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Intelligent Interfaces - University of Bari

Social Relationships In Persuasion Processes

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http://www.di.uniba.it/intint/people/fior.html

I will tackle, in this talk,
some constructive questions like:

*"What processes does social intelligence involve,
in particular, in persuasion?"*

and

"How could machines perform such processes?".

That is:
can *computational models of social intelligence* be built,
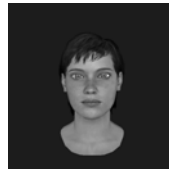in particular in persuasion dialogues, and how?

Data on which I will ground my claims

1. Theories about persuasion, social and emotional influence and user modeling

2. A specific experience (and a corpus of Wizard of Oz studies with an ECA) in the domain of 'healthy eating'.
   Characteristics of WoZ studies:

   • high understanding ability

   • limited adaptation in answering

Outline of the talk

1. On the innumerable ways of persuading
2. Alternative paths to persuasion
3. The role of the Persuader-Receiver relationship
4. Persuading groups: intra-group relationships
5. Towards computational models of social intelligence in dialogues

1. On the innumerable ways of persuading

(almost) Any communication brings some persuasive effect:
Some examples

- Simple -seemingly innocuous- *'intention questions'*, such as *"How likely are you to eat some vegetables today?"* are perceived as benign queries, incapable of influencing behavior… while they cause changes in cognitive structure, that lead to behavioral changes of which the respondent is often not aware.

- The effect is still stronger if the questions are formulated in a not innocuous way: *"Are you tempted by some gorgeous, crispy fried zucchini flowers?"*

Persuasion is an uncertain and context-dependent process

Determinants of effectiveness:

- Message features

- *Source features*

- *Receiver features*

Source features

- **Perceived credibility** (expertise, reputation, trustworthiness): not an *intrinsic* property of the communicator but consists of the judgements made by the Receiver.
- **Liking:** weaker than credibility and more controversial: disliked communicators can be more effective persuaders than liked ones.
- **Similarity:** influences effectiveness indirectly, by affecting the receivers' liking and their perception of credibility.
- **Physical attractiveness:** effects rather varied. Again, indirect influencing through liking.

Receiver features

Generic ones:

- **Persuasibility**: how easily someone is persuaded in general. Differences among persons seems to exist, although rather small.
- **Gender**: women more easily persuaded than men? Again, differences are small. Effect of cultural training and socialization?
- **Personality traits**: self-esteem, self-monitoring and sensation-seeking.

More specific ones (depending on the argument) exist and are stronger.

D J O' Keefe   9

An example:
the importance of causal attributions:

An experiment on positions about death penalty in the US

and how ethnic factors influence the success/ failure of argumentation.

M.Peffley and J Hurwitz   10

Table 1. Percentage Support for the Death Penalty across Race and Experimental Condition

	Baseline Condition (No Argument)	Racial Argument	Innocent Argument
		Some people say * that the death penalty is unfair because most of the people who are executed are African Americans.	Some people say * that the death penalty is unfair because too many innocent people are being executed.
	Do you favor or oppose the death penalty for persons convicted of murder?	Do you favor or oppose the death penalty for persons convicted of murder?	Do you favor or oppose the death penalty for persons convicted of murder?
Whites			
Strongly oppose	17.95%	11.38%	20.09%
Somewhat oppose	17.09	11.79	15.63
Somewhat favor	29.06	25.20	29.46
Strongly favor	35.90	51.63	34.82
% Favor	64.96%[b]	76.83%[b]	64.28%[b]
%Favor v Baseline		+12% favor[a,b]	-.68% favor[b]
N	117	246	224
Blacks			
Strongly oppose	34.17%	43.60%	45.98%
Somewhat oppose	15.83	18.48	20.09
Somewhat favor	22.50	17.54	18.75
Strongly favor	27.50	20.38	15.18
% Favor	50%	37.92%	33.93%
%Favor v Baseline		-12% favor[a]	-16% favor[a]
N	120	211	224

Some of the Receiver's features are stable.

Others are domain-dependent or context-dependendent
and may be influenced by affective factors
and by the Persuader-Receiver relationship.

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2. Alternative paths to persuasion

Central VS Peripheral Route

The ELM Model:
Persuasion can be achieved through two general avenues, varying in the amount of elaboration of information received:
- extensive thinking *(central route)*
- little elaboration   *(peripheral route).*

