Neural Palate Kueh

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Abstract

Neural Palate Kueh is a generative human-AI reinterpretation of Singapore's heritage desserts (aka 'kuehs') as 3D-printed edible architectural food and 3D-pointcloud dining urban plans.

1   Description of the artwork

If there is one thing that you would not need nor want Artificial Intelligence (AI) to do for you, it is probably eating. Yes, more than thinking, designing, building, and even sleeping on your behalf. All work in the future including architecture work could potentially reside at the dining table. Dining as co-designing and eating as consecrating architecture. A 'tasty' architectural 'food-for-thought' and 'food-to-eat'. The project 'Neural Palate Kueh' currently on display at the 19th Venice Architecture Biennale 2025 as part of the Singapore Pavilion attempts to illustrate such a possible architecture design approach in the future. It uses the traditional Singaporean kuehs (bite-sized snack or dessert foods) to speculate on future scenarios of building-making and city-making with the analogical generativity limits (and potential creativity) of today's AI – one that could be made specific to a given culture and built environment like Singapore.

Inspired by Nigel Coates' 'Mixtacity' (2007) in his use of food (and other objects trouvés) to stimulate urban imagination, Sarah Wigglesworth's 'The Dining Table' (1998) in her use of the spatio-temporal traces left by guests at the dining table to generate architecture plans, and Aldo Rossi's 'An Analogical Architecture' (1976) in his use of analogies as design method to awaken collective memory in a Jungian sense, Neural Palate Kueh extends these with AI's current analogical reasoning capability in 3D. It fine-tunes several AI models to generate context-specific 3D urban forms from real-time dining footages and to synthesize 3D building forms with edible food. Using Multimodal Large Language Models (MLLMs), the process begins with AI's deconstruction of each kueh along three axes: conceptual underpinnings (rituals of eating and cultural symbolism), design operatives (geometric form and culinary construction), and materiality (ingredients and textures). These insights become the learnt architectural design principles of the AI models to imagine novel architectural interiors/exteriors with which perceptual associations with Singapore forms, whether buildings or food, are produced. The taxonomies of food-dining and architecture-planning now become blurred and interchangeable. A series of cross-modal perceptual artefacts are presented, ranging from those between 'Huat Kueh' and 'ArtScience Museum', and between 'Ang Ku Kueh' and 'Esplanade Theatres on the Bay', to those between 'Hotpot Dining' and 'Raffles Hotel', and between 'Kueh Lapis Dining' and 'Golden Mile Complex'.

The project features the outputs as 3D-printed architectural pieces in several food scales and 3D point clouds video animations in several urban scales. Neural Palate Kueh proposes an experimental AI methodology driven by architectural narrative and gastrophysics – perhaps like 'a house is a machine for eating in'. In fact, as part of the project, EEG (electroencephalogram) and eye-tracking measurements have been recoded to quantitatively understand the perceptual correlation between the

kuehs and their architectural proxies; thus not simply re-creating forms, but proposing a new mode of architectural design that leverages the brain's inherent cross-modal and multi-sensorial associations.

2 Short biography of artist

Immanuel Koh is the director of Artificial-Architecture and an Assistant Professor in Design & Artificial Intelligence (DAI) and Architecture & Sustainable Design (ASD) at the Singapore University of Technology & Design (SUTD). Trained at the Architectural Association (AA) and Zaha Hadid Architects (ZHA) in London, he holds a Ph.D. from the École polytechnique fédérale de Lausanne (EPFL) in Switzerland. Immanuel is the Principal Investigator for several research projects with the support of AI Singapore, DesignSingapore, ZHA, MVRDV, and many others. He was the conference chair of CAADRIA 2024 and represented Singapore at the Venice Architecture Biennale 2025. Recent creative AI works include Neural Monobloc Black (NeurIPS 2024), Neural Artefact Black (NeurIPS 2024, CVPR 2024), AI Sampling Singapore (WAFX 2024), Neural Memory Palace (AAAI 2023), and Discrete 3D-GAN-Chairs (NeurIPS 2020).

Technical Appendices and Supplementary Material

Figure 1: Neural Palate Kueh in 3D-printed food scale.

Figure 2: Another view of Neural Palate Kueh in 3D-printed food scale.

