# L'Intelligence Artificielle Sonne-t-elle le Glas de l'Interaction Sociale ?


- Justine Cassell
- Carnegie Mellon University


Humain et Numérique en Interaction

- 31 Janvier 2019

# Espoirs vis-à-vis la nouvelle technologie


**Bienfaits de la télé pour vos enfants**

# Peurs

—"My child has murder on the mind. It's because of those horrible [things]. I know it is!"

***1949 ("thing" = radio)***

—"There are a few things to practice not doing. Do not be afraid of [it]. These things are probably here to stay. Do not be afraid of your child. He is not here to stay. He is a precious visitor. Do not wind your child up and set him to [play with it] unguided. Do not wind [it] up and set it to watch your child. A machine is a bad sole companion. It needs help. You can help it. Love your child."

***1962 ("it" = television)***

# Article de Journal: "Wired Love" (L'amour en ligne)

- A father followed his daughter to an assignation with a man whom his daughter had met online, and threatened to blow her brains out. She had him arrested and charged with threatening behavior.

- The girl, Maggie McCutcheon, helped her father run a newspaper-stand in Brooklyn. Maggie's father had decided to get a **telegraph** to help him process electronic orders. Due to his lack of technical skill, Mr. McCutcheon asked Maggie to operate the thing, but soon found out she was using it to flirt with a number of men, particularly one married man she had met on-line. She ultimately invited "Frank" to visit her in the real world. McCutcheon found out and forbade his daughter to meet up with the man. But Maggie nevertheless continued to meet him in secret.

1886 *Electrical World*

# Programme de Recherche

1. Deeper understanding of how people play, work, learn – using language and non-verbal behavior, in close interaction and collaboration with others, through the use of social science and AI tools.
2. Deeper ability to design technologies that support human playing, working, learning, with and through technology.
3. Push field of AI to replace “autonomy” with “interdependence”
4. Push Computer Science to not think of human behavior as “soft”

# L'IA Comme Outil pour Comprendre le Comportement Humain

# L'IA dévoile le lien entre la nature du langage et l'apprentissage

Children who studied with bi-dialectal (African-American Vernacular English and Mainstream Classroom English) virtual peer showed more gains in science discourse than those who worked with mono-dialectal virtual peer (Mainstream Classroom English only).

However, result was mediated by rapport – students were more likely to feel rapport with bi-dialectal agent, and students whose videos were independently rated as showing more rapport were more likely to show gains in science discourse.

**Work with Samantha Finkelstein**

# Rapport (Entente) améliore la performance sur les tâches

**Surveys**

Survey respondents gave higher quality answers if they felt 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).

**Education**

Students learn better when they feel rapport with their peers (Azmitia and Montgomery, 1993; Sinha and Cassell, 2015; Madaio, Ogan, Cassell, 2017)

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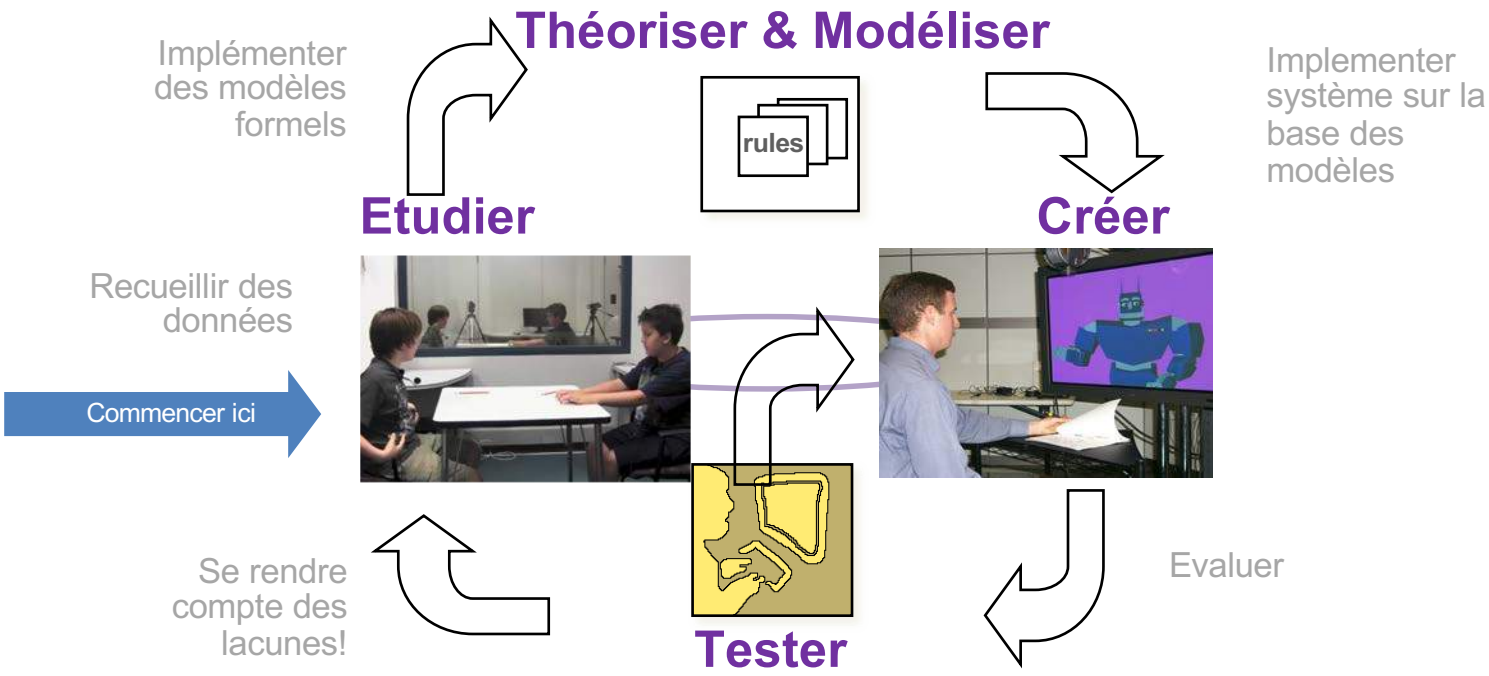
# L'IA comme Outil Pour ameliorer les interactions Humain -Numérique

(OU: Pourquoi des *Ordinateurs* Conscients de nos Réflexes Sociaux ?)

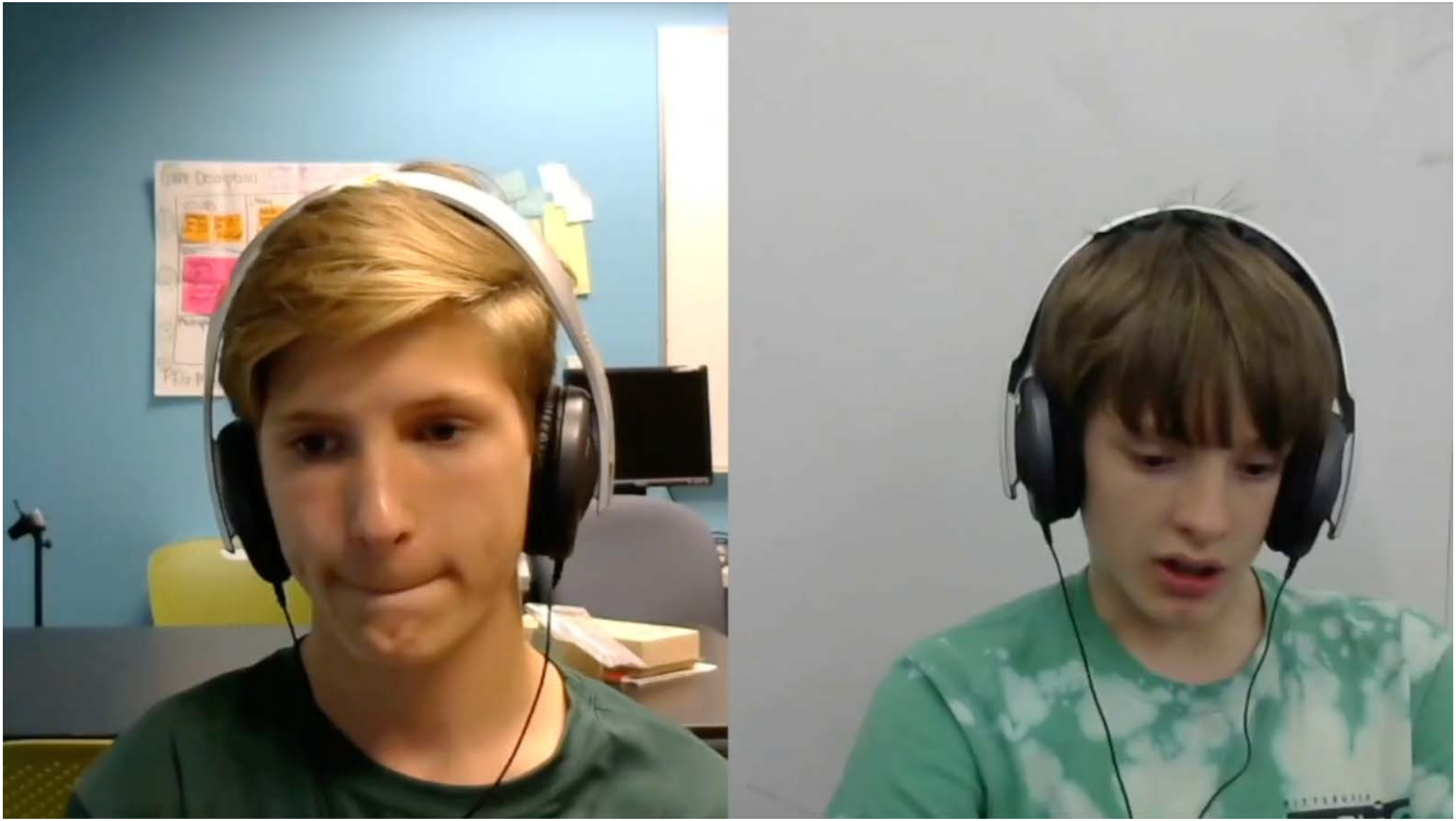
1. People pursue multiple conversational goals in every conversation & expect the same from their interlocutors. I hypothesize that if our computer partners understand the **propositional, interactional *and* interpersonal** functions of conversation, it will increase trust and rapport which, in turn will improve performance.
2. People change interaction styles over time. I hypothesize that increased performance will result if our computer partners **manage long-term interactions** with people by changing interaction style in a way that indicates the system's increased rapport and trust.