The two categories are not mutually exclusive.
The degree to which receivers engage in issue-relevant thinking is a continuum between the two extremes.
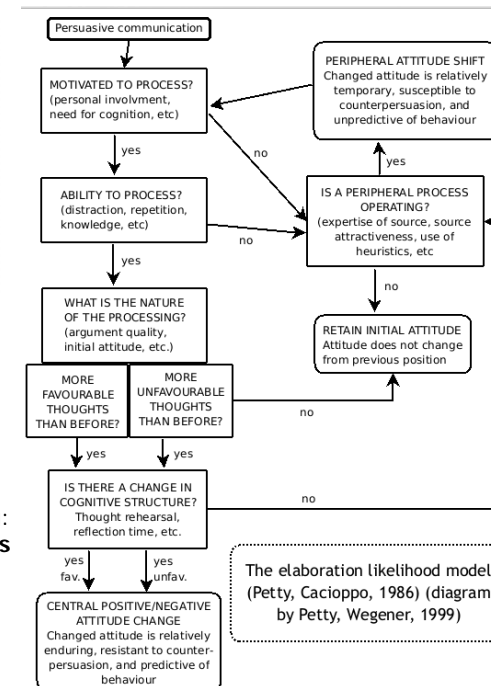
Petty & Cacioppo

Factors affecting the degree of elaboration

- *Motivation to process information:*
  'Tendency for an individual to engage in and enjoy thinking' (again, a personality factor)

- *Ability to process information:*
  level of distraction, prior knowledge needed to process it available or not

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Differences in the elaboration of information and in the persistence of effects

Central route to persuasion: extensive issue-relevant thinking: **careful analysis of information** in the message, **greater temporal persistence**

Peripheral route to persuasion: **simple heuristics** are employed (ex: liking or credibility of the source). **Less persistent effect**

The elaboration likelihood model (Petty, Cacioppo, 1986) (diagram by Petty, Wegener, 1999)

The impact of mood
on information processing

Positive mood seems to **reduce systematic processing**, whereas negative mood enhances it:

- processing a message extensively often results in feeling aversion for the task. Receivers in *positive mood* are then motivated to avoid such thorough processing in order to maintain their positive mood.

Positive feelings lead to **more positive information evaluation**. The opposite seems to hold for negative feelings:

- when Receivers are very motivated to process information, people in positive mood will recall more pleasant material and will make more positive evaluations (chained activation of positive concepts, with encoding and/or retrieval of affect-consistent ideas)

R.Petty et al [17]

A message may be formulated so as to point
at one of the routes*

My beloved Maria,

I know you are discouraged by the weak results of physical activity: making sport is good but whets the appetite. Diet is a necessary evil. I have a suggestion for you: rather than looking at TV ads on 'cycling for heart', 'healthy sets' and so on, with those burly and all-perfect pin-ups who make you feel a real rubbish, why don't you fish out the Artusi which is in you? Don't raise your eyebrows: kitchen is not your site of election, neither is it to me. But, here is the sagacity of the mature woman :-), you have your creative intelligence on your side. Do invent trendy dishes and menus. And if your husband rejects them, do invite him to address himself to the burly pin-ups. A wonderful dish of carrots with apple vinegar and supreme of asparagus, and it's done! What would you ask more to life?

A bear hug.

Ross

*from our corpus of persuasion messages

This message points at a number of emotions: pride, emulation etc[18].

… or to adopt a mixed strategy*

"Think, Mary, to how much more beautiful and healthy you will be if you eat more fruit and vegetables! It was scientifically demonstrated and it is now of public domain that a higher consumption of these elements improves the state of skin, keeps circulatory system young and favours a natural loss of weight without submitting oneself to a heavy physical excercise. Even physical activity, that you prefer, is essential to stay young and beautiful but is often less healthy than what is believed…. Some activities, which are considered as healthy, are not always so. The most natural and greedy choices are often also the most effective ones."

*from our corpus of persuasion messages

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Rational vs emotional
persuasion strategies

Differ in:

- The goals to which they appeal:
  - a 'concrete' (final or instrumental) goal (to be in good health, to be in shape,...) vs an 'emotional' goal (to feel in good mood, to feel proud, ...)
- Whether activation of emotions is exploited to 'generate' an instrumental goal:
  - E. g.: shame - save face – go on a diet , as in
    "You look overweight, lately!"

M.Miceli et al 20

Relationship between persuasion route and rational vs emotional persuasion strategies

Emotional strategies tend to point at the peripheral route,

while

Rational strategies tend to point the central one

(*hence, they should be applied in different contexts and with different Receivers!!*)

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Conclusion:
Not all messages are good to all the Receivers

Persuaders should have the 'social intelligence' that enables them to observe and come to know the Receivers, so as to select an appropriate strategy:

their personality traits, main goals, persuasibility level, but also their motivation and ability to process information in the given context.

These Receivers' features are influenced by the person who is attempting to persuade them.

