Modeling emotions with response styles and uncertainty

Capturing subjective feelings objectively

Abstract

Understanding others' emotions is crucial to human communication. However, trying to understand emotions through subjective questions is often hindered by individual response styles and subjective uncertainties. By mathematically modeling these response styles and uncertainties, we approach subjective emotions objectively. By statistically analyzing responses to various subjective questions, we detect individual response styles and the uncertainties in answers that vary on different occasions, even when the same question is asked repeatedly. Whether someone is overly expressive, reserved, or unclear in their emotional recognition, we aim to unveil their true emotions behind their responses. Human communication is complex, and emotional expression and cognition vary among individuals. By creating AI that comprehends human emotions, including response styles and uncertainties, we aim to reduce misunderstandings caused by unclear communication and foster a more empathetic society.

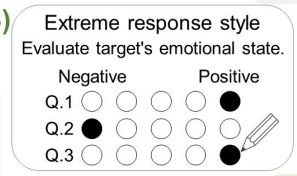
Problem formulation and approach

In estimating individual emotions from human behaviors such as facial expressions, we face issues concerning the validity (whether we are measuring what we intend to measure) and reliability (whether we can obtain consistent measurements) of subjective emotions themselves.

1. Low validity due to response style (RS)

Even though we want to know "how they feel," the focus ends up being on "what they choose."

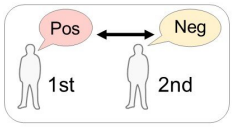
Pro-posal **Eliminate RSs that show a tendency to choose specific options regardless of the content**

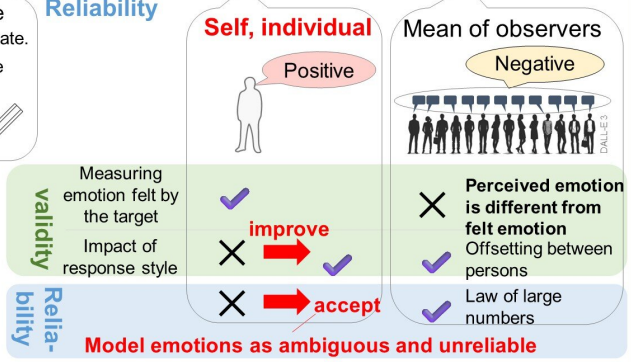


2. Low reliability (consistency)

because answers change each time they are asked. Using strict procedures to enhance consistency undermines essence of ambiguous emotions.

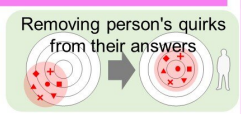
Pro-posal **Construct emotion estimation models assuming responses are inconsistent.**

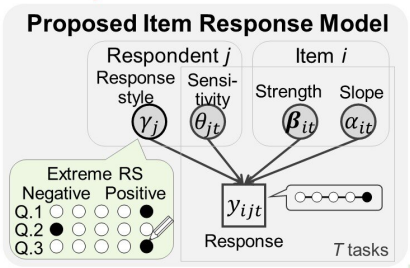


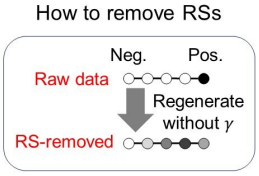


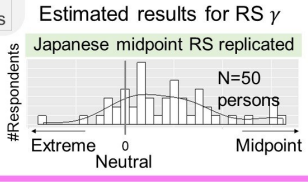
Improved validity eliminating response styles

In addition to main task, **responses to several types of questions (items),** such as personality traits, are **obtained from the same person**, and **RSs that appear in common among** them are **statistically extracted and removed.**[1]









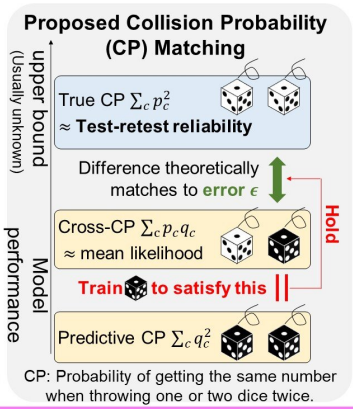
Experimental data

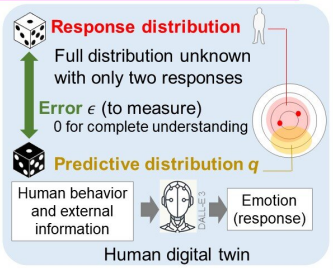
Main task: Emotional judgment
120 facial images, valence & arousal, 5-point scale

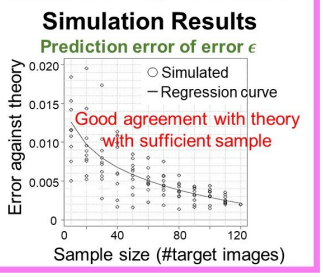
Subtask: Personality questionnaires
7 personality traits questionnaires such as Big Five, 3- to 7-point scales, > 300 items

Build low-reliability aware response models

Consider degree to which the responses of person and model should match in the **training and evaluation of computational models that** estimate emotions.[2]







References

[1] S. Kumano, K. Nomura, "Multitask item response models for response bias removal from affective ratings," in *Proc. The 8th International Conference on Affective Computing and Intelligent Interaction (ACII ' 19)*, 2019.

[2] H. Narimatsu, M. Ozawa, S. Kumano, "Collision probability matching loss for disentangling epistemic uncertainty from aleatoric uncertainty," in *Proc. The 26th International Conference on Artificial Intelligence and Statistics (AISTATS ' 23)*, PMLR 206:11355-11370, 2023.

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