ANR-CREST 2109
TAPAS: Training Adapted Personalised Affective Social Skills with Cultural Virtual Agents

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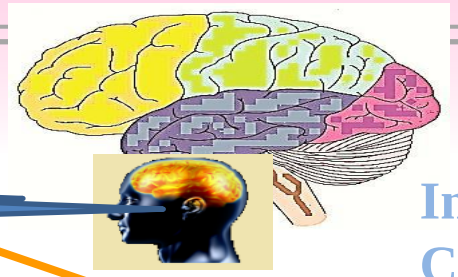
NAIST

Research Topics at AHC-lab, NAIST



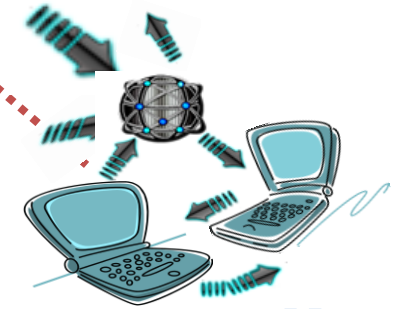
Brain Analysis

Incongruity measurement
Cognitive Load
EEG Hyper Scanning

Augmented Human Communication

Speech Translation
Machine Translation

Multi-language ASR, TTS
Machine Speech Chain



Data Analytics
Caption
Generation

Natural Language
Processing

Affective Computing

①Social Skills Training
②Detection of Early Dementia

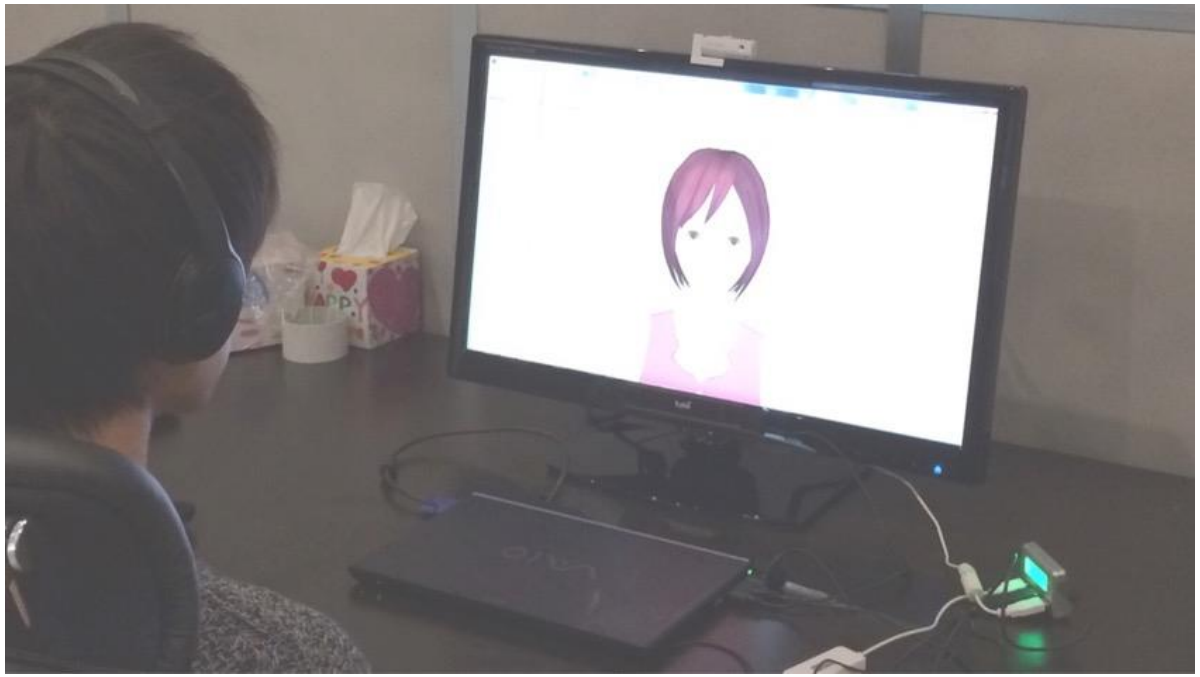
Goal-oriented Dialog
Non goal-oriented Dialogue