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3. The role of the Persuader-Receiver relationship

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Attitude towards persuasion attempts is influenced by emotional and social factors

In addition to individual factors related to the Receivers' motives (goals, values, ...), personality traits etc, factors related to their attitude towards persuasion attempts by a given Persuader should be considered.
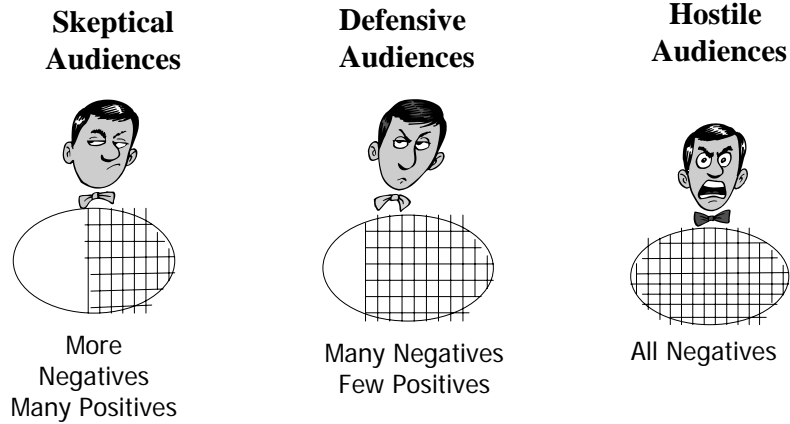
An audience may be biased towards a persuasion attempt, being:
– skeptical
– defensive
– hostile

And this attitude may be influenced
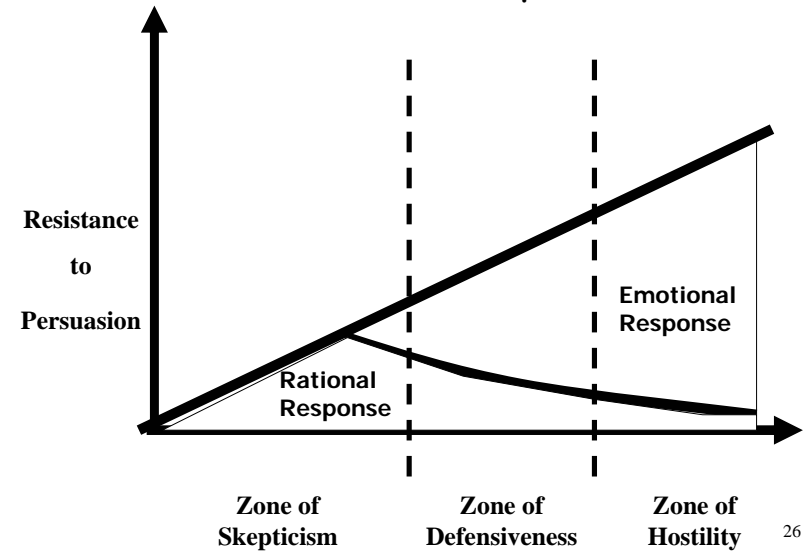by the Receiver– Persuader relationship.
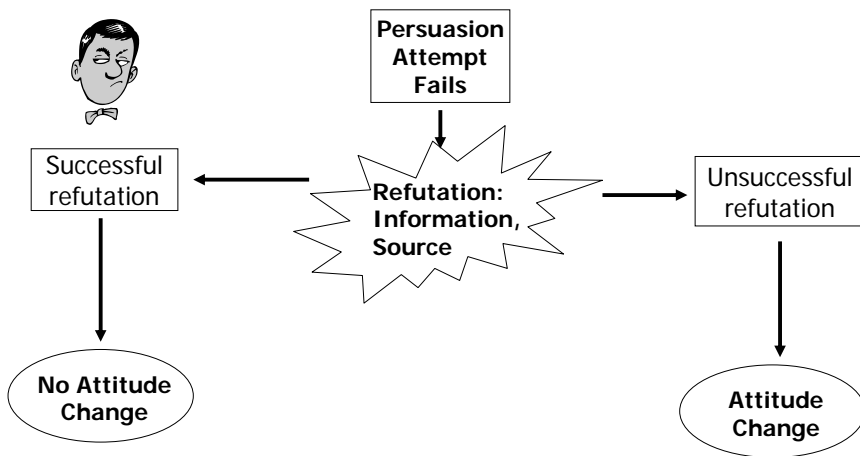
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How Do Reaction Attitudes Differ?