Théoriser & Modéliser
Implémenter des modèles formels
Implementer système sur la base des modèles
rules
Etudier
Créer
Recueillir des données
Commencer ici
Se rendre compte des lacunes!
Tester
Evaluer

# Observer


Justine Cassell

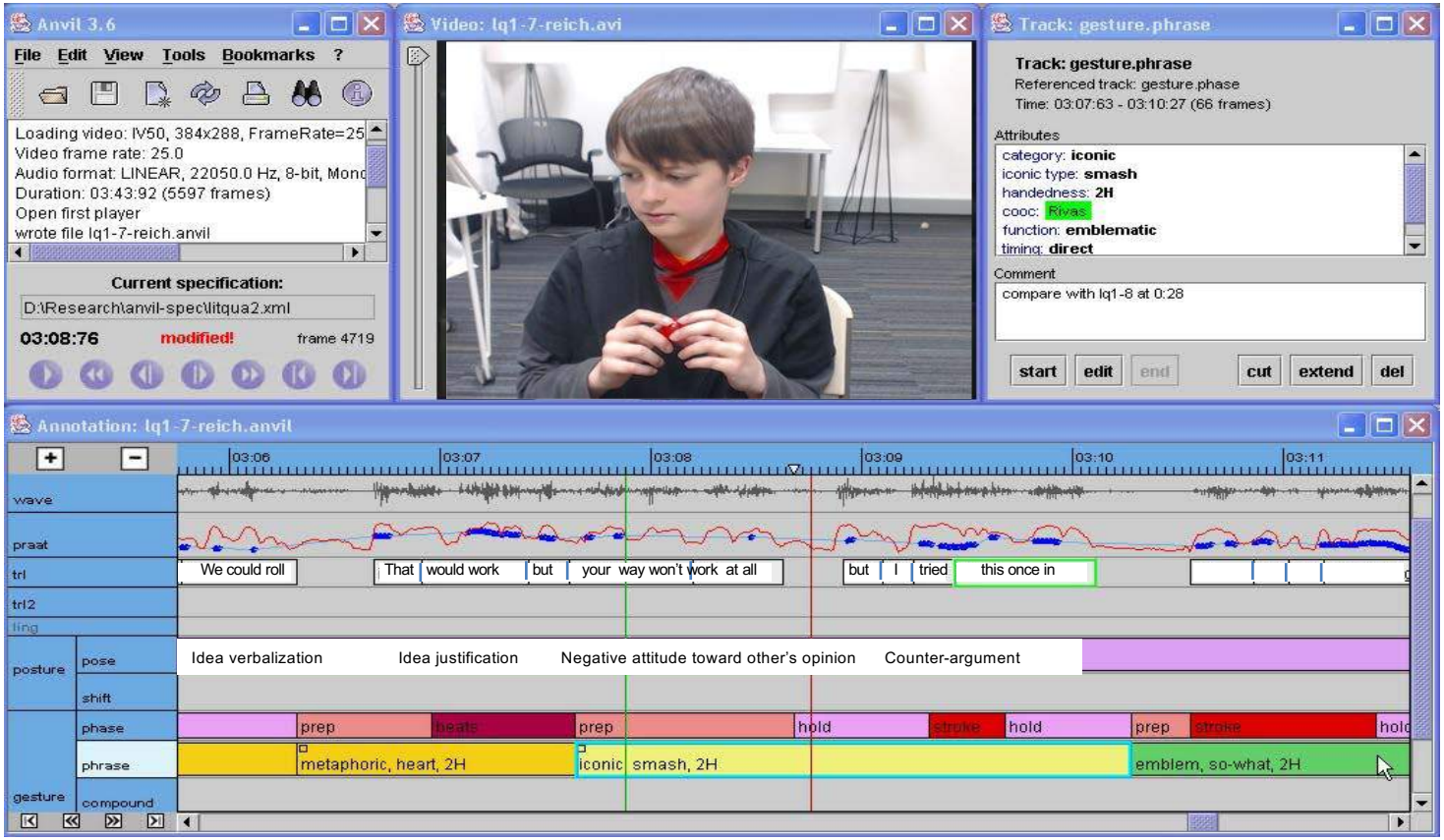
Carnegie Mellon University



# Observer

**Work with Michael Madaio**

# Analyser




Analysis of verbal and nonverbal behavior at 1/30 of a second granularity



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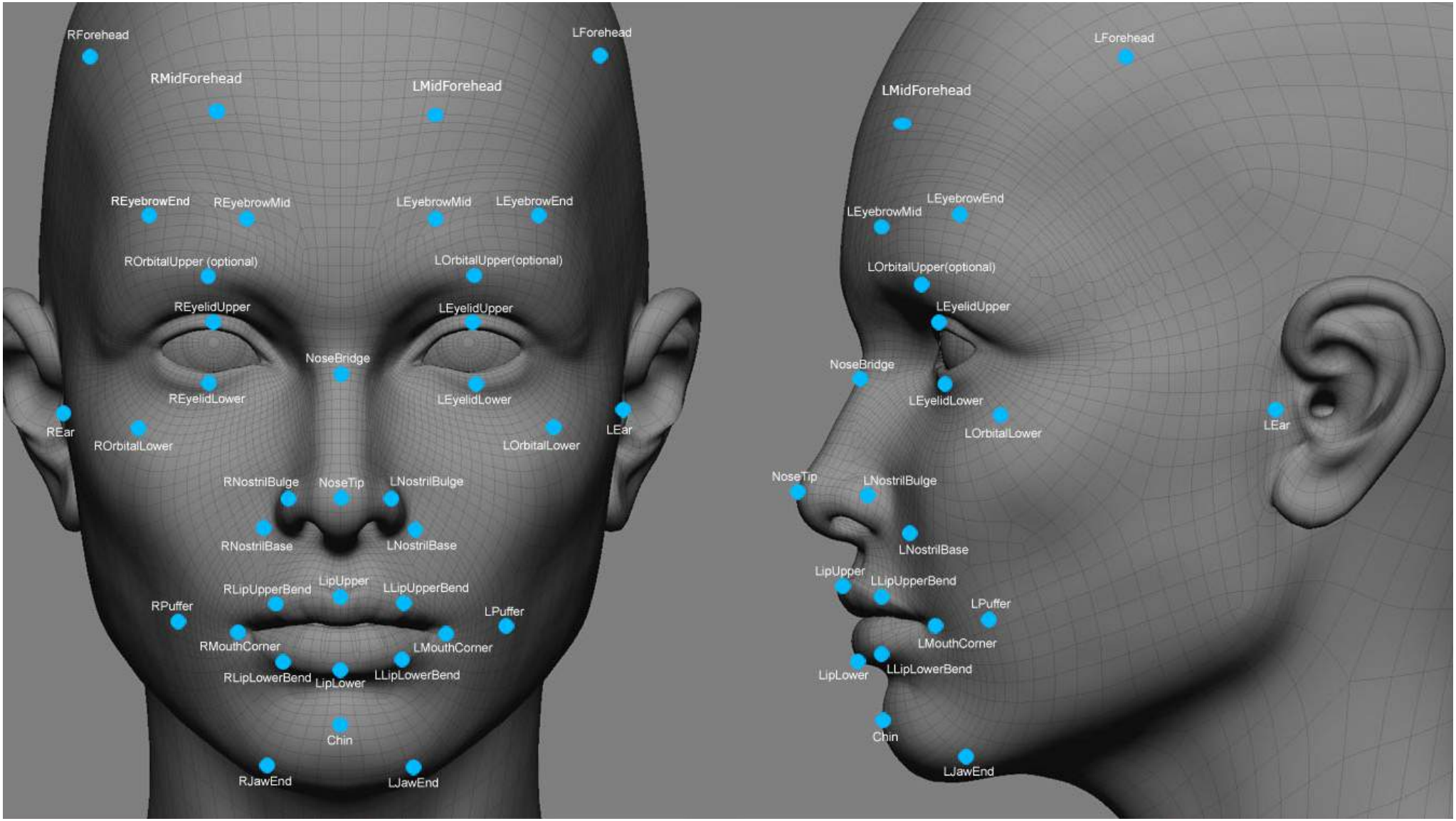
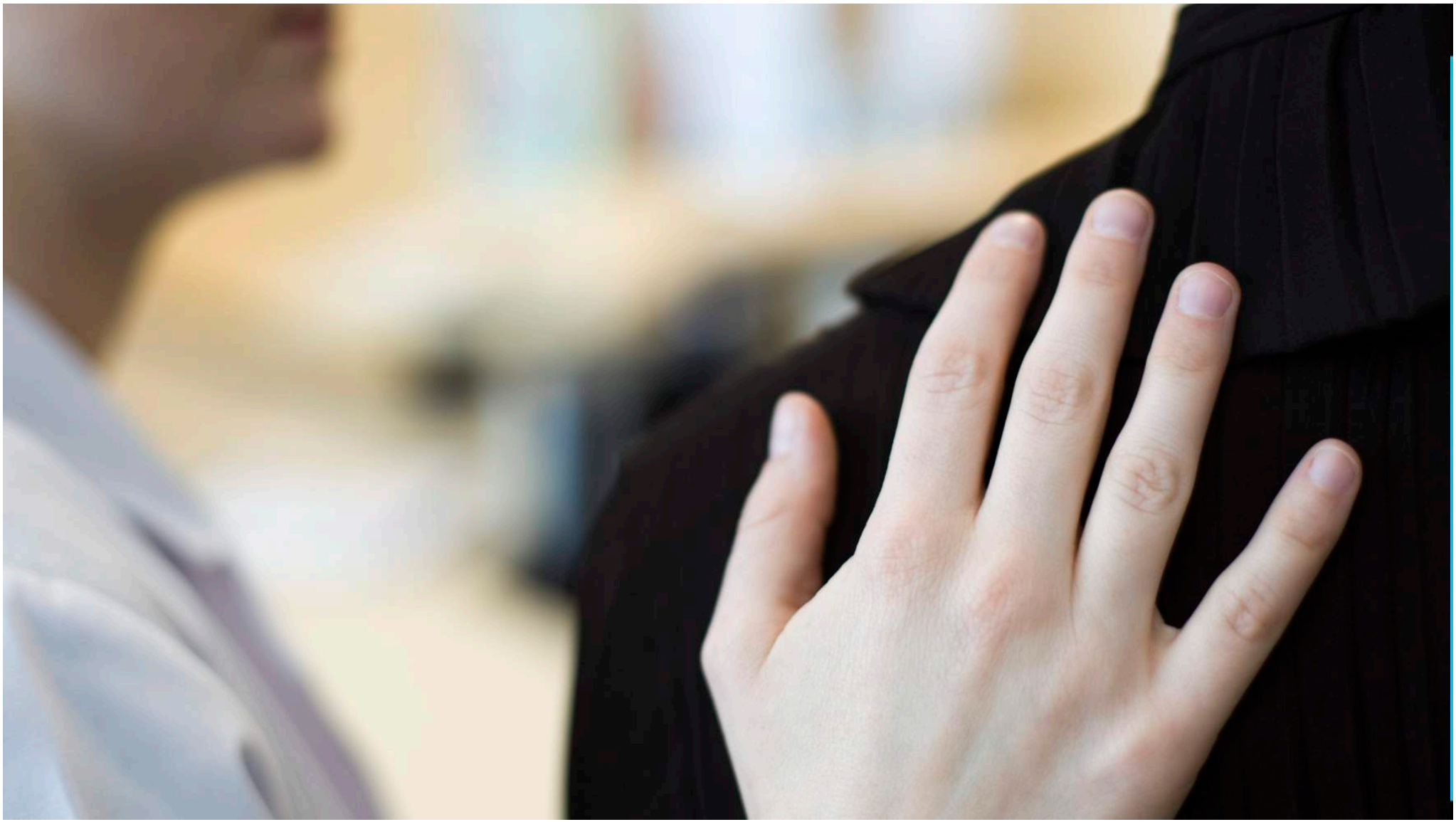
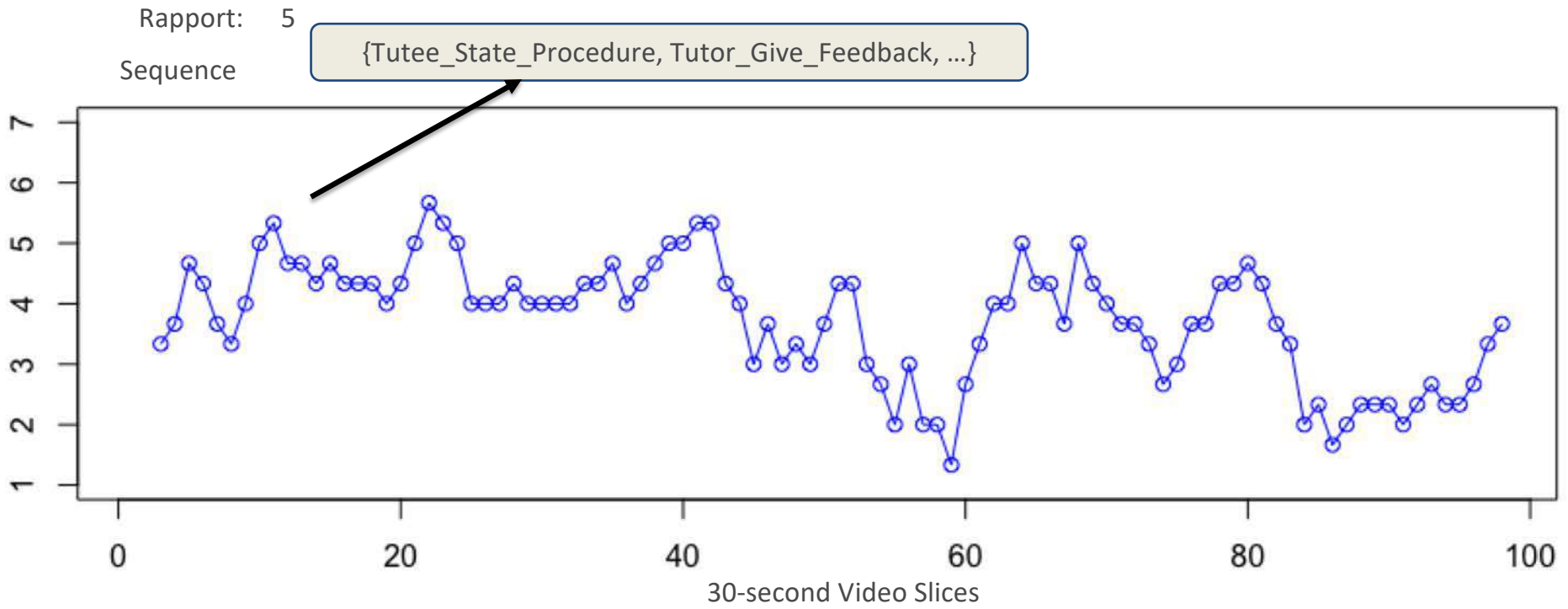

RForehead
LForehead
RMidForehead
LMidForehead
REyebrowEnd
REyebrowMid
LEyebrowMid
LEyebrowEnd
ROrbitalUpper (optional)
LOrbitalUpper(optional)
REyelidUpper
LEyelidUpper
NoseBridge
REyelidLower
LEyelidLower
REar
LEar
ROrbitalLower
LOrbitalLower
RNostrilBulge
NoseTip
LNostrilBulge
RNostrilBase
LNostrilBase
LipUpper
RLipUpperBend
LLipUpperBend
RPuffer
LPuffer
RMouthCorner
LMouthCorner
RLipLowerBend
LipLower
LLipLowerBend
Chin
RJawEnd
LJawEnd
LForehead
LMidForehead
LEyebrowEnd
LEyebrowMid
LOrbitalUpper(optional)
LEyelidUpper
NoseBridge
LEyelidLower
LOrbitalLower
LEar
NoseTip
LNostrilBulge
LNostrilBase
LipUpper
LLipUpperBend
LPuffer
LMouthCorner
LipLower
LLipLowerBend
Chin
LJawEnd



# L'exploration de données:
# á la recherche de sequences productives

(High-utility Sequence Mining Peer Learning)




