surrounding September 11, 2001. Psychological Science 15, 10: 687-693.

Graph from Pennebaker slides

September 11 LiveJournal.com study:
We, us, our

Cohn, Mehl, Pennebaker. 2004. Linguistic markers of psychological change surrounding September 11, 2001. Psychological Science 15, 10: 687-693.

Graph from Pennebaker slides

LiveJournal.com September 11, 2001 study: Positive and negative emotion words

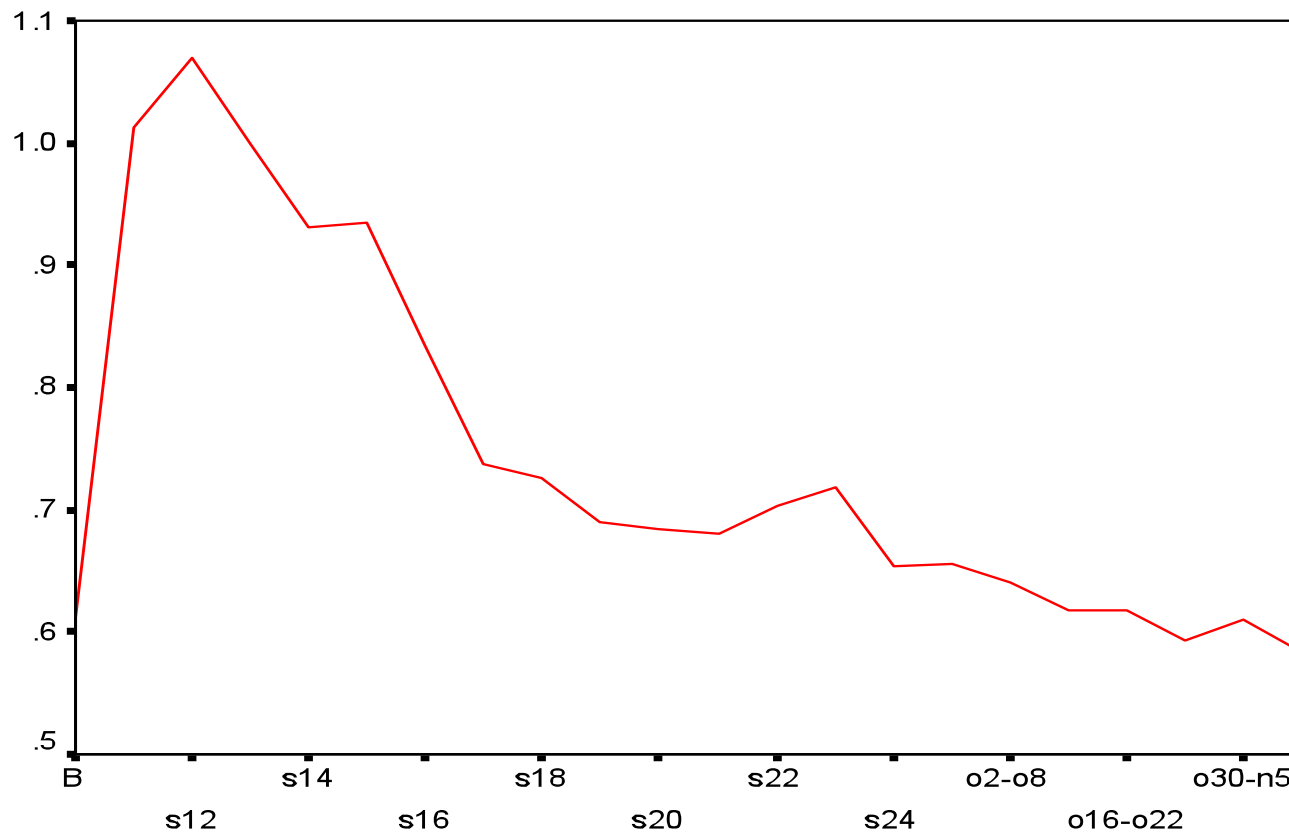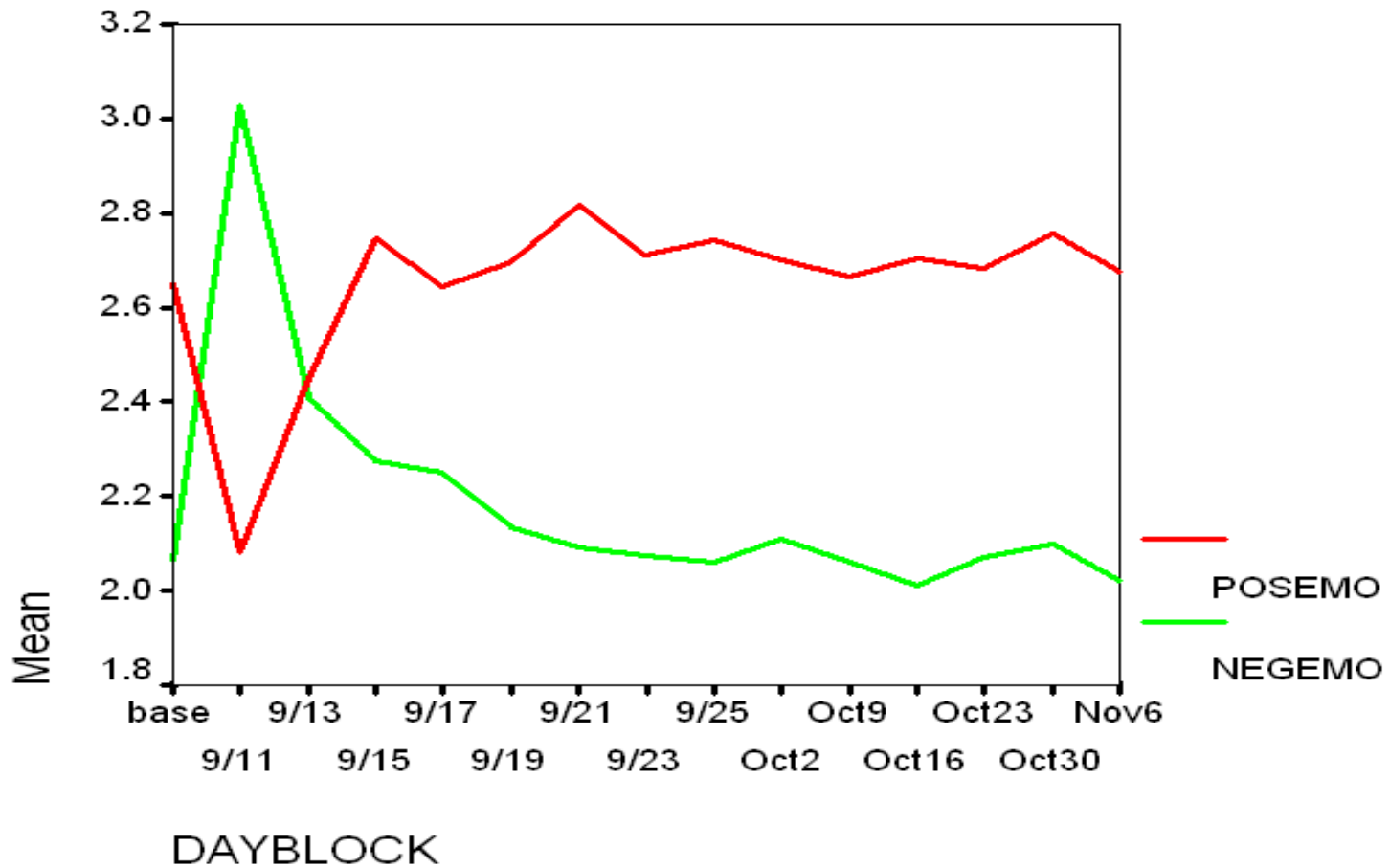Cohn, Mehl, Pennebaker. 2004. Linguistic markers of psychological change surrounding September 11, 2001. Psychological Science 15, 10: 687-693.