Skeptical Audiences

More Negatives
Many Positives

Defensive Audiences

Many Negatives
Few Positives

Hostile Audiences

All Negatives

Balance Between Rational And Emotional Response

Resistance to Persuasion

Rational Response

Emotional Response

Zone of Skepticism　**Zone of Defensiveness**　**Zone of Hostility**

Reaction of *Skeptical* Audiences

Persuasion Attempt Fails

Refutation: Information, Source

Successful refutation → **No Attitude Change**

Unsuccessful refutation → **Attitude Change**

Argument strength really matters

Reaction of *Defensive* Audiences

Persuasion Attempt Fails

Refutation: Source, Information

Successful Refutation → **No Attitude Change**

Unsuccessful Refutation → **Belief Change** → **Emotional response minimizes attitude change** → **No Attitude Change**
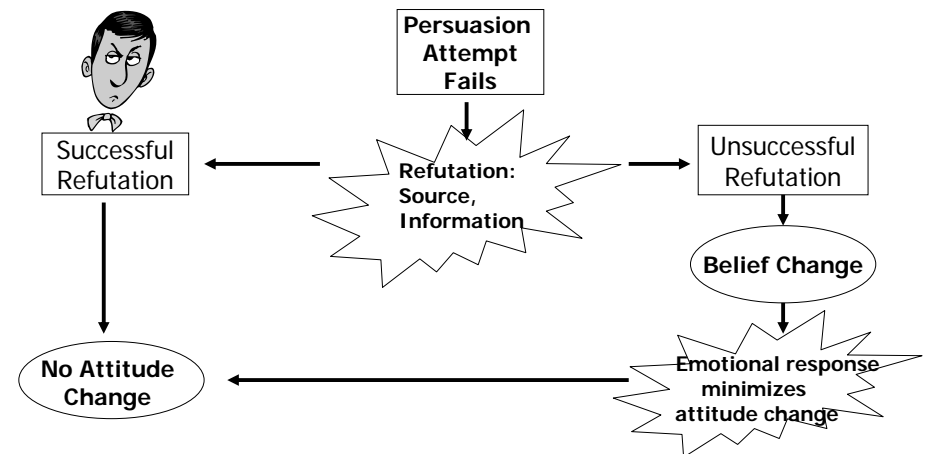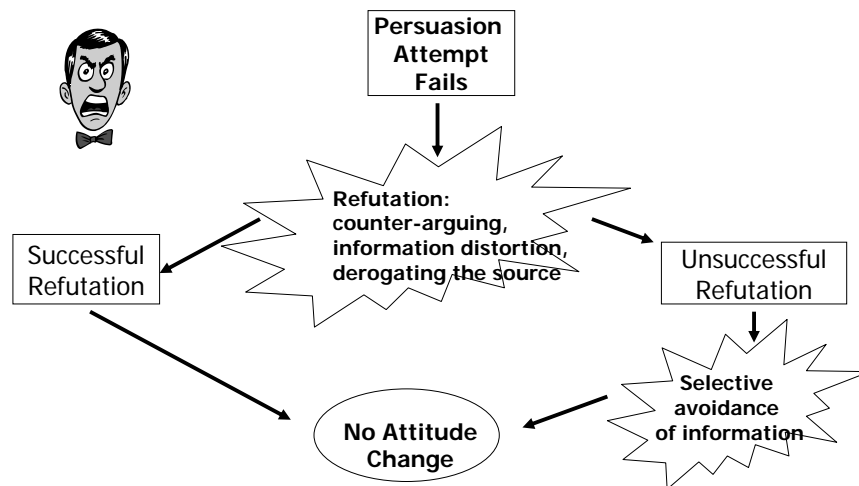
If the persuasion attempt is not very strong and the perceived threat is low, the response is more cognitive.
If the threat is perceived to be high, emotional response is aroused.

Reaction of *Hostile* Audiences

Persuasion Attempt Fails

Refutation: counter-arguing, information distortion, derogating the source

Successful Refutation

Unsuccessful Refutation

No Attitude Change

Selective avoidance of information

Two step process: Refutation (e.g., counter arguing, information distortion, derogating the source).

If difficult to refute, then selectively avoid the information and polarize own position.

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Consequences

Use different arguments
with skeptical, defensive and hostile audiences.

But how to recognize these attitudes?
They may be masked in several ways...

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Some Examples of Reactions in our corpus

S: Sweets should be avoided or limited to particular events. Ice fruits and dry or jam-filled sweets should be preferred, ...

U1: *Why should I avoid and limit them to particular circumstances?* (simple objection)

U2: *I know that what you say is correct: but I prefer some sins of gluttony to a dietary rigour* (humourous counter-arguing)
...

U3a: *Fantastic! Those I like less then...!* (irony)

S (continues): ... by avoiding those containing cream, which are richer in fats and calories. *(not socially intelligent answer!)*

U3b: *Those I prefer, then!* (by laughing, ... irony)

... a socially intelligent system should
recognize andcounter-react differently to these user reactions...
P-S social relation would be weakened by S not answering to the point

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Is Attitude Persuader-Independent?

Attitudes may be a more or less stable characteristics of individuals (*"Long-lasting positive or negative orientations towards things or people, which are more or less permanently part of the way you interact with them or think about them."*

R. Cowie

But Recipients may be hostile/defensive/skeptical *towards a given Persuader,* rather than (or in addition to) being so 'in general'.
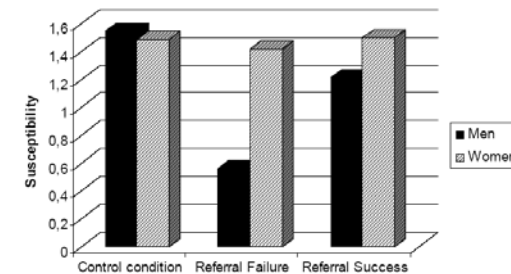
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4. Persuading groups:
intra-group relationships

Mutual influencing between P and R in the persuasion process

Susceptibility (0-3) as a function of referral outcome and gender, study 1.

Persuasion messages aim at influencing the Receivers' attitudes.