Spoken Dialogue
Multi-modal Dialogue

Deep Neural
Network

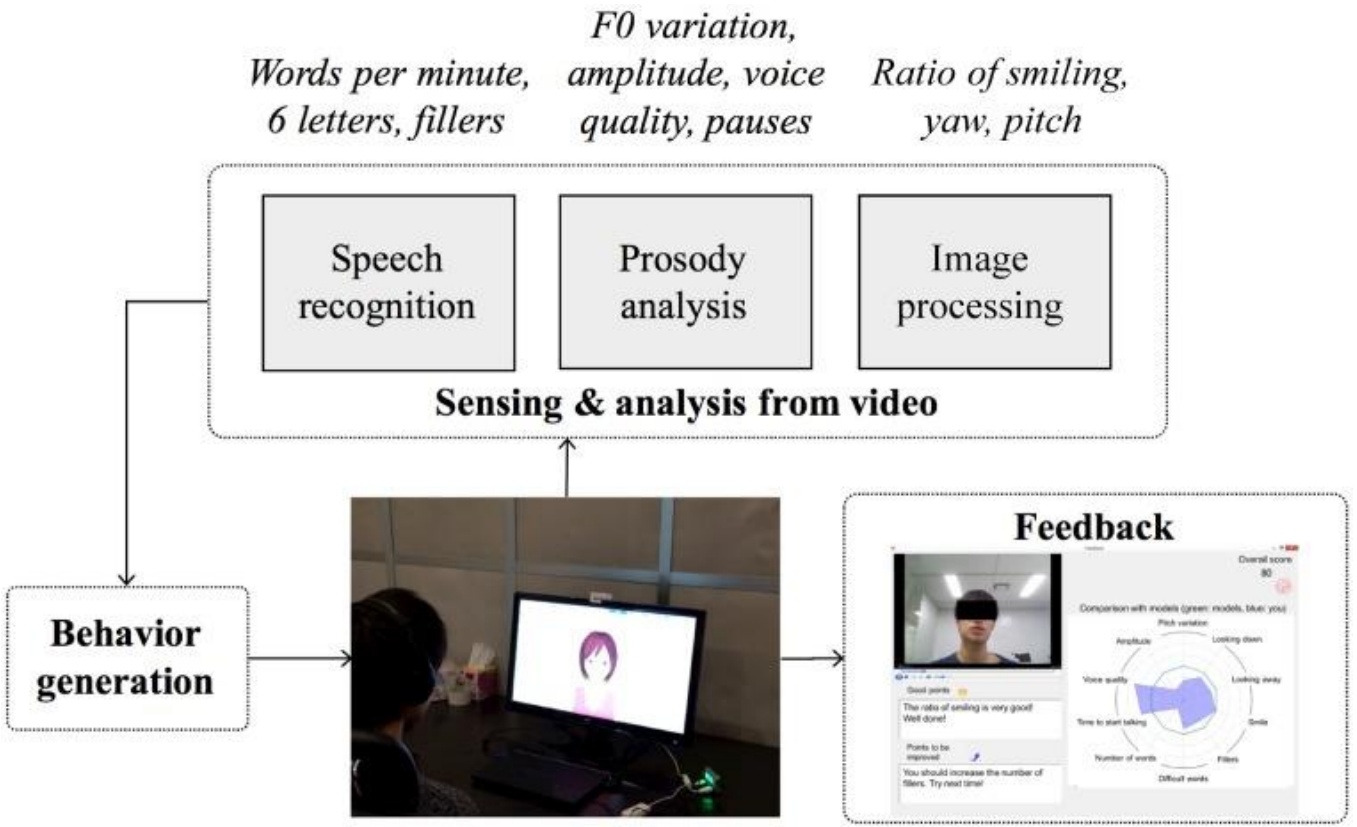
1. Social Skills Training

- Training tools for autism spectrum disorders
- People with autism have good systemizing skills
- Speaking skills [Tanaka, et al., 2015] and listening skills [Tanaka, et al., 2019]



Role-play

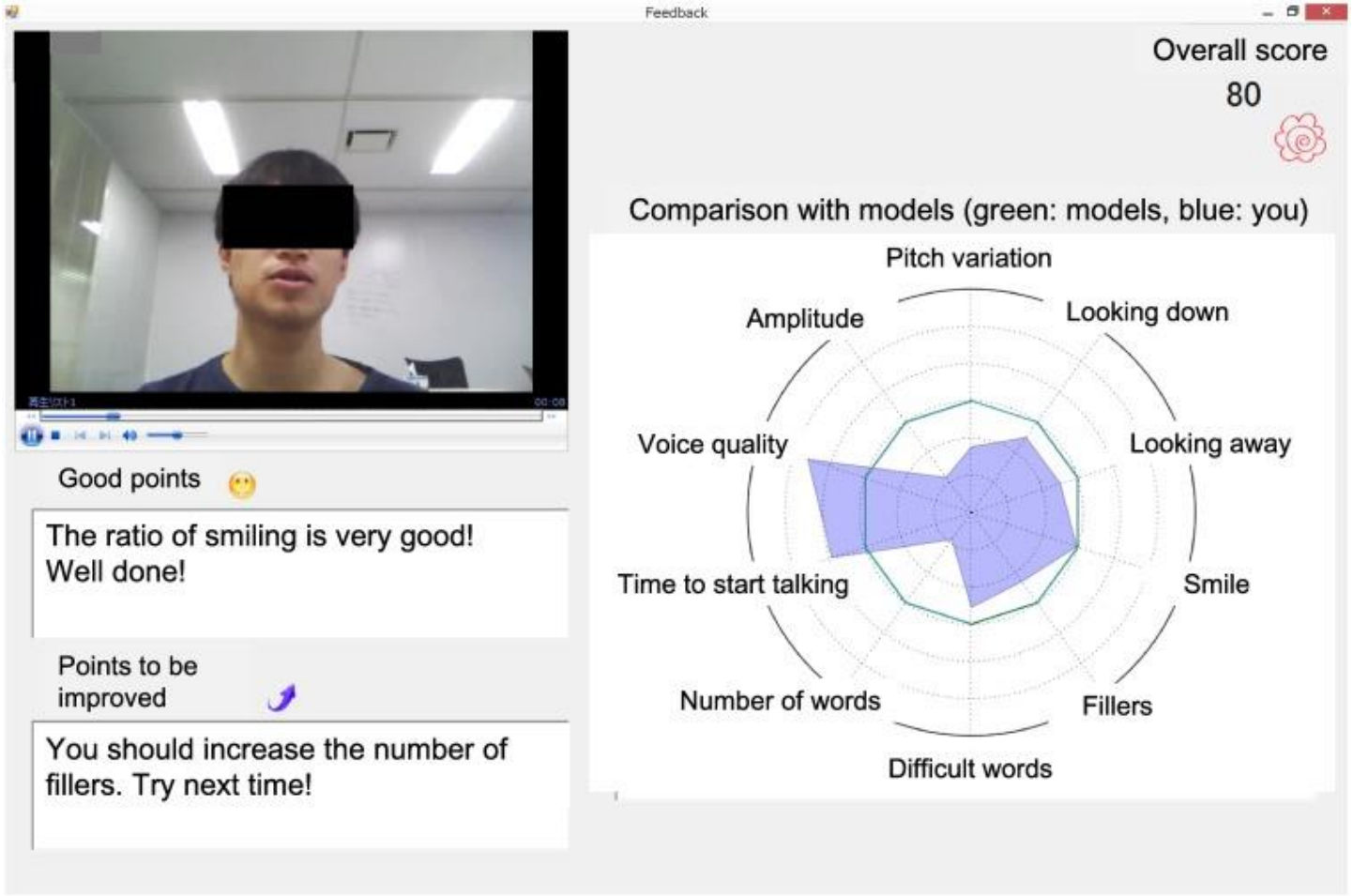
- Analyze behaviors of users and generate avatar actions



