

Machine Learning-based Algorithms for Emotion Recognition: A Preliminary Study



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BACKGROUND & AIMS

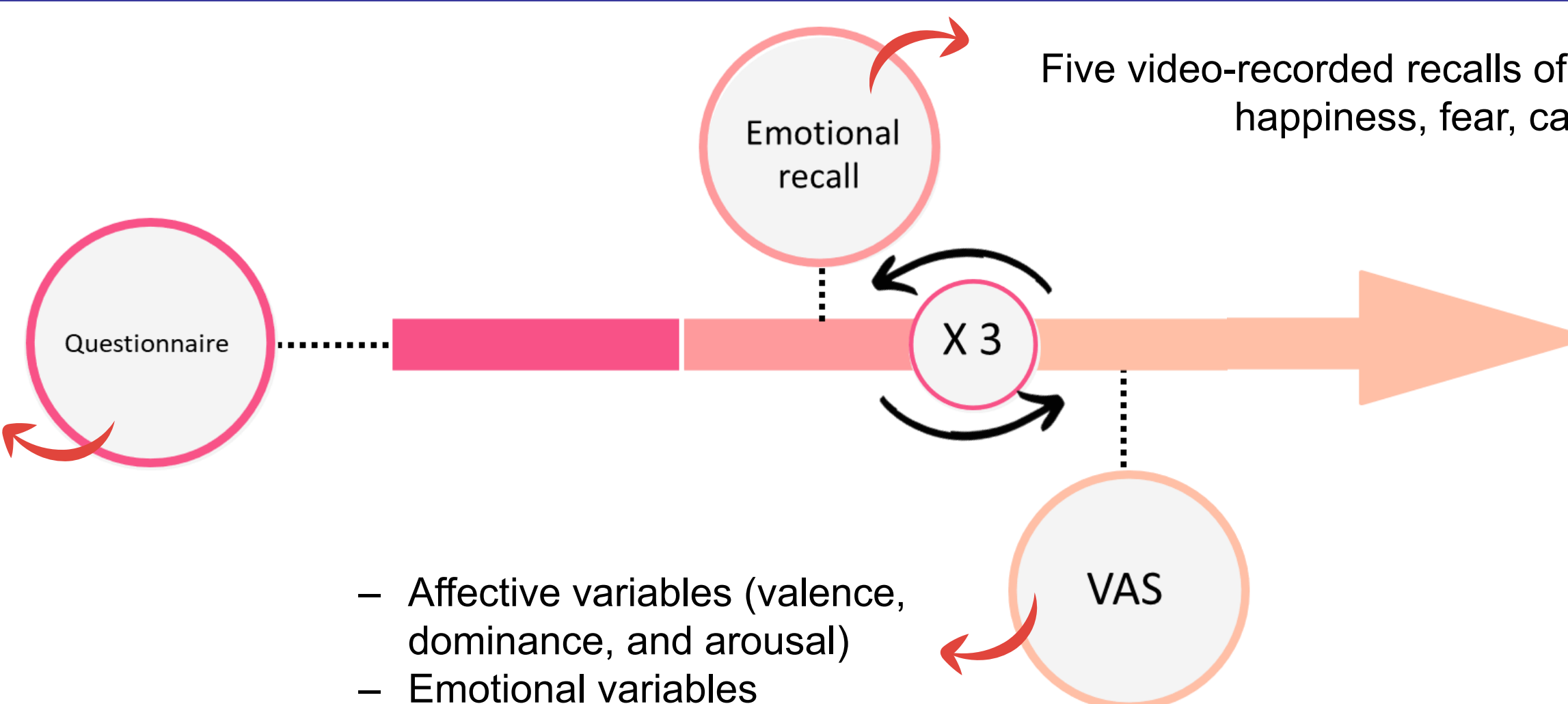
Emotion is a process triggered by internal or external relevant stimuli, which involves subjective experiences, physiological changes, and expressive behaviors. Emotions can be conveyed through facial expressions, body posture and movements, physiological responses, semantic content, and speech prosody¹. Machine learning (ML) algorithms are increasingly trained employed to recognize human emotions across different modalities, ranging from textual analysis to multimodal approaches. Several factors influence the performance of these tools, including the methodological approach used in their development—such as Natural Language Processing or lexicon-based techniques—and the specific datasets used for training². In this study, we aimed to test ML algorithms' effectiveness in detecting emotions using facial, semantic, and prosodic cues, when conveyed in a more ecological context. Moreover, we evaluated whether integrating these sources improves ML recognition accuracy.