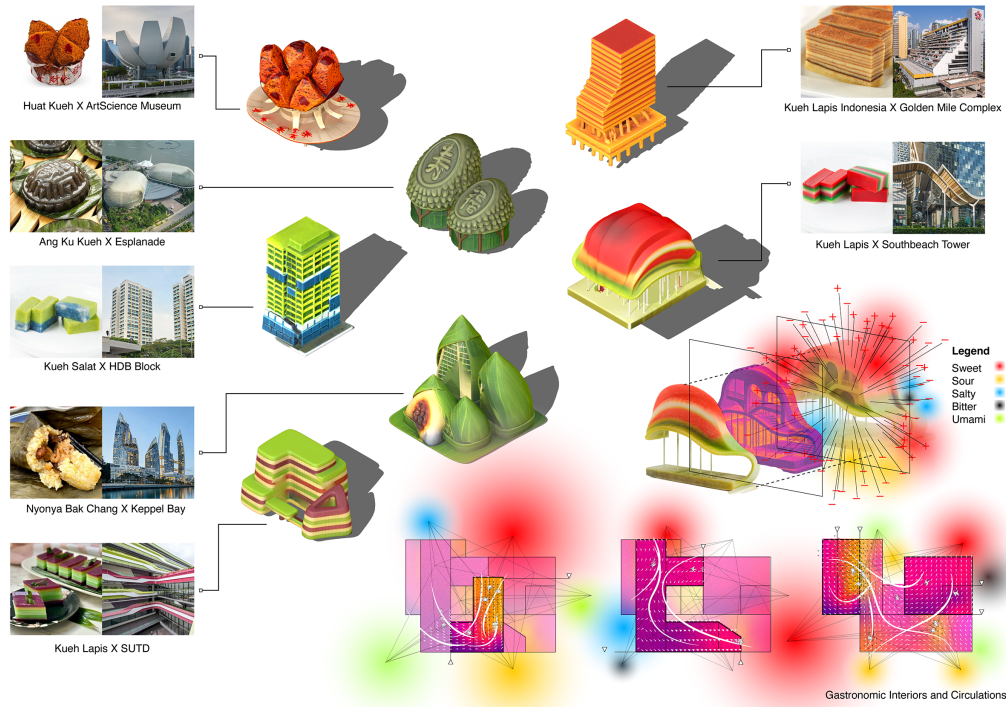Figure 3: Neural Palate Kueh in 3D-printed miniature candy scale.

Figure 4: AI-analogical mapping between food and architecture, including plausible cross-modal associations between gastronomic and spatial interiors.
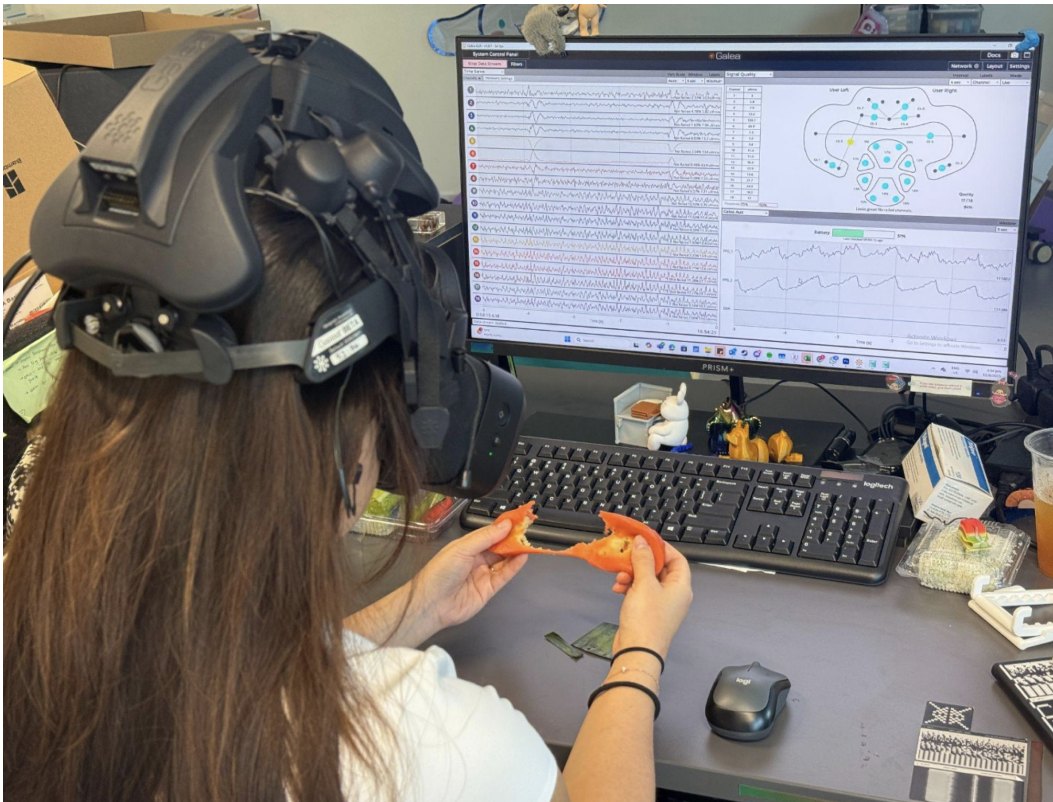

