Scents and Sensibility: Investigating the Influence of Visual Cues on Olfactory Perception of Humans and Building an AI-based Electronic Nose to Compare the Two

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This study investigated the hypothesis that visual stimuli can significantly influence olfactory perception, potentially altering or enhancing the actual scent experience. By building an AI based electronic nose and comparing with human perception, a more objective and accurate assessment of scents, especially in environments challenging for humans. Methods and Procedures: - Electronic Nose: Researched and built an e-nose using Raspberry Pi, ESP Microcontroller and an environmental sensor, exposed scents and built classification-based AI models, and tested its ability to recognize and classify scents. - Participants: Adult volunteers were divided into two groups for a controlled study to measure their scent perception. - Scents Selection: Four identifiable scents: popcorn, amber moss, tide laundry detergent and ocean breeze were utilized. - Visual Stimuli: Two rooms were set up with images and objects, one congruent (matching with the scent) and the other incongruent (not matching) with the scent. - Experimental Design: Participants recorded a questionnaire assessing scent perception in each room: - Room 1: Exposed to scents paired with congruent images. - Room 2: Exposed to scents paired with incongruent images. - Data Collection: Data analyzed comparing the responses from humans and the electronic nose's scent identifications compared to the participants' responses to assess accuracy and reliability. Conclusion: - Proved that Visual stimuli does affect olfaction in humans. Participants were 2.6 times more likely to get the scent wrong with visual incongruence. - Humans were incorrect more than 50% of the time in identifying scents in either scenario. - The AI-powered electronic nose able to accurately identify the scents 98.47% of the time.

Awards Won:
Fondazione Bruno Kessler: Award to participate in summer school "Web Valley"
Air Force Research Laboratory on behalf of the United States Air Force: Glass trophy and USAF medal for each recipient
Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Regeneron ISEF Category,