Features based on [Tanaka et al., 2014]

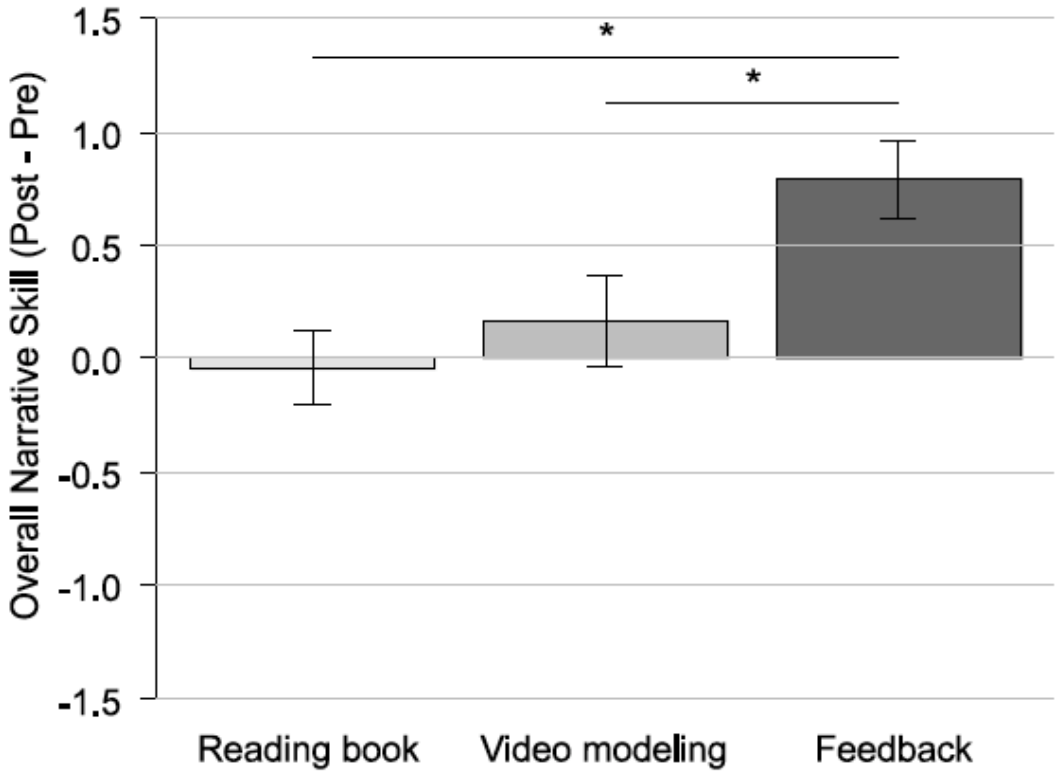
Summary feedback

- After role-play, the system displays feedback
- Repetitive training until mastery