Graph from Pennebaker slides

LIWC

- Linguistic Inquiry and Word Count
  - Pennebaker, Francis, & Booth, 2001
- dictionary of 2300 words grouped into > 70 classes
  - **negative emotion** (bad, weird, hate, problem, tough)
  - **sexual** (love, loves, lover, passion, passionate, sex,)
  - **1st person pronouns** (I me mine myself I'd I'll I'm…)
  - **2nd person pronouns** (you, you'd you'll your you've…)
  - **ingest** (food, eat, eats, cook, dinner, drink, restaurant…)
  - **swear** (hell, sucks, damn, fuck,…)
  - …
- after 9/11
  - greater negative emotion
  - more socially engaged

Architecture: 6 binary classifiers

- **Female ±Awkward, Male ±Awkward,**
- **Female ±Friendly, Male ±Friendly,**
- **Female ±Flirtatious, Male ±Flirtatious,**
- **Multiple classifier experiments**
  - L1-regularized logistic regression
  - SVM w/RBF kernel

Our results: predicting flirt **intention**

- Using my speech to predict whether I say I am flirting

	Male speaker	**Female speaker**
I say I'm flirting	72%	76%

Predicting flirt **perception**

- Using my speech to predict whether partner says I am flirting

	Male speaker	**Female speaker**
Partner says I'm flirting	80%	68%

Summary: flirt detection

- Using my speech to predict whether I am flirting

	Male speaker	Female speaker
I say I'm flirting	72%	76%
Partner says I'm flirting	80%	68%

Fine, but how good is 72 or 76?

- In NLP we use human performance as a "ceiling"
- Checking human performance:
  - If John says Jane is flirting
  - And Jane says Jane is flirting
  - Then we say John is right.

Male speaker (female perceiver)	Female speaker (male perceiver)
64%	57%

Implication #1

- Females are better than males at detecting flirting
  - or males give off clearer flirting cues

Male speaker (female perceiver)	Female speaker (male perceiver)
64%	57%

Implication #2: Machines are better than humans at detecting flirting

	Overall	**Male speaker**	**Female speaker**
Computer detector	**74%**	72%	76%
Human detector	**61%**	64%	57%

How can this be?