But the Persuaders' attitudes are influenced, in their turn, by the success or failure of their persuasion attempt

Referral-backfire effect: Persuasion failure engenders a *lower susceptibility to persuasion* in male persuaders: a sign that one's social relations are threatened? A problem of self-esteem?

K Geysenks et al

Group influencing

What happens when the Receiver is a group of individuals?

How to select the best strategy, by considering mutual influencing and emotional contagion?

How to build group models of the Receiver from -full or partial- knowledge of individuals?

Mutual Influencing and Persuasion
in Groups

Hyp:

We are not content to have positions that differ; there is always a strain to find which position is correct or appropriate.

Conseq:

People in groups tend towards agreement, in various ways

(Experiments with simple tasks, such as comparing the size of lines or judging the colour of slides)

Nemeth and Gonçalo... altri?

How may consensus be found in Groups?

- according to the **majority**:

  people abdicate the information from their own senses to adopt even an erroneous majority view; when faced with a majority view that differs from their own, they not only adopt the majority position but convince themselves of the truth of that position.

  Conclusion:

  Majorities not only have power to get us to *adopt* their positions publicly. They *change the way we think* about an issue or problem such that we consider it from their perspective and tend not to see alternatives.
  We 'brainwash' ourselves by finding and focusing on information consistent with the majority view.

  Nemeth and Gonçalo

  ... follows...

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How may consensus be found in Groups?

- favoured by the minority (**minority influence**)

  Attitude change occurs, in this case, at the *private or indirect level* (probably due to fear of ridicule and rejection) and the effect is produced only if minorities are *consistent* in their position.
  Effect: consistent minorities viewpoints stimulate multiple perspective and creativity.

- more extreme than the average of the individuals **(polarization)**:

  Example: risk taking tendencies of groups. Groups produced more extreme judgements in the direction that was *initially* preferred.
  Two explanations:
  - Social comparison theory (people want to be distinct but in the right direction)
  - Persuasive arguments theory (new arguments expressed in the group tend to strengthen the initial judgement of individuals)

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Emotional Contagion

"Emotions can be infectious – they can be 'caught' like colds."
Typical cases of contagion do not necessarily involve understanding of the other's emotional state, nor result in it.

Various ways that one can come to have an emotional experience of the same sort as another person have been described:

- *Emotional sharing:* an audience shares an emotion in virtue of each member thinking about and responding emotionally to the very same thing;
- *Emotional identification:* one's sense of one's own identity merges with one's sense of the identity of the other;
- *Empathy:* centrally imagining the thoughts, feelings and emotions of another person;
- *In his shoes imagining:* a characterization which retains certain aspects of own characterization as well as bringing in certain aspects of the other's characterization

P. Goldie

But when does every form of contagion happen?
And how is it spread in groups?

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… Previous Considerations Demonstrate The Need Of Group Models Of The Receivers.

These should include consideration of:

- mutual *influencing* in preferences, interests,
- *emotional contagion*, and therefore also attitude towards the Persuader

Which model?

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Group Preference Modeling Methods

These models translate social theories about *influencing* into
methods to aggregate individual ratings into group ratings.

Problem: which information item to display to a group of users,
given some knowledge about their individual interests?

Some proposed strategies:
- *Average:* the group rating is an *average of the individuals' ratings*
  (additive/multiplicative, with/without normalization);
- *Least misery:* the *minimum of the ratings* is taken as a group rating;
- *Average without misery: minorities' ratings are excluded* from averaging
- *Strongly support grumpiest's position*:
  – Determine an aggregated profile
  – Single out the least satisfied members
  – Select the item with the highest (individual) rating for the least satistifed member
    and average it with the ratings of the other individuals

  ... ...

Limits? Static models   J Masthoff[41]

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5. Towards computational models
of social intelligence in dialogues

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Which models

Persuasion is a gradual process, in conditions of uncertainty.

It is influenced by Persuader's and Receiver's characteristics,
their relationship and the context.

Receivers need time to be persuaded, possibly with different
arguments, each with a different strength and likelihood
to be effective: a unique message is usually not enough.
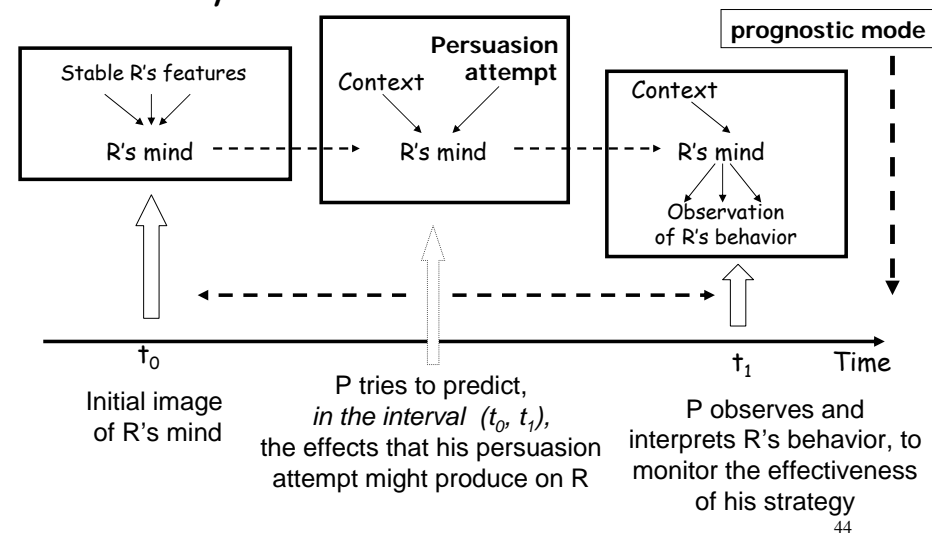
Mutual influencing and emotional contagion within groups of
Receivers evolve in time.