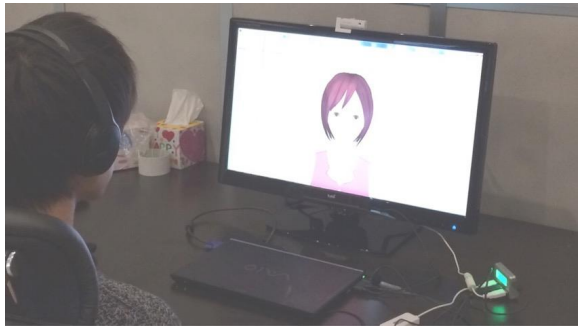


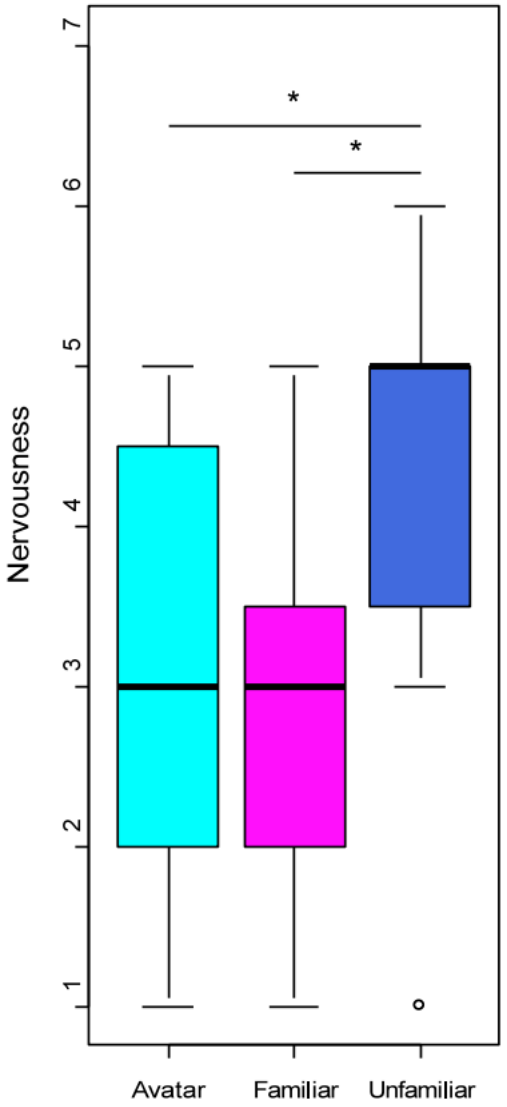
Training effect

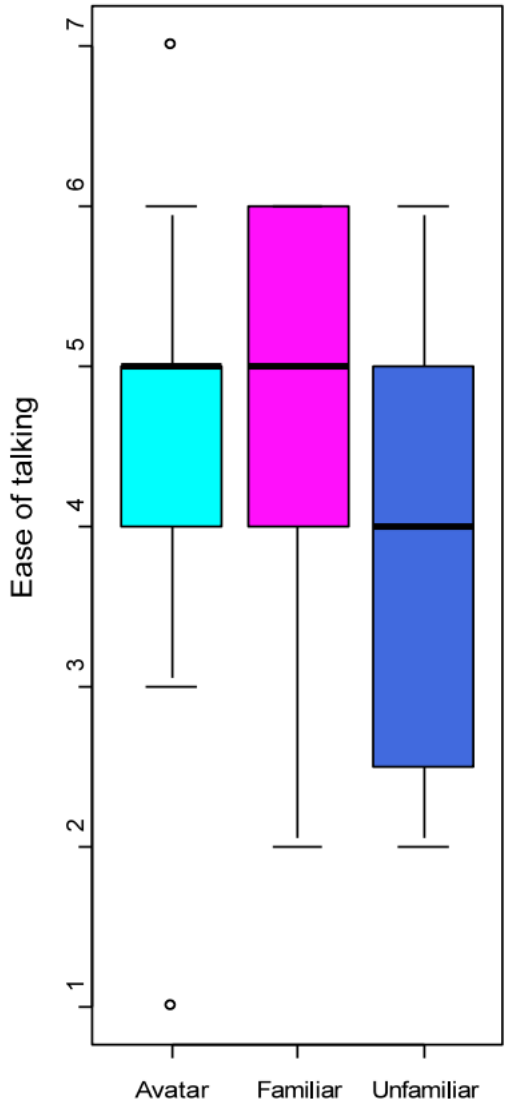
- One-way ANOVA: ($F[2,24]=4.70$, $p<.05$)
- Post hoc comparisons with Bonferroni's method: significantly different between feedback and reading book ($p<0.05$)