- Why are humans so bad at detecting flirtation?

- Our Intuition:

	I am flirting	Other is flirting
Male 101 says:	8	7
Female 127 says:	1	1

What correlates with my perception of others flirting

- Pearson correlation coefficients

Variable	ρ
How I see other flirting & How other sees themself flirting	.15
How I see other flirting & How I see myself flirting	.73

What correlates with my perception of others style

- Pearson correlation coefficients

Variable	My perception of other & self-intention	My perception of other & other-intention
Flirting	.73	.15
Friendly	.77	.05
Awkward	.58	.07
Assertive	.58	.09

"It's not you, it's me"

- My perception of whether my date is flirting
- Is the same as my perception of whether I am flirting
- **Why?**
  - Speakers aren't very good at capturing intentions of others in 4 minutes
    - Speakers instead base judgments on their own behavior/intentions

Gender differences in flirt intention

- **Both genders when flirting**:
  - use words related to negative emotion
    - especially men
    - didn't use words related to academics
- **Women when flirting:**
  - use words related to love or sex
  - use appreciations
  - laugh, and use I
- **Men when flirting:**
  - raise their pitch floor

What are these "negative emotion" words we use when flirting?

- M: "Oh wow, that's **terrible**"
- M: "That is **awful**"
- M: "Wow, are you **serious**?"
- M: "Yeah, like, I **hated** it too"

- F: That's crazy.
- M: It's like kind of **weird**

Sympathy!

Likely (positive or negative) words for flirting

- **More likely to flirt:**
  - phone
  - party
  - girl
  - dating
  - hate
  - weird
- **Less likely to flirt:**
  - academia
  - interview
  - teacher
  - phd
  - advisor
  - lab
  - research
  - management

What are these "love/sex" words women use when flirting?

- love, loved, loves, passion, passionate
  - Well, I **love** to cook.
  - I really **love** San Francisco.
  - Oh, I **love** that show
  - …my **passion** is teaching.
  - …cooking is my **passion**.
  - Um, right now I'm **passionate** about getting through my first year of my PhD program.

Strong positive affect toward hobbies or interests!

Missing the cues!!

- **Women think men are flirting when:**
  - men ask questions
  - men speak faster.
- **But men who are flirting actually:**
  - raise their pitch floor
  - are sympathetic
  - are more fluent

Missing the cues!!

- **Men think women are flirting when women:**
  - use love/sex words,
  - tell stories
  - have higher pitch max,
  - vary their loudness.
- **But women who are flirting actually:**
  - use love/sex words [men get this right]
  - use more I
  - laugh more
  - use more appreciations

What about friendliness, awkwardness, etc?

Detecting awkward and friendly speakers

- Using what I do & what my date does to predict what my date calls me

- Simpler (logistic regression) classifier

	Awkward		Friendly	
	M	F	M	F
Using speaker words/speech	63%	51	72	68
+ partner words/speech	**64**	**64**	**73**	**75**

What makes someone seem friendly?
"Collaborative conversational style"

Clarifications

Collaborative Completion

- I finish your sentence

And I'm wearing a yellow shirt

And black pants

What makes a man seem awkward?

- More disfluent
  - Increased uh/um and restarts
- Not collaborative conversationalists
  - (no appreciations, repair questions, collab completions, you)
- Take fewer turns
- Don't overlap

Work in progress:
Can we predict liking?

- That is, can we predict the binary variable:
  - 'willing to give this person my email'
    - Either for a single speaker (baseline 53%=no)
    - Or for a dyad (baseline 81% = no)

What you do when you like someone: Preliminary results

- Men when they like their date
  - use more appreciations ("Great!", "Wow!", "That's cool")
- Women when they like their date
  - vary their pitch and loudness more,
  - raise their max pitch
  - laugh
  - tell stories

Who do you say yes to? Preliminary results

- Men say yes to women who:
  - show interest by asking *clarification questions* ("excuse me?")
  - use "love" and "passion"
  - talk about food
- Women say yes to men who:
  - don't use appreciations
  - talk about food
  - tell stories
  - laugh

Current work: Accommodation

- In general, speakers change their behavior to match (or not match) their interlocutor

  Natale 1975, Giles, Mulac, Bradac, & Johnson 1987, Bilous & Krauss 1988, Giles, Coupland, and Coupland, 1991, Giles and Coupland 1992, Niederhoffer and Pennebaker 2002, Pardo 2006, Nenkova and Hirschberg 2008, inter alia.

  - Matching rate of speech
  - Matching F0
  - Matching intensity (loudness)
  - Matching vocabulary and grammar
  - Matching dialect

- Our question:

  - Do we see more accommodation when people like each other?

Conclusions – for daters

- Talking about your advisor is a bad idea on a date
- Sympathy is a good idea, if you're a guy
- Passion is good, if you're a woman
- Food is good, if you eat

Conclusions – for psychology

- Humans project their internal state on others
- Men and women (at least in 4 minutes) seem to focus on the wrong verbal cues to flirtation

Conclusions – for computer science

- We can do automatic extraction of rich social variables from speech and text.
- For at least this variable ("does speaker intend to flirt") we beat human performance