**Work with Zhen Bai, Bhargavi Paranjape, Tanmay Sinha**



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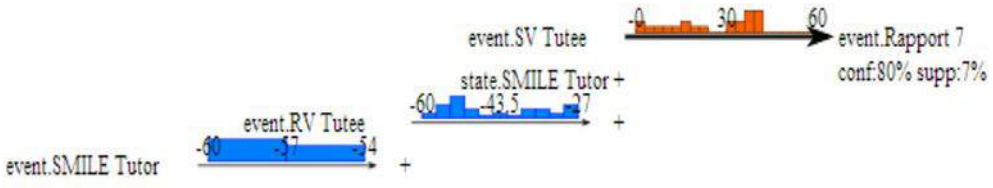
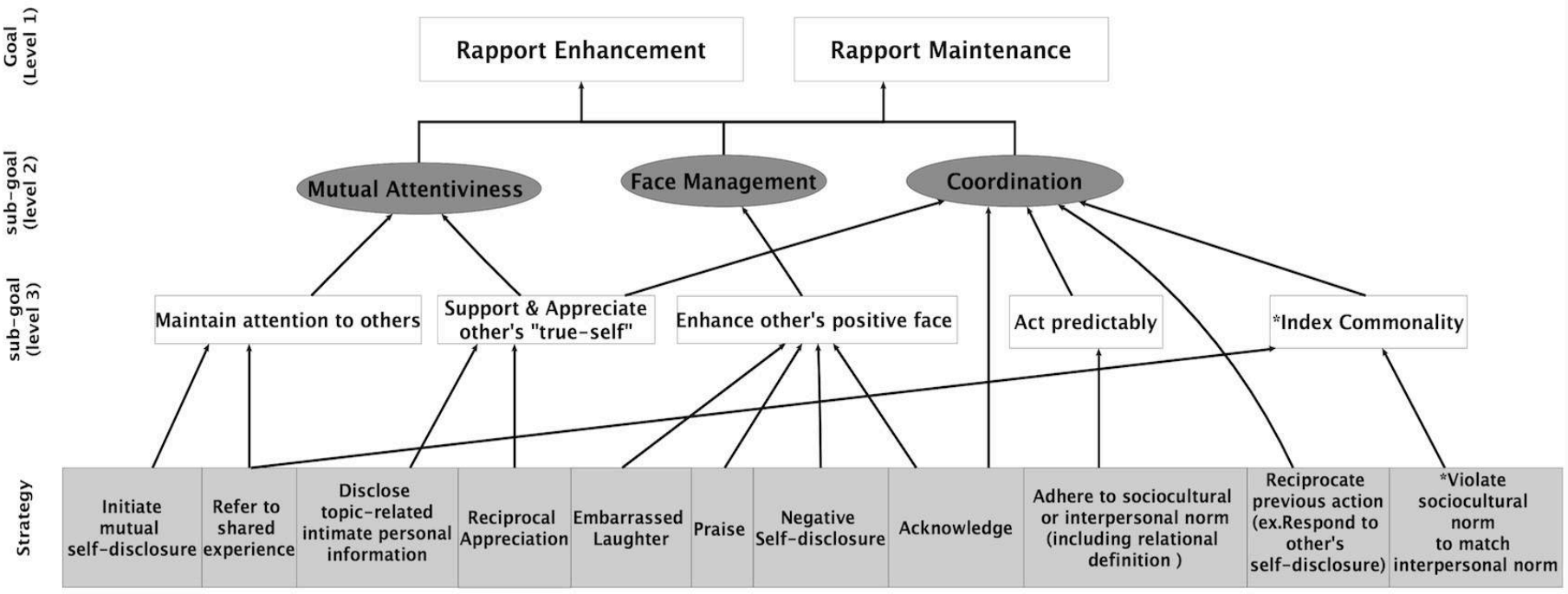
# Apprentissage de règles d'Association temporelles : des Amis




**Example: Friend in high rapport**

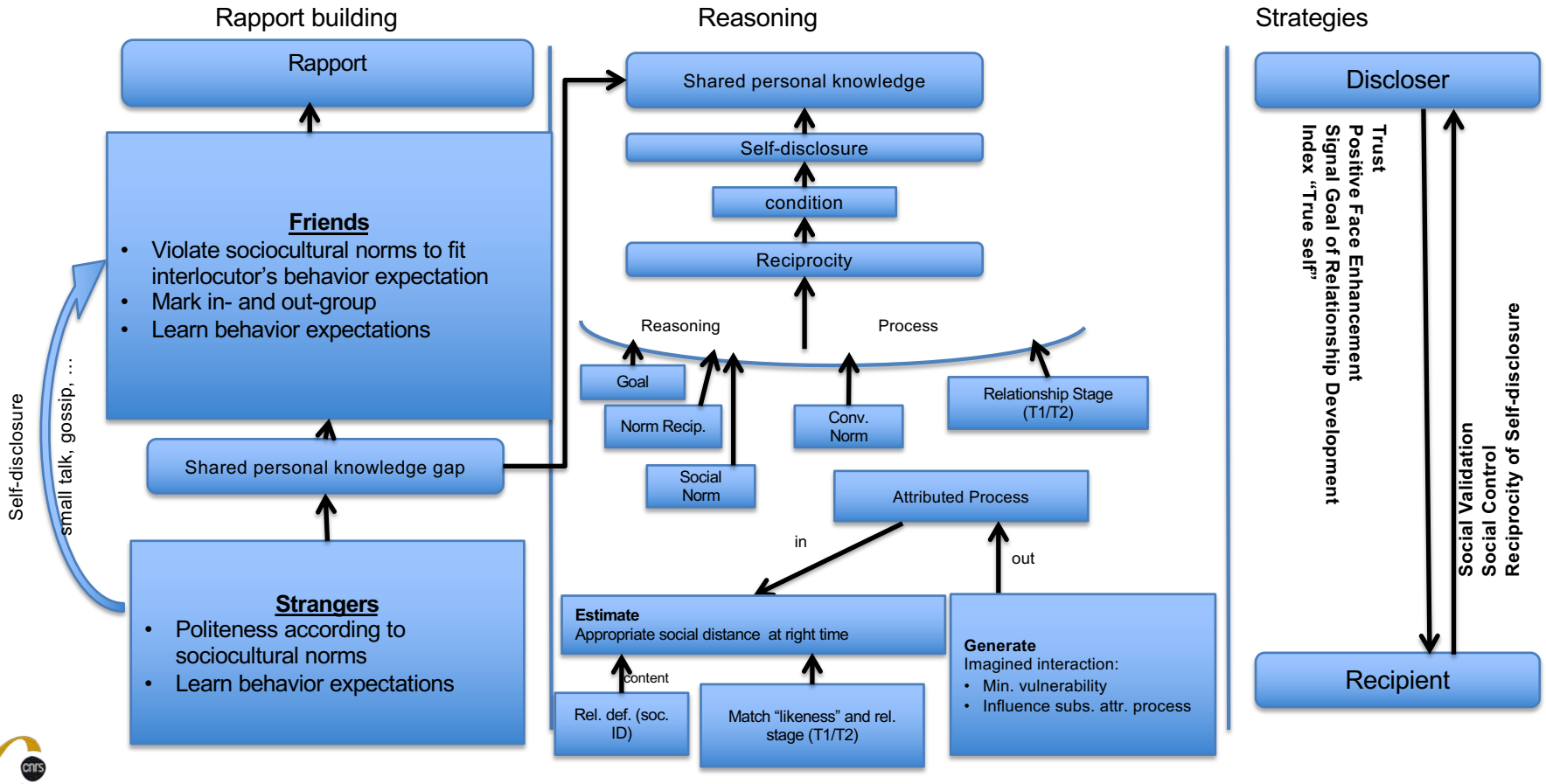
- **Tutor:** Sweeney you can't do that, that's the whole point *{smile}* [Violation of Social Norm]
- **Tutee:** I hate you. I'll probably never never do that [Reciprocate Social Norm Violation]
- **Tutor:** Sweeney that's why I'm tutoring you *{smile}*
- **Tutee:** You're so oh my gosh *{smile}*.We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

