Welcome
2017 Faculty Summit
Attendees

Faculty Summit 2017
microsoftfacultysummit.com

Microsoft Research
Microsoft.com/research

Facebook
@microsoftresearch

Twitter
@MSFTResearch
#FacSumm
#EdgeofAI
Socially-Aware Conversational Agents

Justine Cassell

Carnegie Mellon University

July 2017
The ineffable quality of Rapport

Children who report more rapport with Alex are more likely learn from the virtual peer.
Search Engine vs. Socially Aware

Justine: “OK Google, I love Manchester United”

Google: Manchester United Football Club is a professional football club Based in Old Trafford, Greater Manchester, England, that competes in the Premier League, the top flight of English Football

Justine: “SARA, I love Manchester United”

SARA: “No way! Arsenal wipes the floor with those Red Devils!”
Chatbot vs. Socially Aware

SARA, 00:13.7, I'm so glad to have the opportunity to meet you in person, 00:16.7

User, 00:18.7, hi how are you [doing, 00:19.2

SARA, 00:19.3, [I'm] in Davos to assist attendees but to be honest I am a little anxious about it it's a big deal to be invited to Davos is it your first time here, 00:28.7

User, 00:29.1, it is and I'm a little anxious too, 00:31.4

SARA, 00:32.7, I found there's a lot to take in I hope that it isn't overwhelming you, 00:37.2

User, 00:37.9, it is overwhelming a little bit, 00:39.8

SARA, 00:40.2, well, let's find another attendee for you to meet who fits your interests and who is an old timer and can show you around, 00:50.1
Motivation for Socially-Aware Agents

1. People pursue *multiple conversational goals* in every conversation & expect the same from their interlocutors. To put people at ease, and increase relationship strength, we must understand the *propositional, interactional & interpersonal* functions of conversation.

2. People change interaction styles over time. We must *manage long-term interactions* with people by changing interaction style in a way that indicates the system’s increased rapport, intimacy, and trust.
Goal of Socially Aware Systems

Development of an agent that manages *interpersonal rapport* (relationship strength) with users over interactions across time, as well as managing propositional and interactional goals, *in order to improve task performance*.

*Automatically recognize* rapport-managing conversational strategies from *verbal, visual and vocal* modalities of speaker and interlocutor, both within the individual and in the dyad.

*Automatically generate responses, in verbal, visual and vocal* modalities that manage rapport as well as fulfilling system intentions / task goals.
Not just chit-chat: rapport improves task performance

Surveys
- Survey respondents give higher quality answers if they feel rapport with interviewer (Berg (1989))

Health
- Physicians who build rapport during trial interviews enroll more participants (Albrecht et al., 1999).

Sales
- Rapport with sales staff leads to increased likelihood of purchasing goods/service (Brooks, 1989).
- Customers show increased trust and disclosure when rapport is maintained with sales staff (LaBahn, 1996).
Methodology

Build formal models

Study

Theorize & Model

Build system on the basis of model

Test

Realize gaps in understanding

Collect Natural data

Start here

Design evaluation of use
Observe
Analyze
Data- &Theory-Driven Model of Rapport Management

Goal (level 1)
- Rapport Enhancement
- Rapport Maintenance

Sub-goal (level 2)
- Mutual Attentiviness
- Face Management
- Coordination

Sub-goal (level 3)
- Maintain attention to others
- Support & Appreciate other’s "true-self"
- Enhance other’s positive face
- Act predictably
- *Index Commonality

Strategy
- Initiate mutual self-disclosure
- Refer to shared experience
- Disclose topic-related intimate personal information
- Reciprocal Appreciation
- Embarrassed Laughter
- Praise
- Negative Self-disclosure
- Acknowledge
- Adhere to sociocultural or interpersonal norm (including relational definition)
- Reciprocate previous action (ex: Respond to other's self-disclosure)
- *Violate sociocultural norm to match interpersonal norm
Agent Model of Rapport must be:

1. Dyadic,
2. Multi-level: differentiate between observable signals & underlying psychological states,
3. Sensitive to effect of *time*
4. Cross-Modal

with L.P. Morency, 2015
Example: Friend in high rapport

Tutor: Sweeney you can't do that, that's the whole point {smile} [Violation of Social Norm]
Tutee: I hate you. I'll probably never never never do that [Reciprocate Social Norm Violation]
Tutor: Sweeney that's why I'm tutoring you {smile}
Tutee: You're so oh my gosh {smile}. We never did that ever [Violation of Social Norm]
Tutor: {smile} What'd you say?
Data- & Theory-Driven process model

**Rapport building**

**Friends**
- Violate sociocultural norms to fit interlocutor’s behavior expectation
- Mark in- and out-group
- Learn behavior expectations

**Strangers**
- Politeness according to sociocultural norms
- Learn behavior expectations

**Reasoning**

- Shared personal knowledge
  - Self-disclosure
  - Reciprocity
  - Reasoning

**Process**

- Goal
- Conv. Norm
- Social Norm
- Attributed Process

**Relationship Stage (T1/T2)**

**Generate**
- Imagined interaction:
  - Min. vulnerability
  - Influence subs. attr. process

**Estimate**
- Appropriate social distance at right time

**Reciprocity**

- In
- Out

**Strategies**

**Discloser**
- Trust
- Positive Face Enhancement
- Signal Goal of Relationship Development
- Index "True self"

**Recipient**
- Social Validation
- Social Control
- Reciprocity of Self-disclosure

Justine Cassell

Carnegie Mellon University
Socially-Aware Agent Architecture

- Microphone
- Speech Recognition
- Natural Language Understanding
- Dialogue Manager
- Recommendation System
- Content DB
  (schedule of person, event)

- Speech Analysis
- Camera
- OpenFace
  Behavior Recognition

- Rapport Estimator
- Social Reasoner
- Language Generation
- User Model
- Nonverbal Behavior Generation
- Virtual Body
- Game World
- Text-to-Speech

- Conversational Strategy Classifier

- Conversational
  Strategy Classifier

- Game World

- Text-to-Speech

- Justine Cassell

Carnegie Mellon University
Implement
Evaluate

Total Interactions:
250+ sessions

Current Dataset:
120 sessions (totally 10+ hours)
• Mean duration = approx. 5 min.
• SD = 69.00 seconds

SARA, 00:13.7, I'm so glad to have the opportunity to meet you in person, 00:16.7
User, 00:18.7, hi how are you [doing, 00:19.2
SARA, 00:19.3, [I'm] in Davos to assist attendees but to be honest I am a little anxious about it it's a big deal to be invited to Davos is it your first time here, 00:28.7
User, 00:29.1, it is and I'm a little anxious too, 00:31.4
SARA, 00:32.7, I found there's a lot to take in I hope that it isn't overwhelming you, 00:37.2
User, 00:37.9, it is overwhelming a little bit, 00:39.8
Some Applications: Rapport-Aware Peer Tutor (RAPT)
RAPT
WoZ System Architecture
Application: Mobile front-end to apps
SARA: Socially-Aware Robot Assistant at Davos
SARA: Socially Aware Robot Assistant
WHAT SARA UNDERSTANDS

OpenFace

User-Sara Rapport

User Conversation Strategy

SELF DISCLOSURE (SD) 88%

SHARED EXPERIENCE (SE) 72%

PRAISE (PR) 78%

VIOLATE SOCIAL NORM (VSN) 50%

FOLLOW SOCIAL NORM (FSN) 50%

Smile NO

Eye Gaze NO

Head Nod NO
HOW SARA WILL RESPOND

Sara's Conversational Strategy Selection

INPUTS
- OpenFace Output
- User Conv. Strategy
- User-Sara Rapport

CHosen Strategy
- SELF DISCLOSURE (SD)
- SHARED EXPERIENCE (SE)
- VIOLATE SOCIAL NORM (VSN)
- FOLLOW SOCIAL NORM (FSN)
- PRAISE (PR)

Sara's Current Task
WHAT SARA SAYS
Sara's Words and Body Language

this is my favorite part let me look this up one minute
Thank you