The degree of persuasion tends to decrease in time, unless
reinforced.

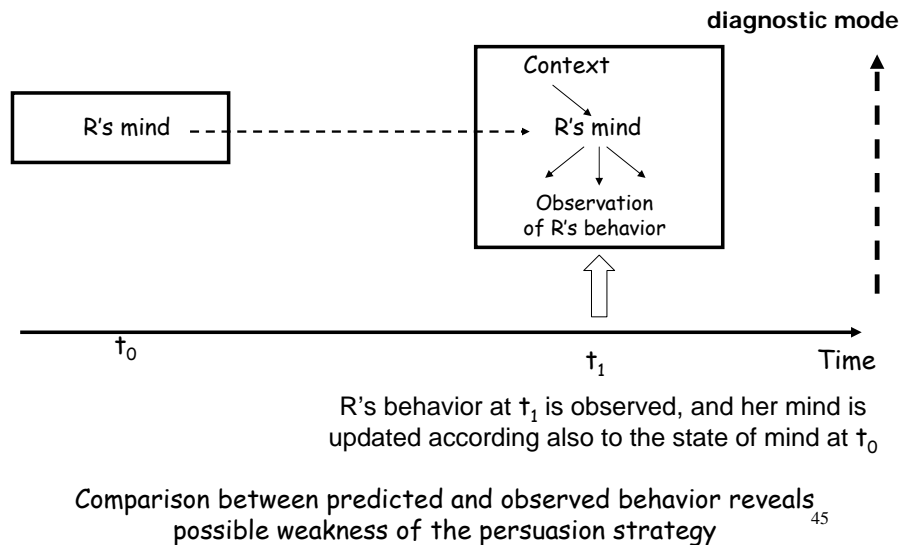> Therefore, dynamic models of the Receiver(s)
> representing uncertainty are needed.

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Two functions for these models:
a. to *predict* the Receiver's behavior

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Two functions for these models:
b. to *interpret* the Receiver's behavior

diagnostic mode

t_0 t_1 Time

R's behavior at t_1 is observed, and her mind is updated according also to the state of mind at t_0

Comparison between predicted and observed behavior reveals possible weakness of the persuasion strategy
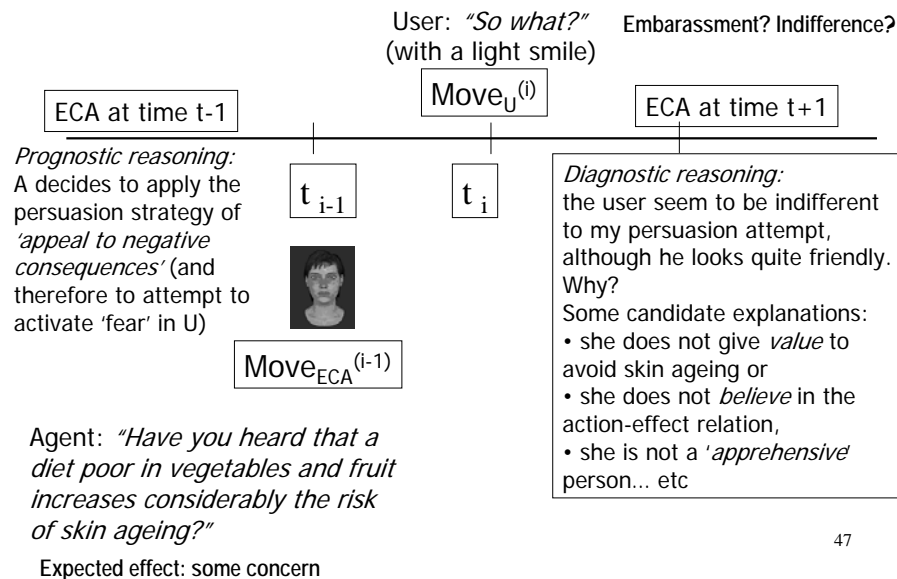
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Our ongoing experience:

Modeling *reaction* to persuasion attempts
and *social attitude* towards the Persuader
displayed with **language**

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An Example Small Fragment of Persuasion Dialogue:
A1 (an ECA) tries to persuade the user (U) to adopt some behavior