METHODS

SESSION PROCEDURE

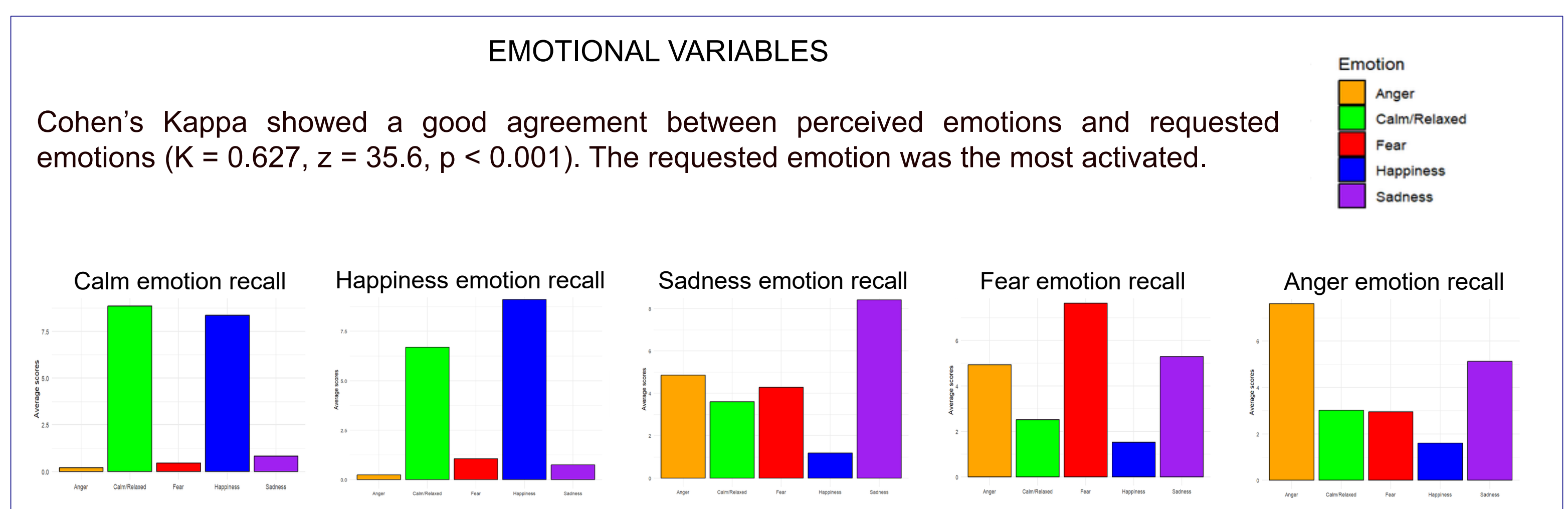
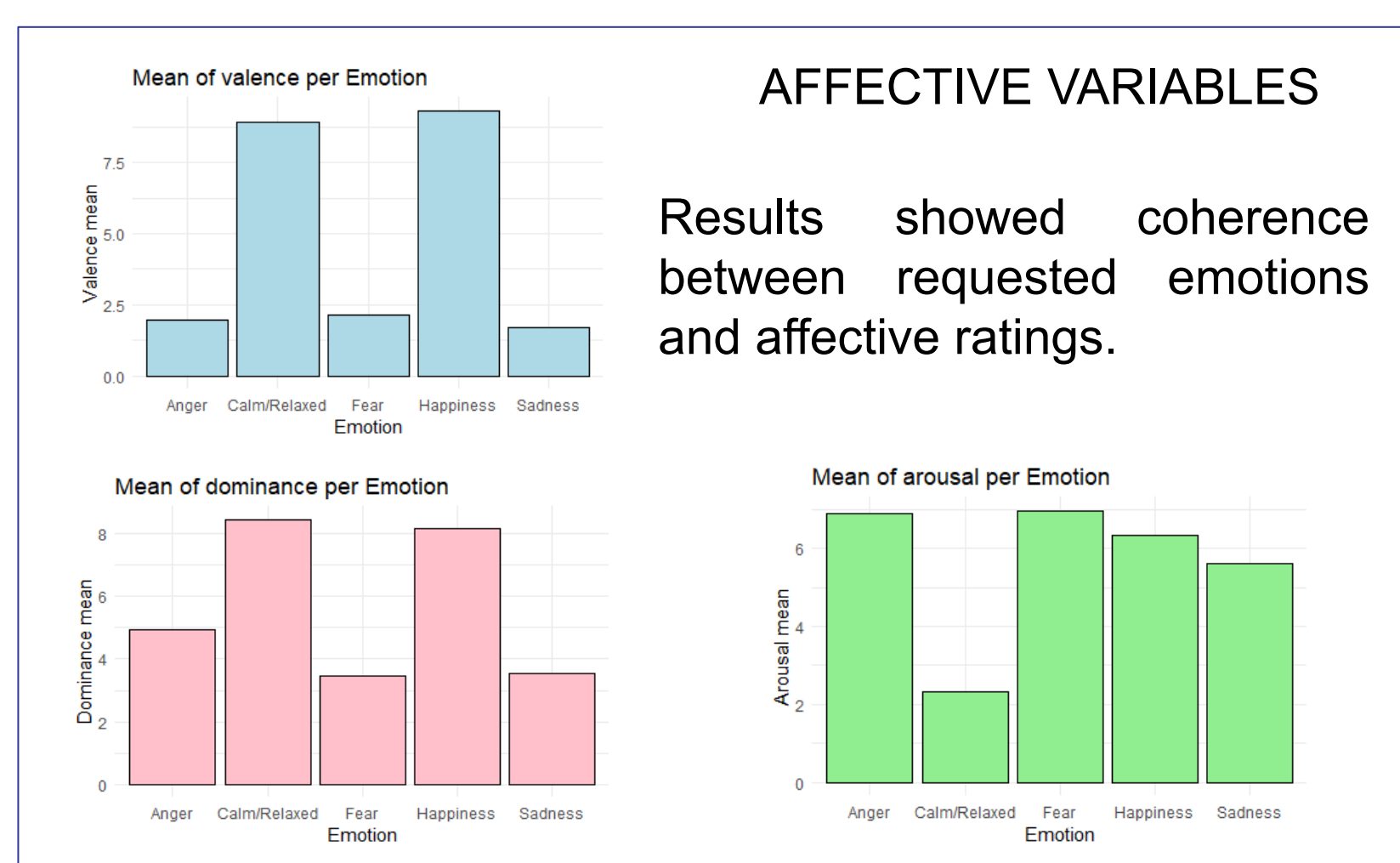
Two-session experiment:

Mood, emotional regulation, and session-by-session assessment.



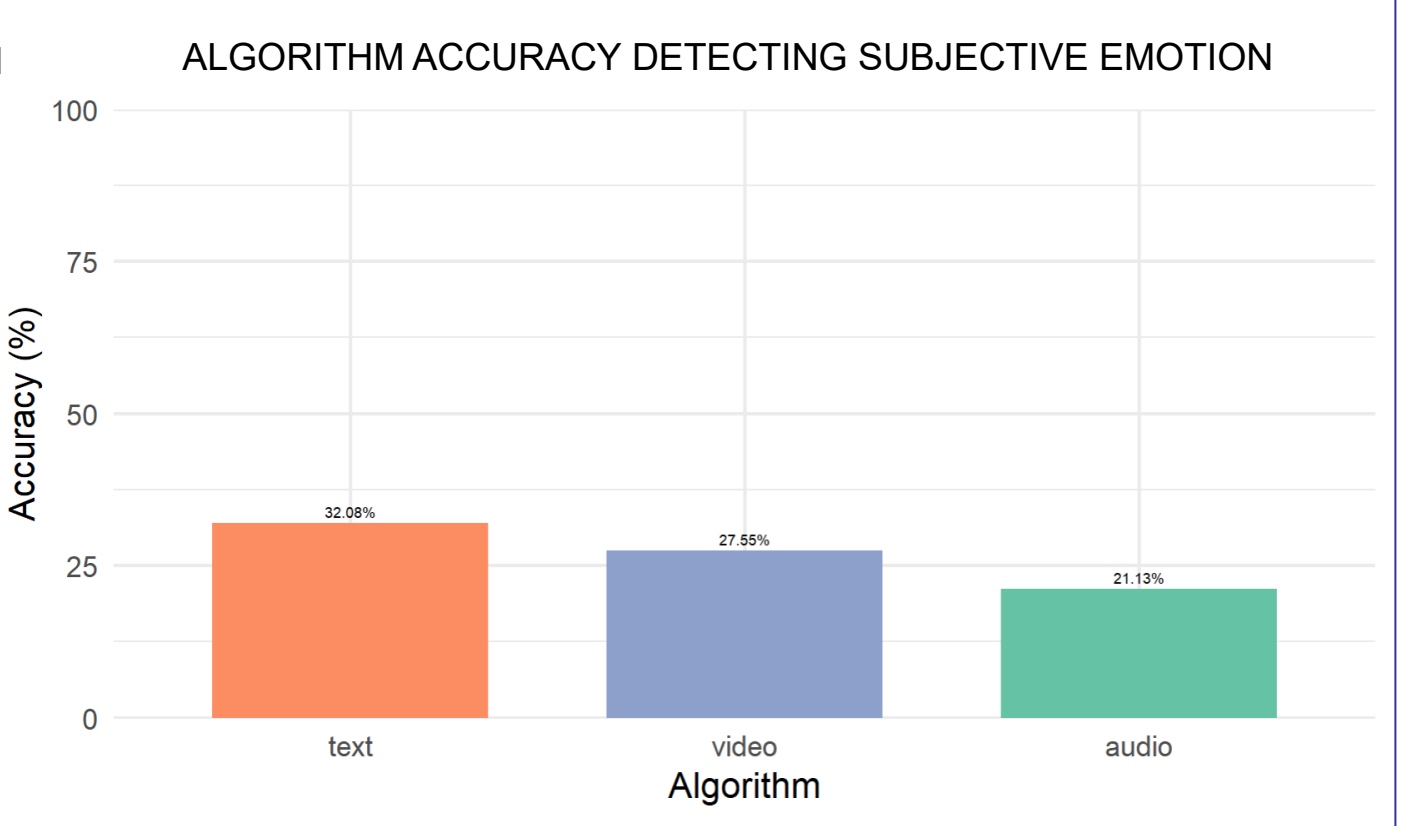
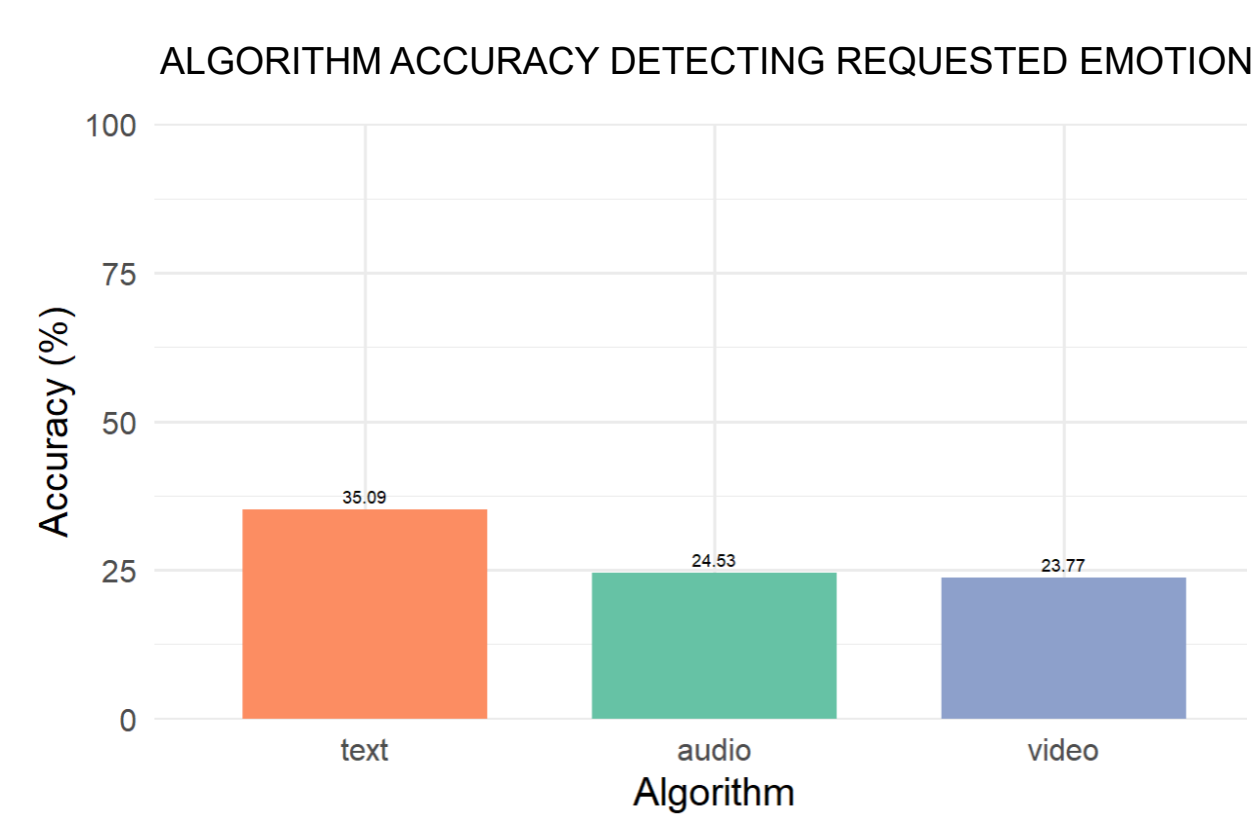