# MODÈLE ISSU D'ANALYSE DE DONNÉES ET DE LA THEORIE: GESTION DU RAPPORT




With Ran Zhao

# Modèle des *Processus* de Gestion de Rapport

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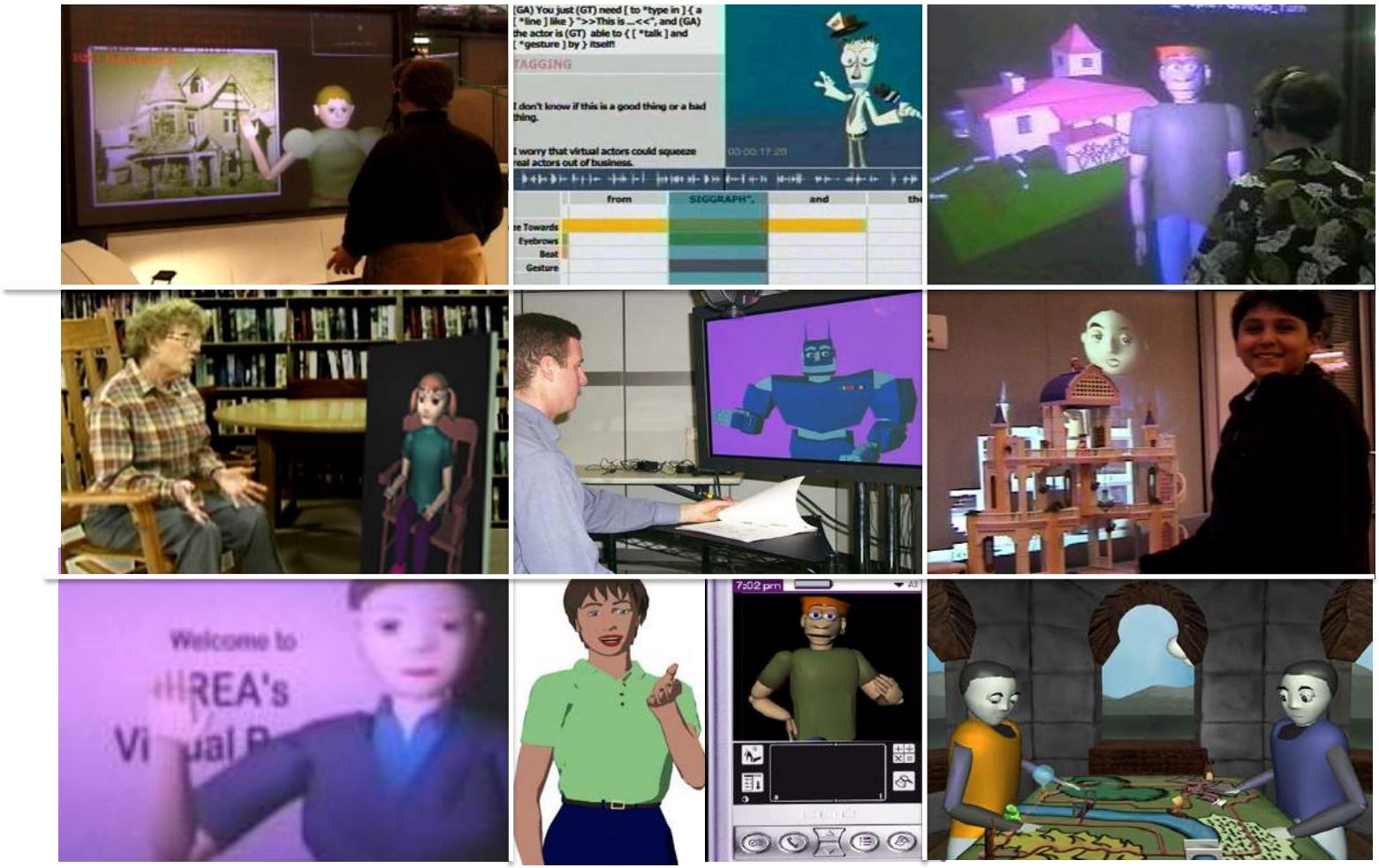
# Implementer



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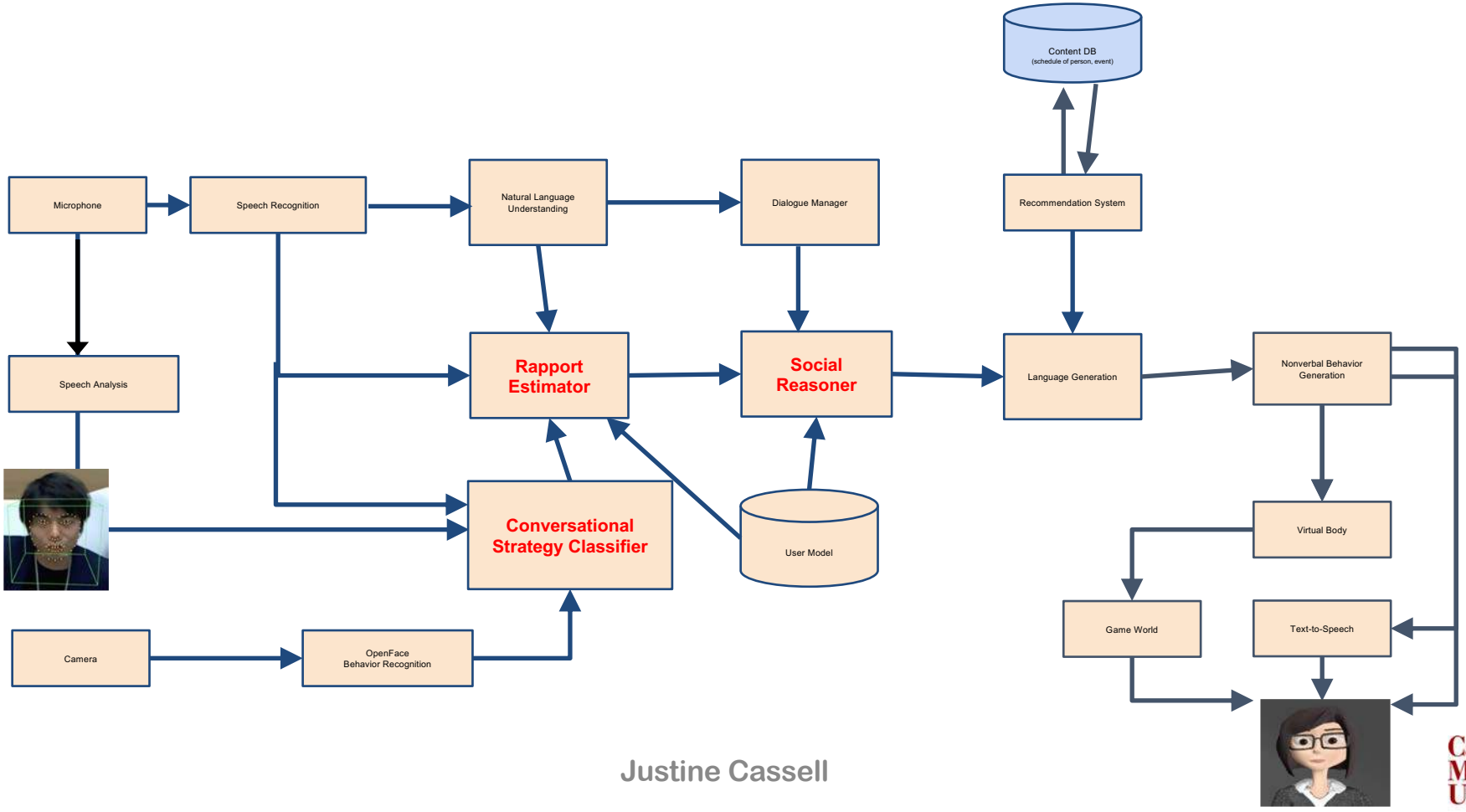
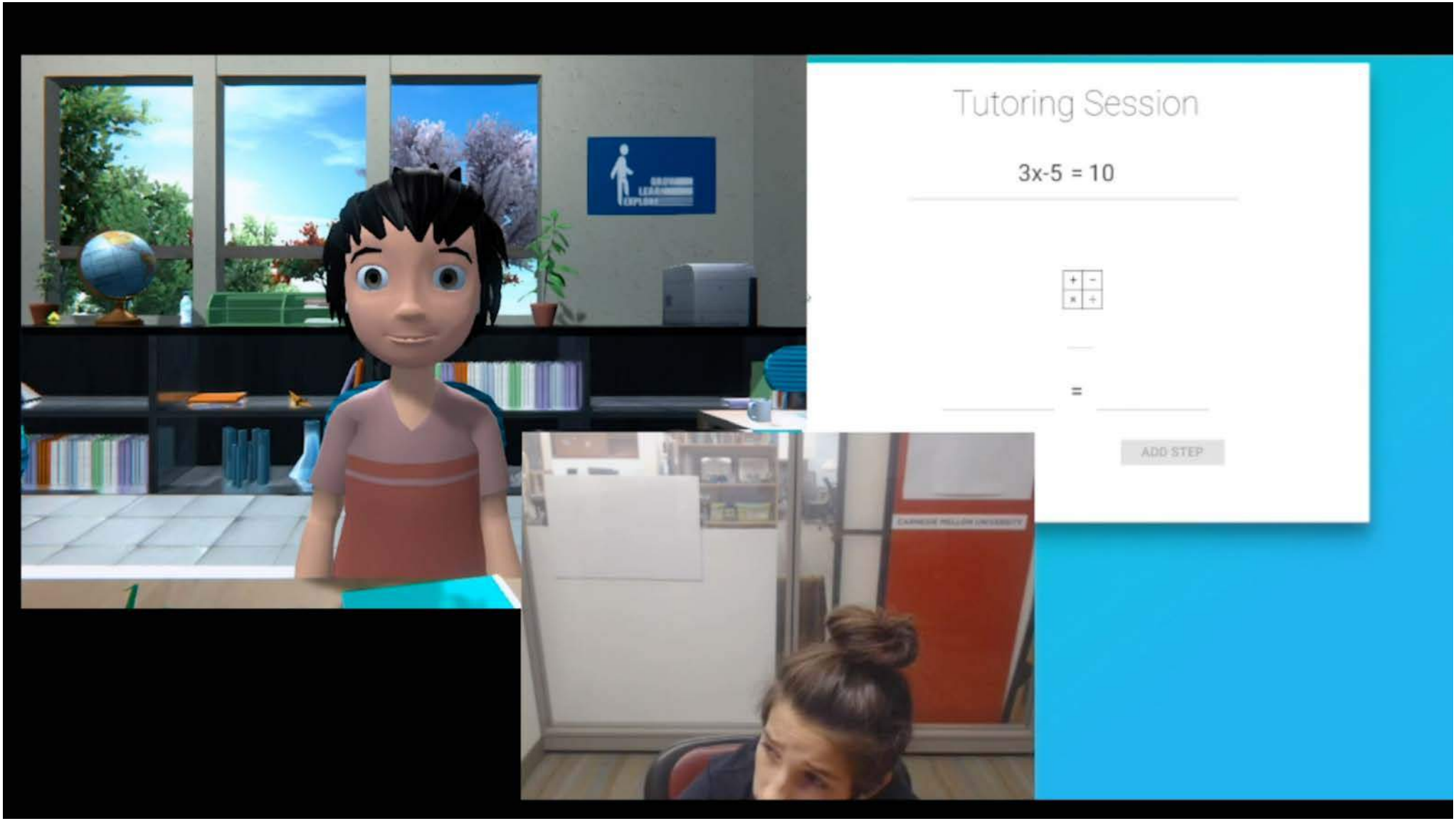
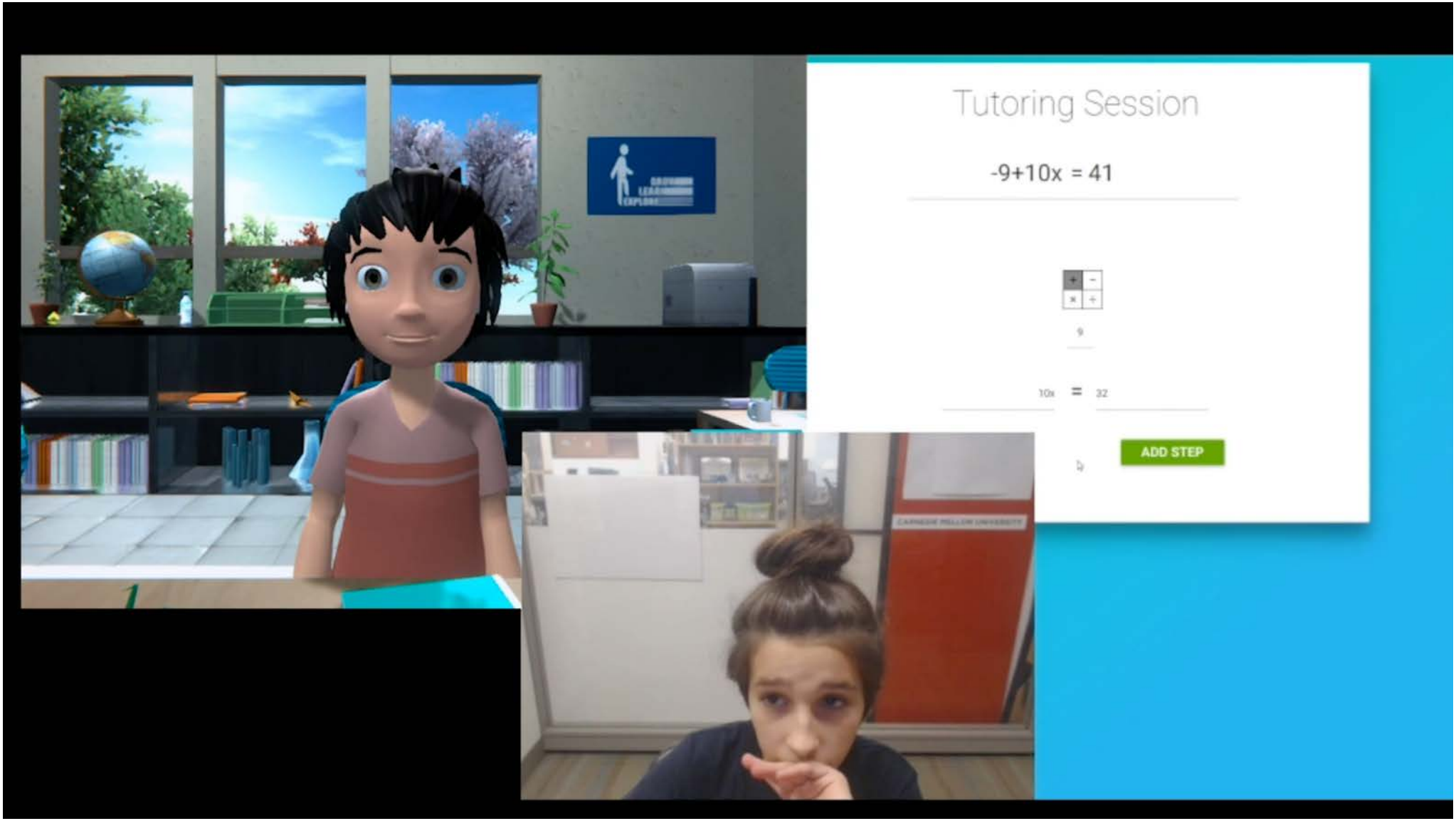
# Implementation d'Architecture Informatique: Agent Sensible aux Comportements Sociaux