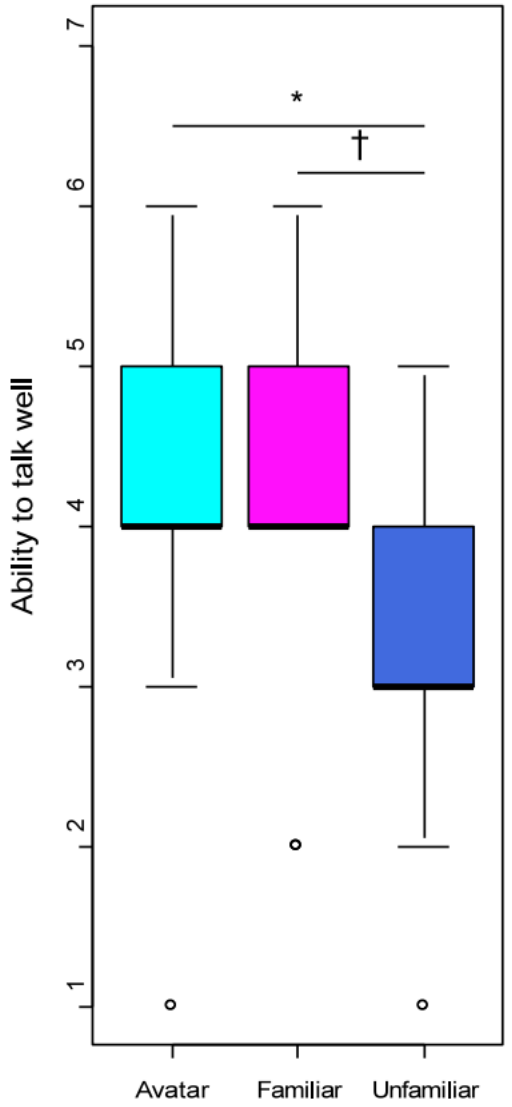


Human-human and human-agent interaction



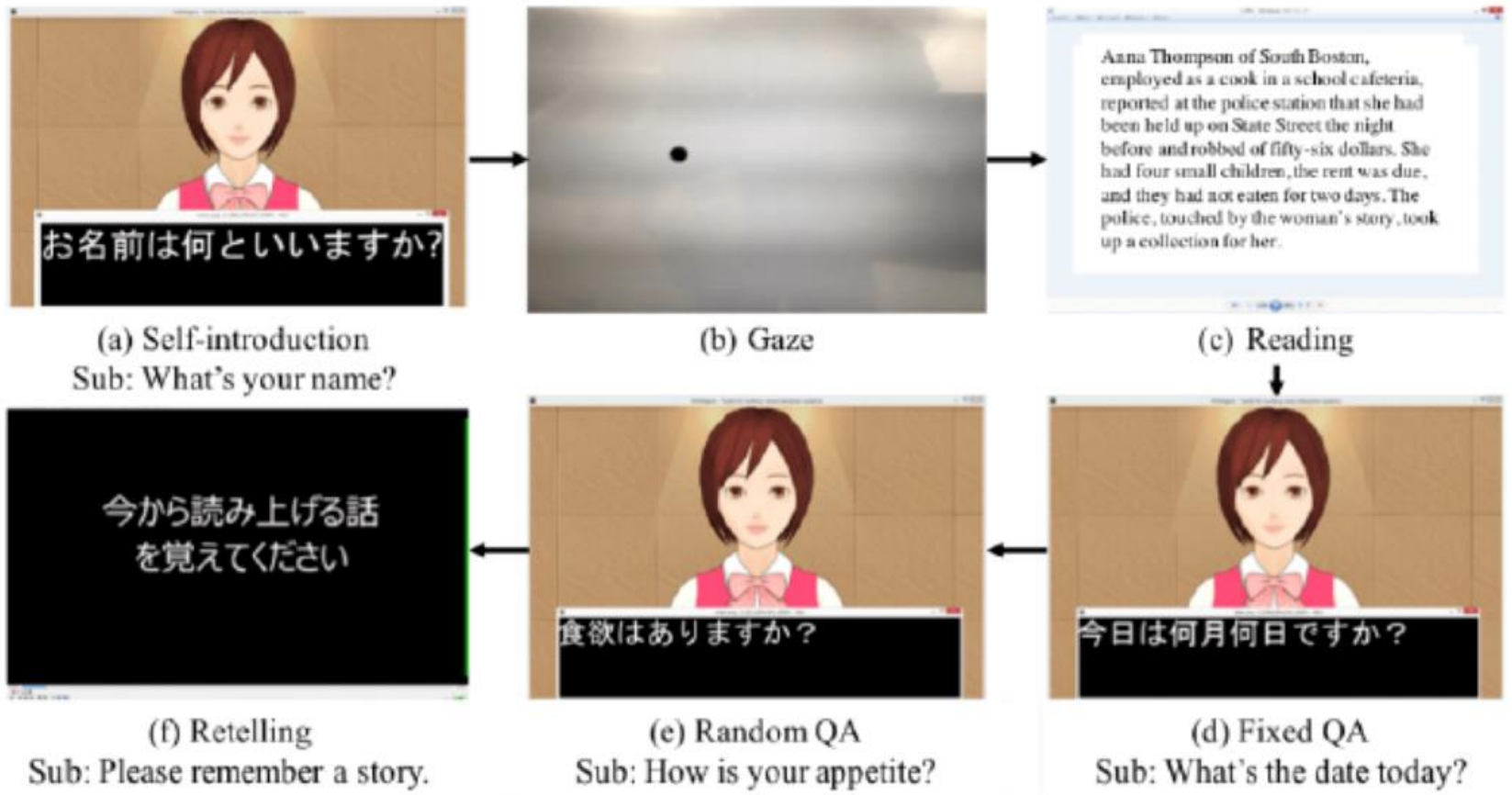






2. Detection of early dementia

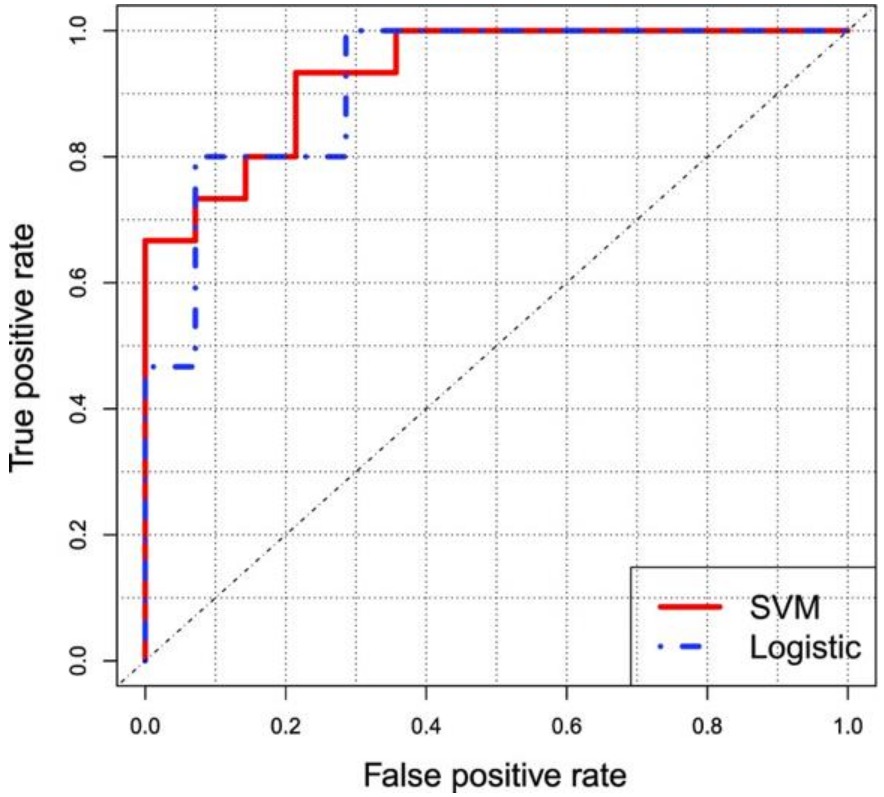
- 10 minutes interaction: 12 early stage of dementia and healthy control



[Ujiro et al., 2018] [Tanaka et al., 2017]

Multimodal-based classification

- Answers to fixed questions: e.g. what is the date today?
- Areas under the ROC curve
  - 0.90 (SVM), 0.88 (Logistic regression)



Features: response gap, language, speech, face

ANR-CREST (2019-2024)