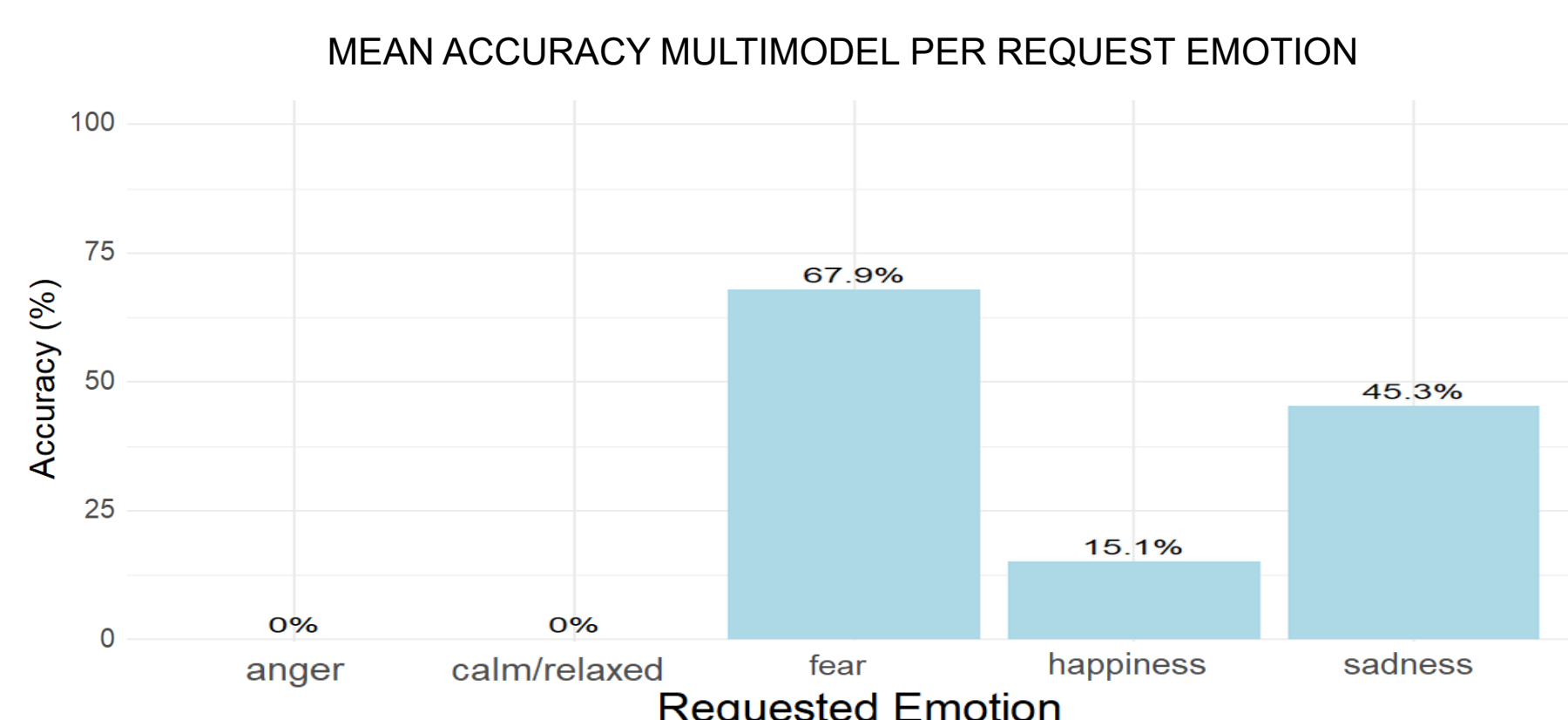
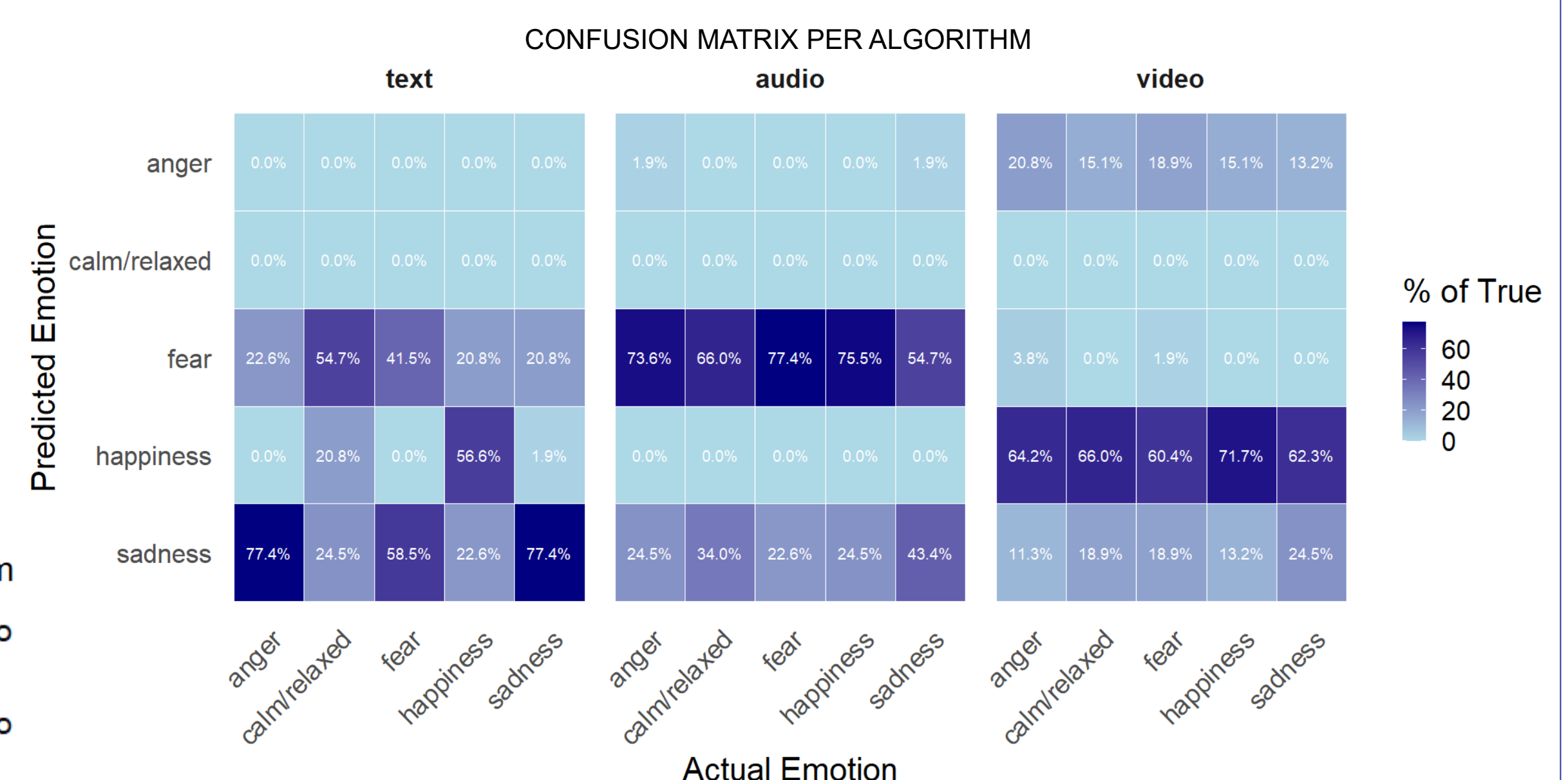
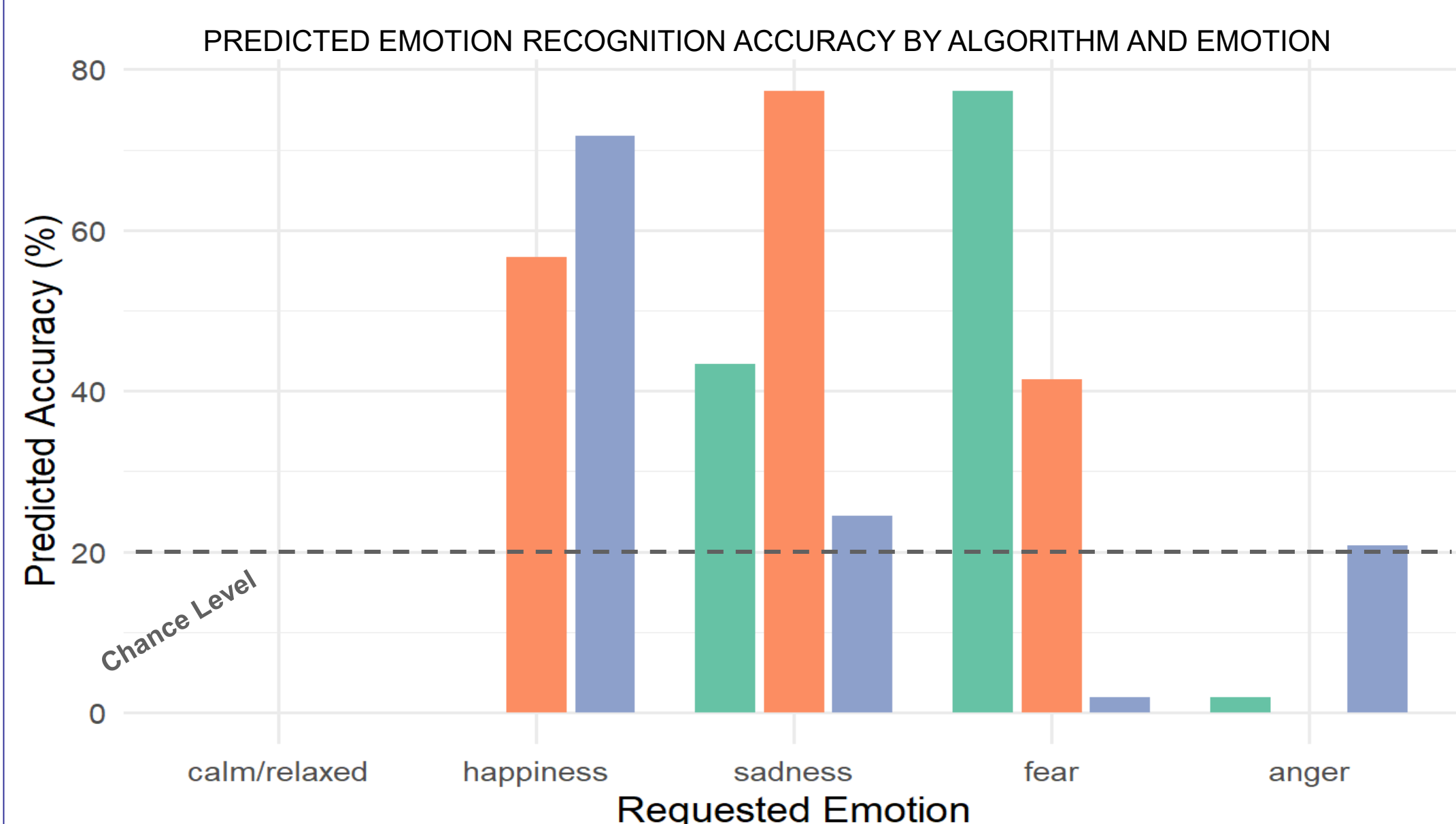
- 53 participants (10 males, mean age: 25.2, SD: 8.45)
- ML algorithms used:
 - Emozionalmente (audio)³
 - Text2Emotion (text)⁴
 - OpenFace (video)⁵