User: *"So what?"*   Embarassment? Indifference**?**
(with a light smile)

Move_U^(i)

ECA at time t-1   ECA at time t+1

Prognostic reasoning:
A decides to apply the persuasion strategy of *'appeal to negative consequences'* (and therefore to attempt to activate 'fear' in U)

t_{i-1} t_i

Move_ECA^(i-1)

Diagnostic reasoning:
the user seem to be indifferent to my persuasion attempt, although he looks quite friendly. Why?
Some candidate explanations:
• she does not give *value* to avoid skin ageing or
• she does not *believe* in the action-effect relation,
• she is not a '*apprehensive*' person... etc

Agent: *"Have you heard that a diet poor in vegetables and fruit increases considerably the risk of skin ageing?"*

Expected effect: some concern

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Some examples of R's reactions
to persuasion attempts*

*from our corpus

... after P asked the reasons of unhealthy dieting followed by R...
... unbridled life, with light aversion for healthy food

... after P suggested to eat some vegetables at every meal.
Are you joking? You mean I should bring a fruit bag with me, at work?

... after P suggested to eat at least five portions of vegetables a day
So many portions of fruits?

... after P described the advantages of healthy dieting...
But... a sin of gluttony is better than any healthy diet!

... after P described the risksof eating too much sweets
I don't want to avoid sweets at all

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Interpreting reactions of 'cold' users is not hard.

But

The more the users display a social attitude
towards the system,
the more their reactions to persuasion attempts
are hard to recognize.

… need to combine recognition of the type of reaction with recognition of the 'social attitude' of R towards P

'Social Attitude as an aspect of 'Social Presence'

Social presence refers to the *nature of interaction with other people in a technologically mediated communication* .

In virtual environments:

'The extent to which the communicator is perceived as real'

E.g.: people's *perception* of ECAs

In human-ECAs interaction:

'The extent to which individuals treat embodied agents as if they were other human beings'

E.g.: people's *social response* to ECAs

Rettie; Polhemus; Blascovich; Bailenson et al… and many more…

Social attitude: *"the pleasant, contented, intimate feeling that occurs during positive interactions with friends, family, colleagues and romantic partners…[and]… can be conceptualized as… a type of relational*

experienceand a dimension that underlines many positive experiences."

Andersen & Guerrero [50]

How to detect Social Presence

Researchers proposed a large variety of (subjective and objective) markers of social presence related to *nonverbal behavior*, such as

- self-report
- likability,
- memory,
- body distance,
- physiological data,
- task performance

… but verbal behavior may be takes as a marker of social presence as well…

Bailenson et al [51]

Signs of Social Presence
in language

- *personal address and acknowledgement* (using the name of the persons to which one is responding, restating their name etc),
- *feeling* (using descriptive words about how one feels),
- *paralanguage* (features of language which are used outside of formal grammar and syntax),
- *humor*,
- *social sharing* (of information non related to the discussion),
- *social motivators* (offering praise, reinforcement and encouragement),
- *negative responses* (disagreement with the other's comment),
- *self-disclosure* (sharing personal information).

Polhemus et al [52]

Signs Of Social Attitude
in language

Sence of intimacy (use of a common jargon)
  friendly self-introduction, familiar style,
Attempt to establish a common ground
  talks about self,
  personal questions about the agent
Humour
  jokes and irony
Benevolent/polemic attitude towards the system failures
  favourable/negative comments
 Interest to protract interaction
  friendly farewell

Andersen & Guerrero   53

Examples of 'Social Moves' in our corpus

A: Hi, my name is Valentina and I'm here to suggest you how to improve your diet.

U: Hi Valentina, my name is Carlo and I'm happy to interact with you

signs: *friendly self-introduction*

A: What did you eat at lunch?

U: I went to a wedding where I eated lot of fantastic food!!

signs: *talks about self; familiar style*

A: What do you think of a good dish of spaghetti?

U: A good dish of spaghetti is tempting and would be OK now!

signs: *familiar style*

A: Are you attracted by sweets?

U: Quite a lot: I like both preparing and eating them

signs: *talks about self*

Signs of Social Attitude
in speech

Sence of intimacy
  friendly intonation   *(SPImma,SPMarino, NiceEyesMarino)*
  encouragement,
  agreement,   *(IKnowM, URightM, WeAgree)*
  apologizing   *(SorryM)*
Humour
  smiling   *(Imma, MensSana)*
Benevolent/polemic attitude towards the system failures
  favourable/negative intonation   *(PosComm, negComm7, NegComm17)*
  syllabizing or slowering speech, to favour system
  understanding of the subject utterance

+ signs of reflection *(I'm thinking, doubt)*   *(ThinkI, ThinkM)*

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Model building in two steps

Phase 1: move analysis
- **language processing** :
  sentiment analysis, latent semantic analysis, bayesian classification
- **speech processing**:*
  feature extraction + classification with LDA
- **combination of results** of language and speech analysis with
  machine learning methods