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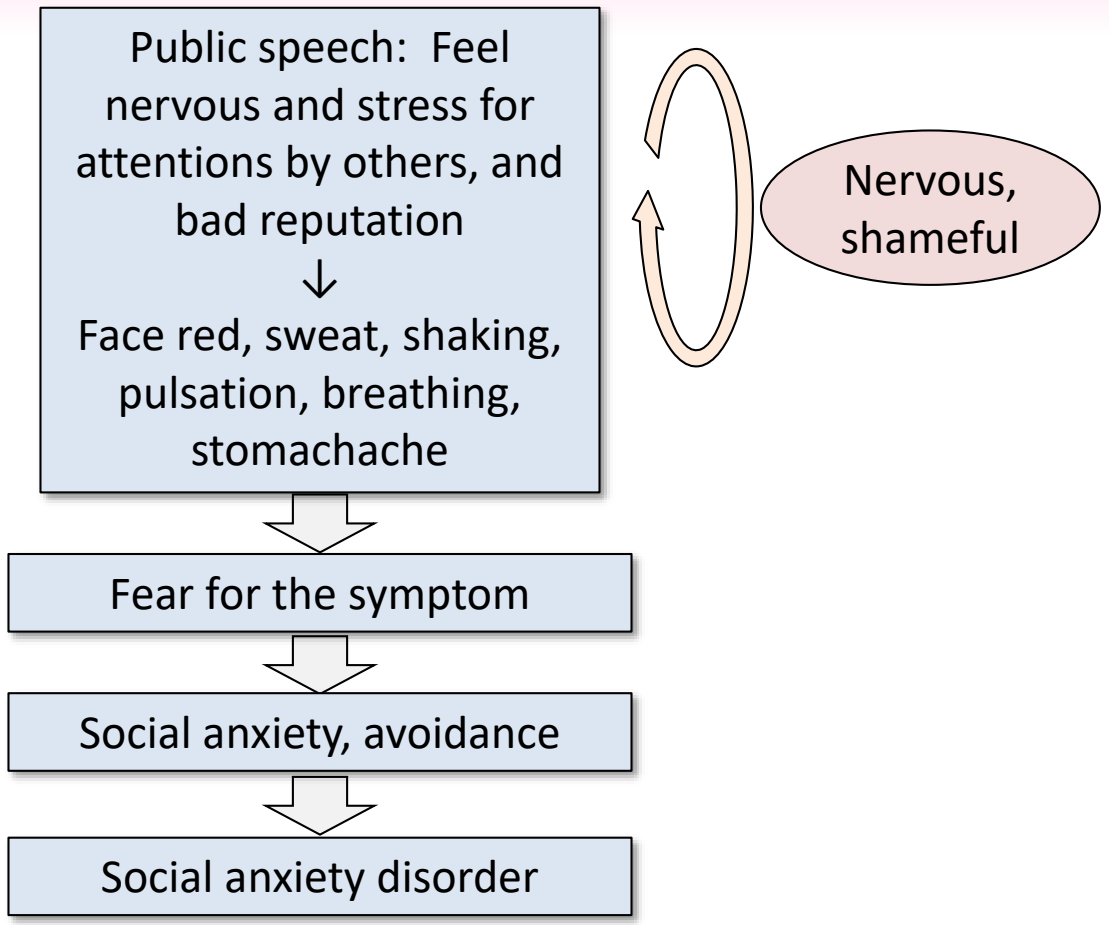
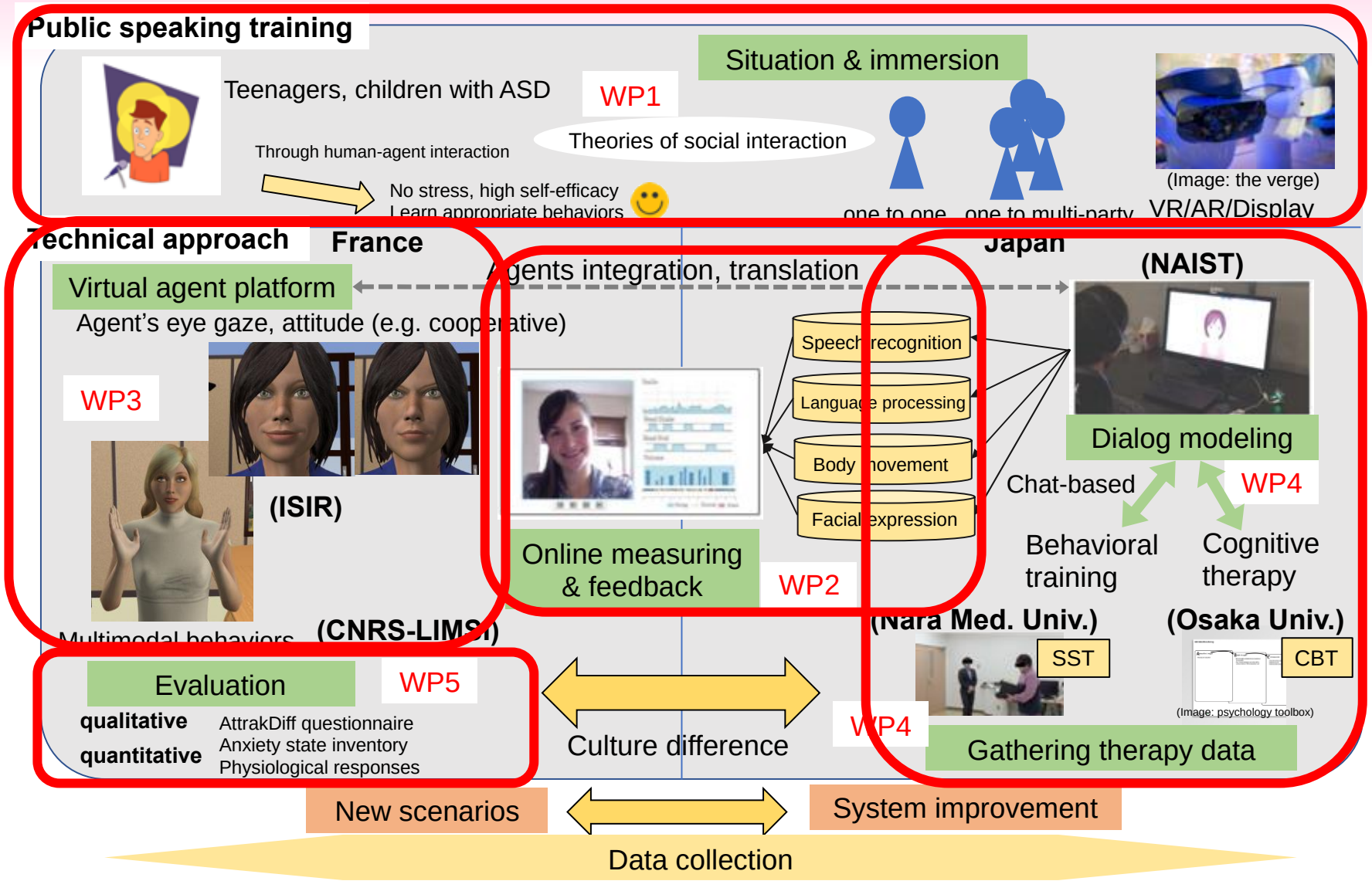
Research background and objectives

- Increase of people who are not good at social communication and social anxiety disorder in schools and workplace (3 to 13%)

- Try to solve by verbal / non-verbal interactive training system by Embodied Conversational Agent
  - Target population: **general population**, depression, autism spectrum disorders, schizophrenia
  - Behavioral training: apply Social Skills Training (SST)
  - Cognitive training: apply Cognitive Behavioral Therapy (CBT)



Overall framework



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Social skills training (SST)

- Medically established method for behavior training for autism, and schizophrenia.
- Flow: Situation setting -> Modeling -> Role play -> Feedback -> Homework
- 1 period: 30 minutes or more x 10 times [Nara Med. Univ. 2018]

Language: words, expression, consistency, coherence, causality, etc.