Figure 5: EEG (electroencephalogram) and eye-tracking measurements when interacting with Neural Palate Kueh.
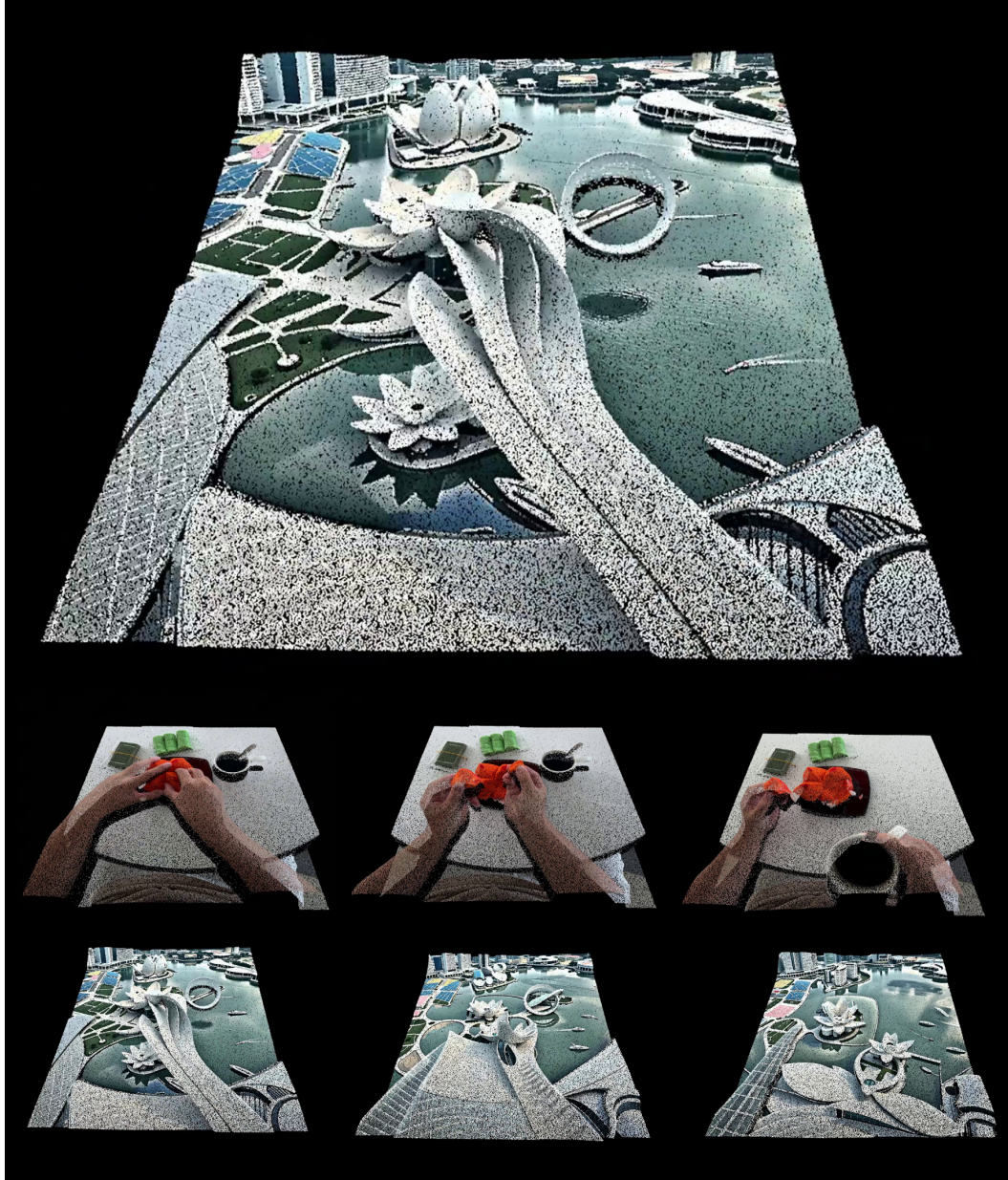
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Figure 6: 3D-pointcloud video animation demonstrating AI-analogy between Singapore social dining (Huat Kueh) at the hawker centre and participatory city planning (ArtScience Museum).
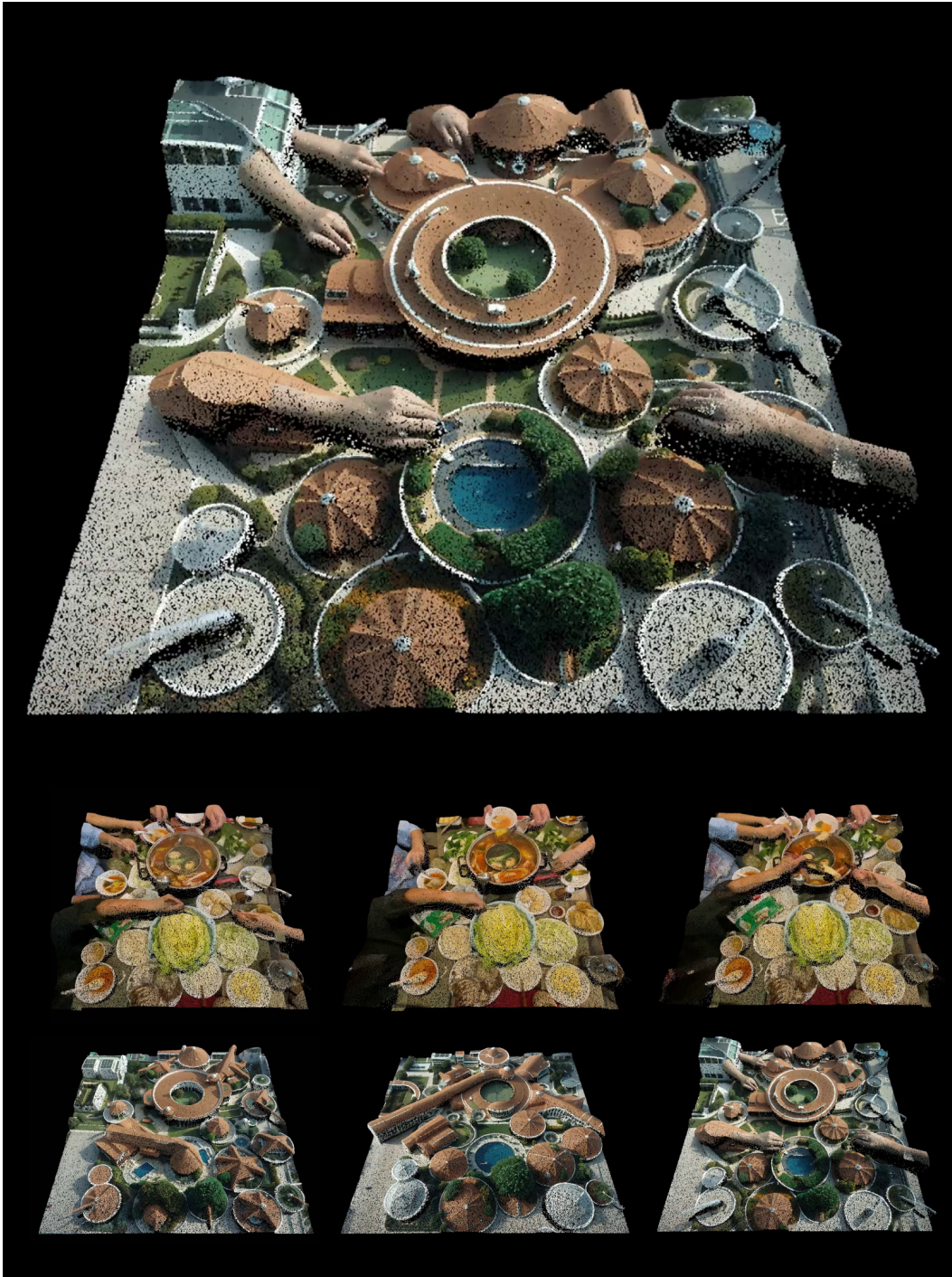
Figure 7: 3D-pointcloud video animation demonstrating AI-analogy between Singapore social dining (Asian Hotpot) at the restaurant and participatory city planning (Raffles Hotel).