RESULTS: MANIPULATION CHECK



RESULTS: ALGORITHMS' ACCURACY

Participants' most intense perceived emotion (self-assessed) and requested emotion were compared to algorithm-recognized emotion to evaluate ML's accuracy. GLM performed on each ML showed main effect of emotion type on accuracy: audio ($\chi^2(4) = 156.09$, $p < .001$), text ($\chi^2(4) = 142.27$, $p < .001$), video ($\chi^2(4) = 104.42$, $p < .001$).



DISCUSSION

ML accuracy levels were lower than those reported in the literature⁶; this discrepancy may stem from the fact that ML models are often trained in less ecological settings, where participants simulate emotions. Our results highlight the need for more ecological paradigms to train and test ML algorithms for emotion recognition. Each algorithm performed best at classifying different emotions, yet some emotions were frequently misclassified; for instance, anger was mistaken for sadness in 77% of cases. To address this issue, we plan to compare ML's accuracy with that of human raters in the same ecological context and to explore alternative ML techniques for emotion classification.

CITATIONS

- ¹ Scherer, K. R. (2005). What are emotions? And how can they be measured?. *Social science information*, 44(4), 695-729.
- ² Cai Y., Li X., Li J. Emotion Recognition Using Different Sensors, Emotion Models, Methods and Datasets: A Comprehensive Review. *Sensors* (Basel). 2023 Feb 23;23(5):2455. doi: 10.3390/s23052455. PMID: 36904659; PMCID: PMC10007272.
- ³ Catania, F., Wilke, J. W., & Garzotto, F. (2025). Emozionalmente: A Crowdsourced Corpus of Simulated Emotional Speech in Italian. *IEEE Transactions on Audio, Speech and Language Processing*.
- ⁴ Dhar, S., & Bose, I. (2020). Emotions in Twitter communication and stock prices of firms: the impact of Covid-19 pandemic. *Decision*, 47(4), 385-399.
- ⁵ Baltrušaitis, T., Robinson, P., & Morency, L. P. (2016, March). Openface: an open source facial behavior analysis toolkit. In *2016 IEEE winter conference on applications of computer vision (WACV)* (pp. 1-10). IEEE.
- ⁶ Cai Y., Li X., Li J. Emotion Recognition Using Different Sensors, Emotion Models, Methods and Datasets: A Comprehensive Review. *Sensors* (Basel). 2023 Feb 23;23(5):2455. doi: 10.3390/s23052455. PMID: 36904659; PMCID: PMC10007272.