Speech: pitch, speaking speed, filler, voice quality, amplitude etc.

Image: facial expression, gesture, posture, eye gaze etc.

Cognitive behavioral therapy (CBT)

- Psychotherapy-based instructional method to change the cognitive schema
- Cognitive Reconstruction, Behavioral Activation, Situation Analysis, Problem Solving, Progressive Relaxation, Assertion, Schema Modification
- This study uses cognitive reconstruction
  - Situation setting -> Initial mood -> Automatic thinking -> Disapproval -> Adaptive thinking -> Change in mood -> Analysis (homework)
  - 1 period: 30 minutes or more (usually 4-50 minutes) x 16 times

e.g. thinking note (column method)

	Cognitive Therapy Record	ECA Dialogue
Situation	Pointed out my small voice in presentation, and weakness logicality by the audience.	Situation breakdown
Initial score	Discouraged(80)、Sad(90)	Describe emotion state
Negative thinking	I am not able to present in front of audience. I am not good for this job.	Extract tendency
Evidence for this thinking	My voice is small in general. I am not able to explain logically.	Extract evidence
Alternative thinking	There are many people who give a good presentation in small voice. It is possible to present logically if I prepare well in advance.	Provide information to guide for extracting counter thinking.
Change thoughts	I can give a good presentation even voice is small. I will prepare more in advance	Extract alternative thinking
score	Discouraged(20)、Motivated(80)	Recognize change of thoughts

Summary

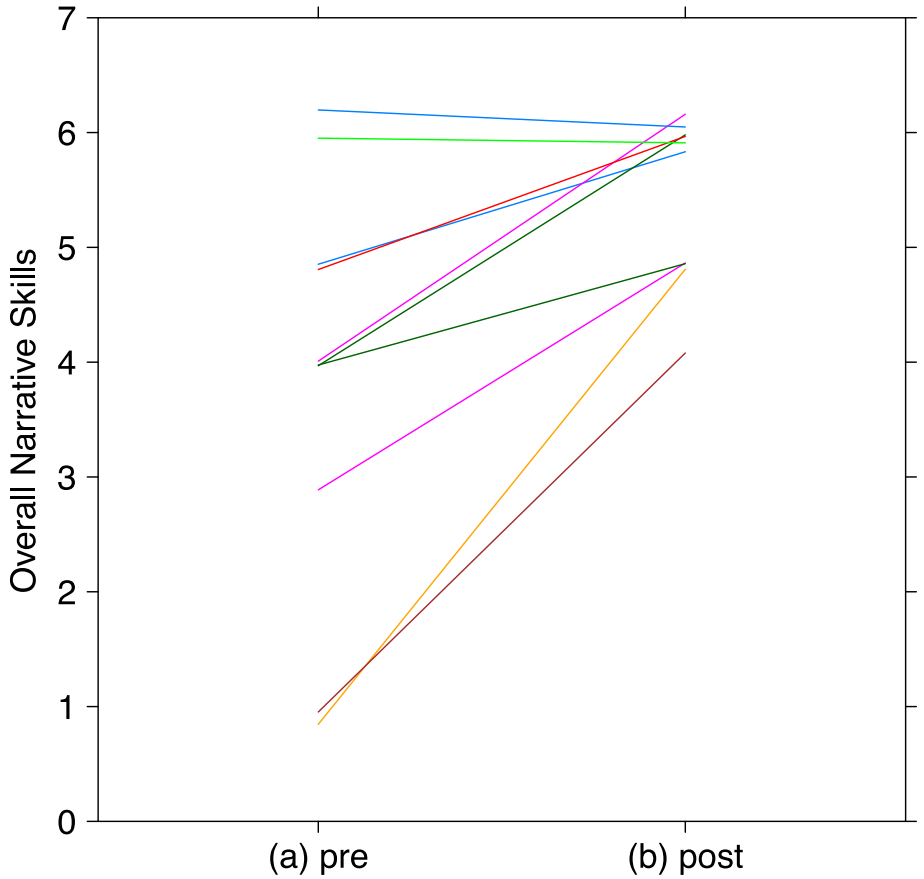
- Social Skill Training
  - SST for Autism
- Detection of early dementia

- New project
  - ANR-CREST: TAPAS project !

Continue to J-C Martin!

Children with ASD

- Communicate to unfamiliar person
- Pre-post comparison（p = 0.002, Cohen's d = 1.17)



Cognitive reconstruction data

- Collecting interaction data between doctors and people with depression
- e.g. Beck & Beck cognitive therapy live session