Tutoring Session
3x-5 = 10
=
ADD STEP


Tutoring Session
-9+10x = 41
9
10x = 32
ADD STEP

# Evaluer

# Comment Evaluer la Performance du Système

## Interaction

- Total Time
- System Speaking Time
- User Speaking Time
- System's Response Time
- User's Response Time
- System's Interruptions
- User's Interruptions

## Verbal

- System's Intentions
- User's Intentions
- System's Conversational Strategies
- User's Conversational Strategies

## Task

- Session Rec. Acceptance Rate
- Person  Rec. Acceptance Rate

## Interpersonal

- Thin Slice Rapport Score
- Mutual Attentiveness
- Coordination
- Positivity

# Curiosité, Innovation, et l'Ecole d'Aujourd'hui

Curiosity is "a desire to know, to see, or to experience that motivates exploratory behavior dedicated towards the acquisition of new information" *(Litman, 2005)*

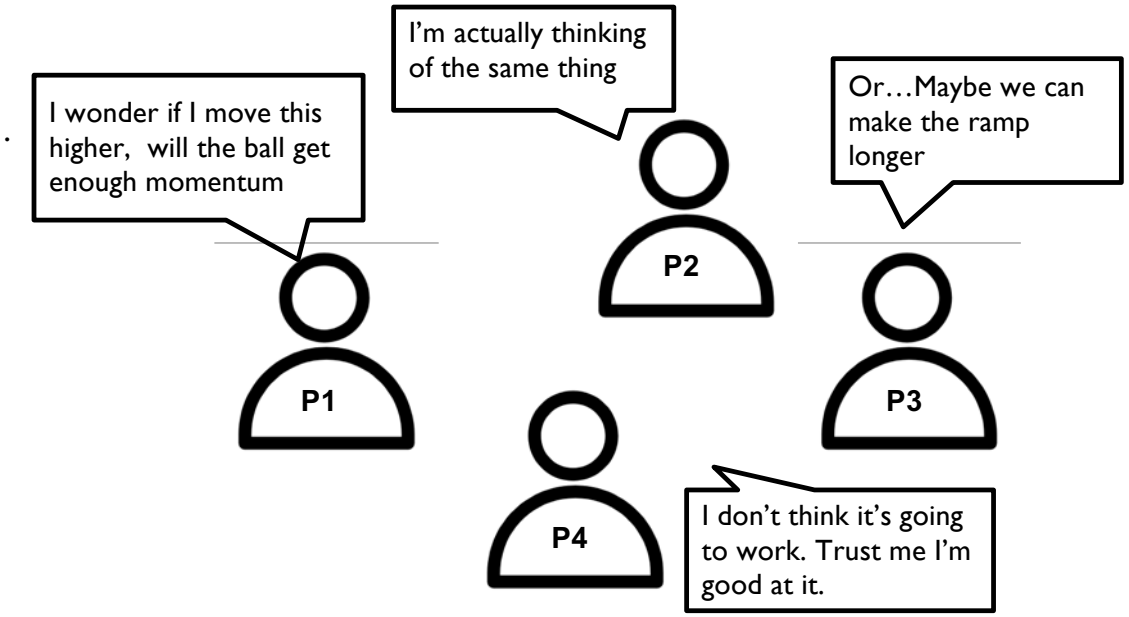
It is an important predictor of academic performance, and a key character quality of 21st century skill *(Stumm, et al. 2011, New Vision for Education, 2016)*

"Children are born scientists. From the first ball they send flying to the ant they watch carry a crumb, children use science's tools - enthusiasm, hypotheses, tests, conclusions - to uncover the world's mysteries. But somehow students seem to lose what once came naturally. " *(Parvanno, 1990)*