Phase 2: mind updating
- integration of observations of the Receiver's behavior in a **dynamic bayesian network** (DBN) representing his mind

*in cooperation with the University of Erlangen 56

Preliminary results of phase 1:

Recognition accuracy of social attitude from language and speech

	Negative	Neutral	Light-warm	Warm	Recall	Precision
Negative	232 (94 %)	11 (4 %)	1 (.5 %)	4 (1.5 %)	.94	.94
Neutral	2 (1 %)	174 (95 %)	8 (4 %)	0	.95	.84
Light-warm	10 (3 %)	23 (6 %)	317 (85 %)	21 (6 %)	.85	.92
Warm	3 (1 %)	0	19 (9 %)	201 (90 %)	.90	.89

- classification rules for labelling cases as 'negative', 'neutral', 'light-warm' or 'warm'
- K2 learning algorithm with k-fold cross validation for combining the two categories of signs

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... Towards a more refined approach

Integrating linguistic interpretation of the utterance at the move level with **recognition of the variation of prosody** in the utterance

Some reactions to information about the possible negative consequences of the dietary habits declared by the subject:

"No, I did not suffer of these problems. My liver is OK, my kidneys too."

Language: ....a 'talks about self'..
Speech: ....negative prosody.....................
.......neutral..........
.......friendly........
Intention to smooth objection to the system's remark?

"Well *(familiar form),..* But I don't eat fried food every day!!!"

Language: ....a 'colloquial style' ....
Speech: ...a negative prosody...
Display of disagreement with the ECA's evaluation?

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From move analysis to mind updating

In a move, the Receiver may:

- spontaneously express a personal opinion
  - S: 'Hi, my name is Valentina. Tell me something about your diet'
  - U: 'I think I should control my consumption of sweets'
- answer a system's question
  - S: 'Do you think your diet is correct or would you like to change your dietary habits?'
  - U: 'I think I should control my consumption of sweets'
- ask a question to the system
  - U: 'Do you think that drinking four beers a day is too much?'
- refer others' opinions
  - U: 'My wife says I'm drinking too much')

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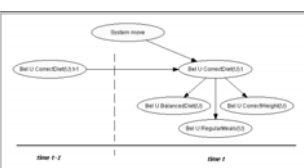... R's beliefs may be inferred with different degrees of certainty...

Outline of the two-step algorithm

1. New User move → Move Analysis → 1a. Move classification
   → 1b. Receiver's attitude
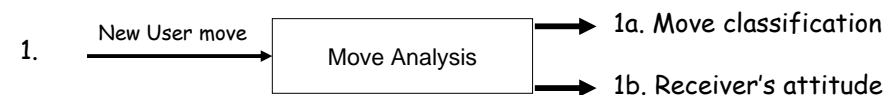
2a. The system infers a particular R's belief…

2b. …the particular belief inferred influences more general ones

2. →

3.

3. the dynamic image of the Receiver's mind is updated

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A Probabilistic View of SA: An Example Dialog

P(SocialAttitude)

W1: Hi, my name is Valentina. I'm here to suggest you how to improve your diet. Do you want to talk about your eating habits?

S1: Yes

W2: Do you like eating?
S2: Reasonably

W3: What would you think of a good dish of spaghetti?
S3: A good dish of spaghetti is tempting and would be OK now! **(fam. style)**

W4: I agree! Do you think that your diet is correct or would you like to change it?
S4: I think I would need a more regular regimen. (talks about self)

W5: Good, let's try to do something then. Did you ever think to change your diet?
S5: Yes, sometimes I did it and got very good results. Now, either because of my laziness or my stressing rythms I can't lay myself into more regular habits. (talks about self)

W6: You seem to be in a more positive attitude now. Do you believe your weight is correct or would you like to change it in any way?
S6: Unfortunately it is not ideal. I would like to change it and come back to my weight of a few years ago. (talks about self)

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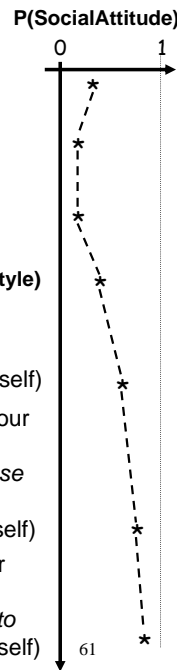
Innumerable open problems

As for modeling *individual Receivers:*
- How to make move recognition methods domain-independent and speaker independent? (rubustness)

As for modeling *groups of Receivers:*
- How to represent the effect of P - R relationship
- How to model social influence and emotional contagion?
- How to combine individuals' reactions?

More generally:
- How reliable are corpora collected with Wizard of Oz studies, to investigate final Recipients' reactions to persuasion attempts?
- How to study and model long-term persuasion effects, their decay and the effect of multiple persuasion attempts?

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Special Thanks
to my persuasive and socially intelligent co-workers

Valeria Carofiglio

Irene Mazzotta

Nicole Novielli

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