

SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING

Website: <https://cde.nus.edu.sg/ece>

Area: Control, Intelligent Systems & Robotics (CISR)

Host: Assoc Prof Khoo Eng Tat

TOPIC	:	Signals of Aggression: Modelling Multimodal Cues and Perceptual Effects in Virtual Agents
SPEAKER	:	Mr Ong Jing Heng Shaun Graduate Student, ECE Dept, NUS
DATE	:	Tuesday, 11 November 2025
TIME	:	10:00AM-11:00AM
VENUE	:	EDIC Design Studio 5, Block E2A #04-05 5 Engineering

ABSTRACT

Aggression in service professions is a growing concern across domains, from aviation to healthcare, where front-line staff frequently face verbal and non-verbal hostility from customers or clients. Such incidents can harm employee well-being and undermine service quality. Addressing this problem requires training approaches that both prepare employees for the emotional impact of aggression and build effective de-escalation skills. Traditional approaches such as classroom-based instruction or peer role-play can be valuable, but they often lack the realism, repeatability, and range of scenarios needed to develop adaptive strategies.

Simulation-based training offers a way to create safe, controllable, and varied exposure to aggressive encounters. One promising approach uses Intelligent Virtual Agents (IVAs) within immersive virtual reality, leveraging advances in animation and speech synthesis to portray realistic emotional cues and behavioural dynamics. As IVAs are increasingly used in VR-based training, understanding how users perceive aggression in this context is essential for designing agents that feel convincing and elicit appropriate responses. For such training to be effective, IVAs must convincingly portray aggression—eliciting emotional reactions such as heightened alertness, stress, or recognition of threat.

While multimodal emotion perception has been widely studied in HCI and affective computing through wearable devices, expressive interfaces, and even inanimate objects, comparatively few studies examine how humans perceive emotion in IVAs across multiple modalities—a gap especially relevant for training and simulation contexts. Prior work shows that language, voice, body movement, and facial expressions shape how virtual agents are perceived, but little empirical evidence addresses how aggressive cues, and their varying intensities across modalities, influence perceptions of aggression.

Existing IVA-based training systems often prioritize scenario realism, yet their aggression modelling remains unclear, with little attention to which modalities matter most, how cues should be scaled, or how they interact. This is important because prior work has shown that verbal and non-verbal cues can reinforce or weaken perceived affect depending on their intensity and alignment. Without systematically examining how people perceive and integrate these cues, training systems risk leaving aggression signals ambiguous, making it harder for trainees to recognize or respond appropriately. Yet, to our knowledge, no study has comprehensively investigated the independent and combined effects of the three modalities—Language, Voice, and Body (combining body movement and facial expressions)—on perceived aggression in IVAs.

To address this gap, we examine how humans perceive aggression in an IVA for aviation customer service, whose behaviour is driven by a multimodal aggression model. Grounded in psychological characterizations of aggressive attributes, the model varies verbally aggressive message types (Language), modulates vocal roughness and loudness (Voice), and incrementally adjusts anger-related facial expressions and body movements via Laban Movement Analysis (Body). These cues are synchronized in the IVA to generate realistic displays of aggression.

We evaluated the model in two studies with 38 flight attendants. Experiment 1 tested unimodal cues, showing all modalities except language conveyed aggression gradients. Experiment 2 extended this by combining

modalities, demonstrating that coordinated multimodal integration stabilised weaker language cues and produced perceptually robust aggression levels (low, mid, and high) with body and facial cues carrying most weight. Our work contributes the first validated multimodal, multi-level aggression model for IVAs, offering design principles for broader socially expressive agents.

BIOGRAPHY

Shaun Ong received his bachelor's degree in Computer Science from Nanyang Technological University, Singapore, in 2023. He is currently working in SIA-NUS Digital Aviation Corp Lab as a research engineer to create virtual simulations for cabin crew on-flight training. His research interests include deep learning, HCI, multimodal LLMs, emotion simulation and recognition.

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