*But curiosity is being systematically squelched by a teach-to-the test environment, and test-score dependent funding.*

# Phénomène Encore Peu Etudié

- Curiosity in the Social Context?
- "Children learn by talking and working together"
- *(Cohen & Lotan, 2014)*



# Comment Recueillir les Données

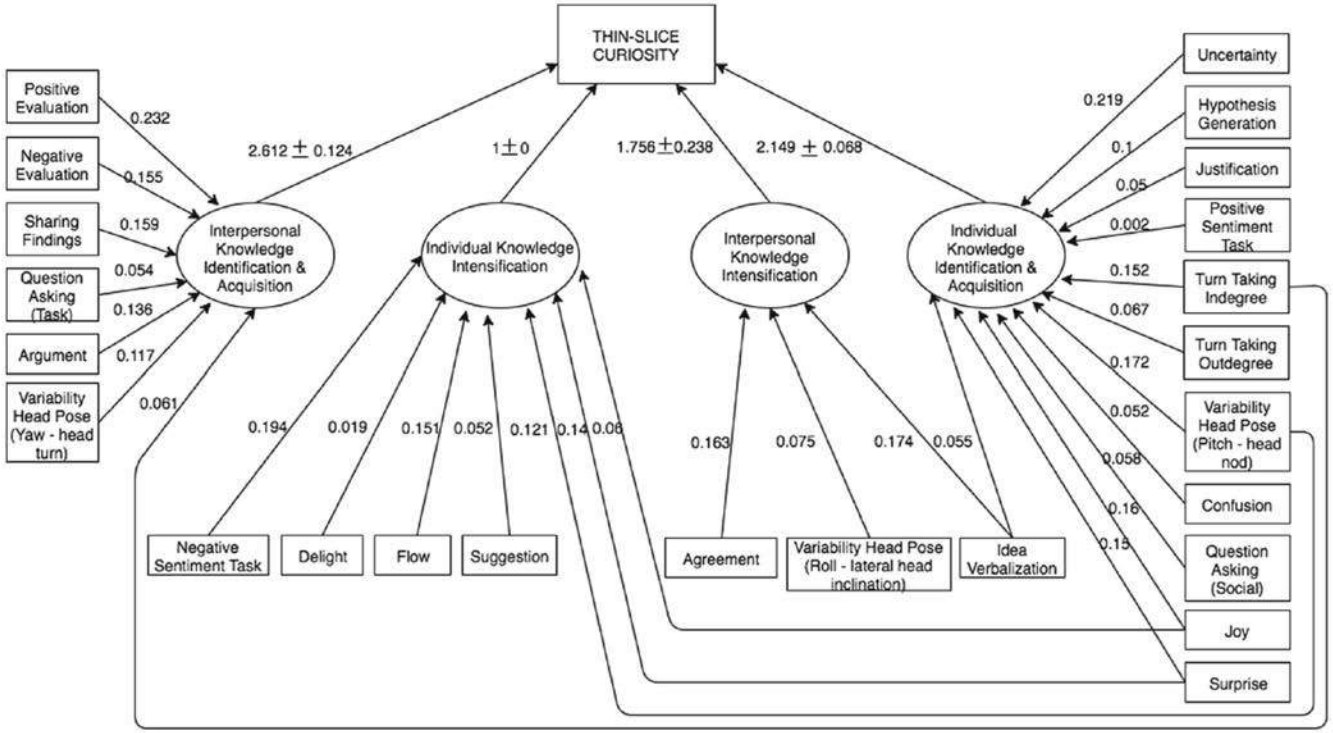
**Group Views**

**Single Views**

**Webcam Views**

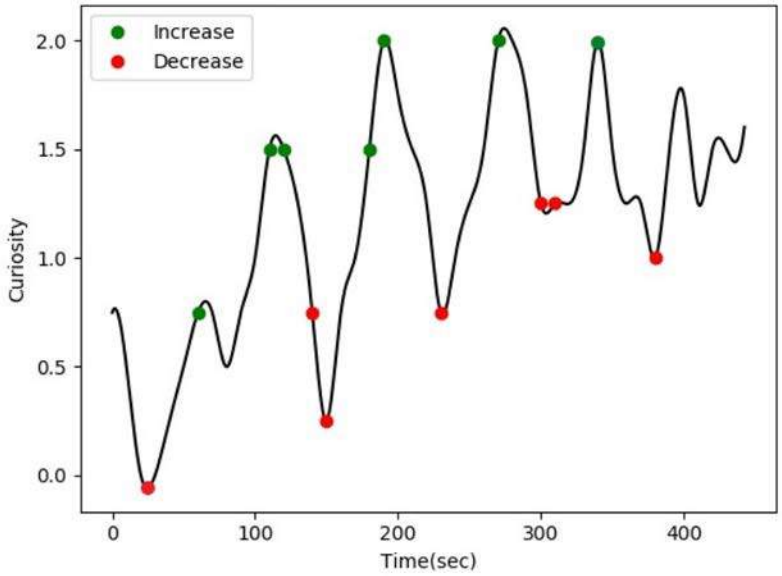
Groups of 3-4 children building a Rube Goldberg Machine were videotaped with cameras from every angle.

# Resultats Préliminaire:
# Comportements Indiquant Curiosité

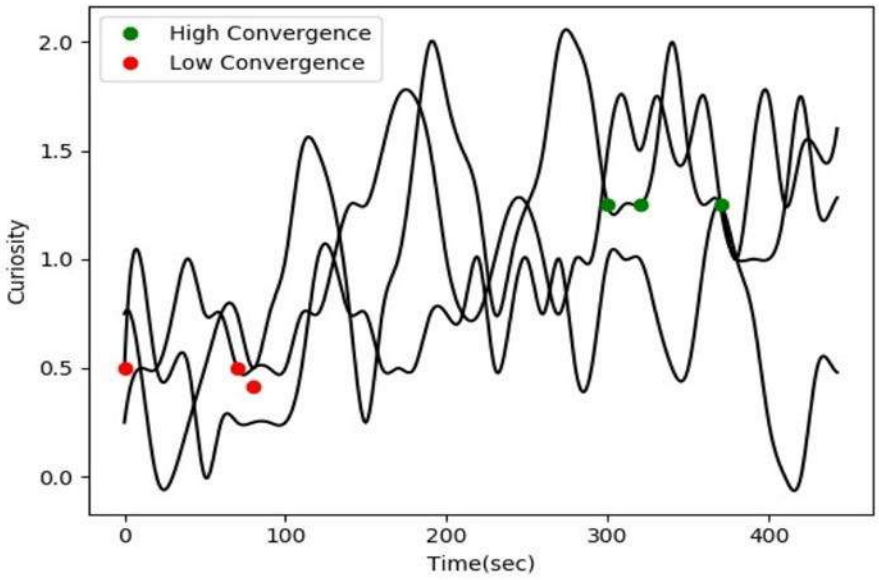



Continuous time Structural Equation Modeling factor analysis pilot results.
Direction and degree of predictive influences are represented by edges between multimodal behaviors and latent variables

# Dynamiques Interpersonelles et Temporelles




**Temporal Dynamic** Rapid increase and decrease of curiosity mined using anomaly detection, measured as the deviation of curiosity from windowed average




**Social Dynamic** Convergence of curiosity by three or more group members, measured as low standard deviation in group's curiosity

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# Resultats Préliminaires:
# Sequences de comportements qui evoquent la Curiosité

| Rapid Increase in Individual Curiosity (O – Other, T – Target) |
|---|
| O's Idea Verbalization ➔ O's Justification ➔ O's Negative Evaluation |
| O's Negative Evaluation & Justification ➔ O's Idea Verbalization ➔ O's Confusion |
| O's Agreement ➔ O's Idea Verbalization, Justification ➔ T's Confusion |
| O's Idea Verbalization & Justification ➔ O's Negative Evaluation ➔ O's Question Asking |
| **O's Idea Verbalization and Justification ➔ T's Justification ➔ O's Arguments** |
| **T's Idea Verbalization and Justification ➔ T's Justification ➔ O's Arguments** |

- Other argues with target child's idea verbalization and justification

# Example: Behavior Dynamic across Individuals that led to Curiosity Increase


P1's Idea Verbalization and Justification ➔ P2's Negative Evaluation ➔ P3's Curiosity Increase

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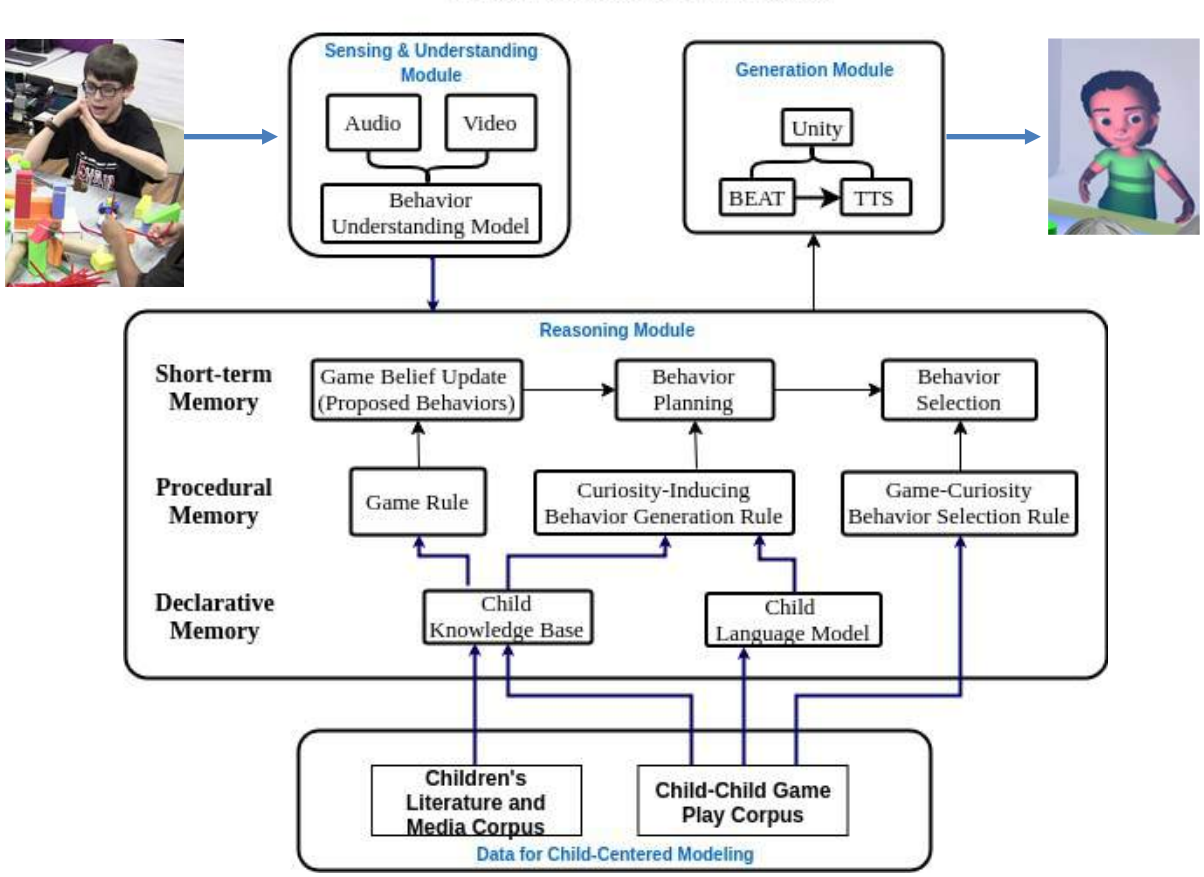
# How Rules are Embedded in Virtual Peer: Curiosity-Evoking Virtual Peer Computer Architecture

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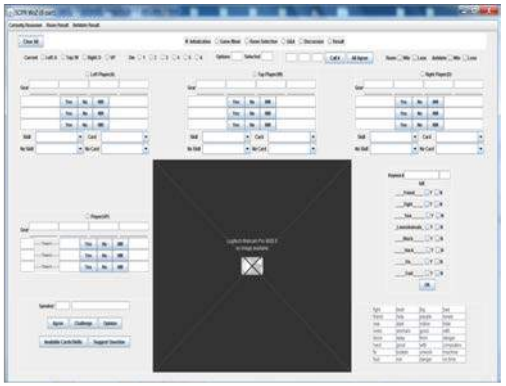
# Implementation



# Interface Pour Enfants Autistes

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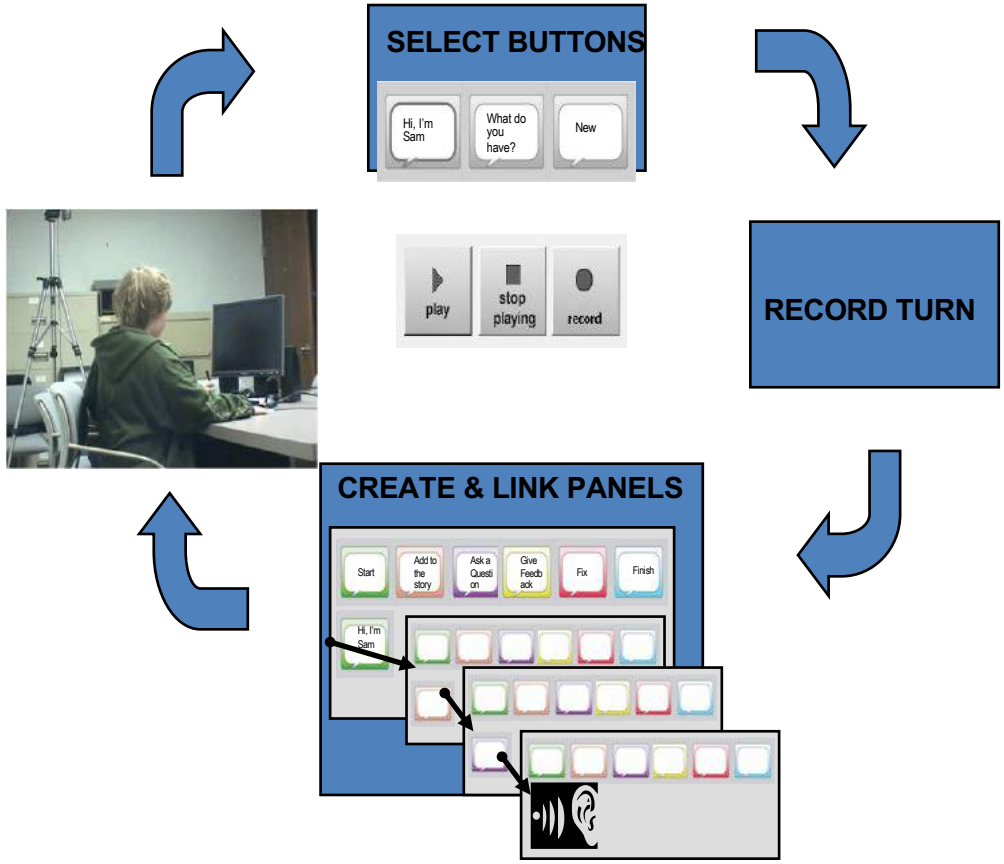
# Virtual Peers: Interlocuteurs virtuels : autant partenaires que marionnettes

**ASD ~ TD conversation**

**ASD ~ Virtual Peer conversation**

Children with ASD demonstrate more narrative and interactional skills with virtual peer

# Contrôler les interlocuteurs virtuels pour Comprendre les Comportements Interpersonnelles

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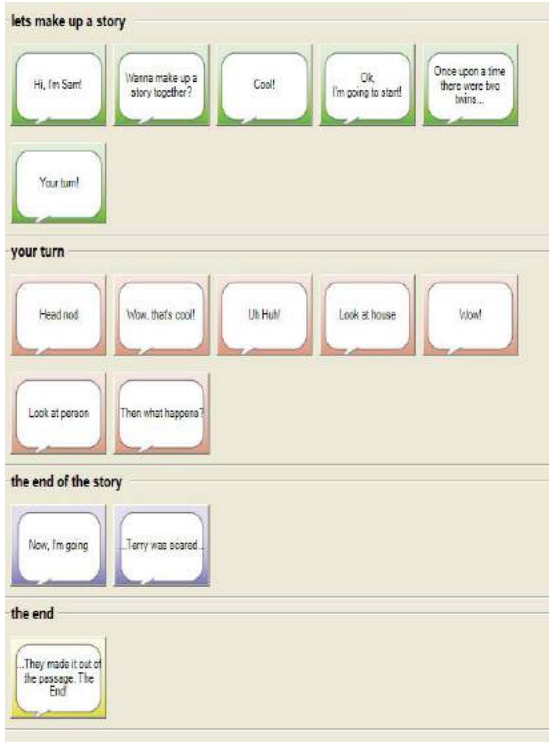
# Revision des Panneaux

**First try**




**Second try**

# Resultats

*Design*: The very use of the panel was diagnostic of behaviors that may be affecting reciprocity:

- [Begin conversation button] “Wanna hear a scary story? Well if you said yes, that’s good. If you said no than too bad, cause I’m about to tell one. One day…” <continues on with the story>.

*Design*: The use of the panel resulted in monitoring and revising:

- “I should have used more question buttons. Can I try it again”

*Intervention*: The use of the panel resulted in transfer effects to child-child role play in the use of reciprocity:

- significant effect due to use of the AVP ($F$ ratio = 11.48; $p<0.002$), with a higher rate of appropriate responses predicted if the child first interacted with the AVP. Especially affected were “give feedback” and “respond”

# Donc:

• Social AI allows us to better understand social interaction.

• Social AI allows us to continue to act human, in an increasingly technological world.

• We are creating AI that evokes social behavior.

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## For more information

http://www.cs.cmu.edu/~justine/

http://articulab.hcii.cs.cmu.edu/

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