

Third N3BG Summer School 2025, Sofia

Conscious decision making: A case on neuromarketing



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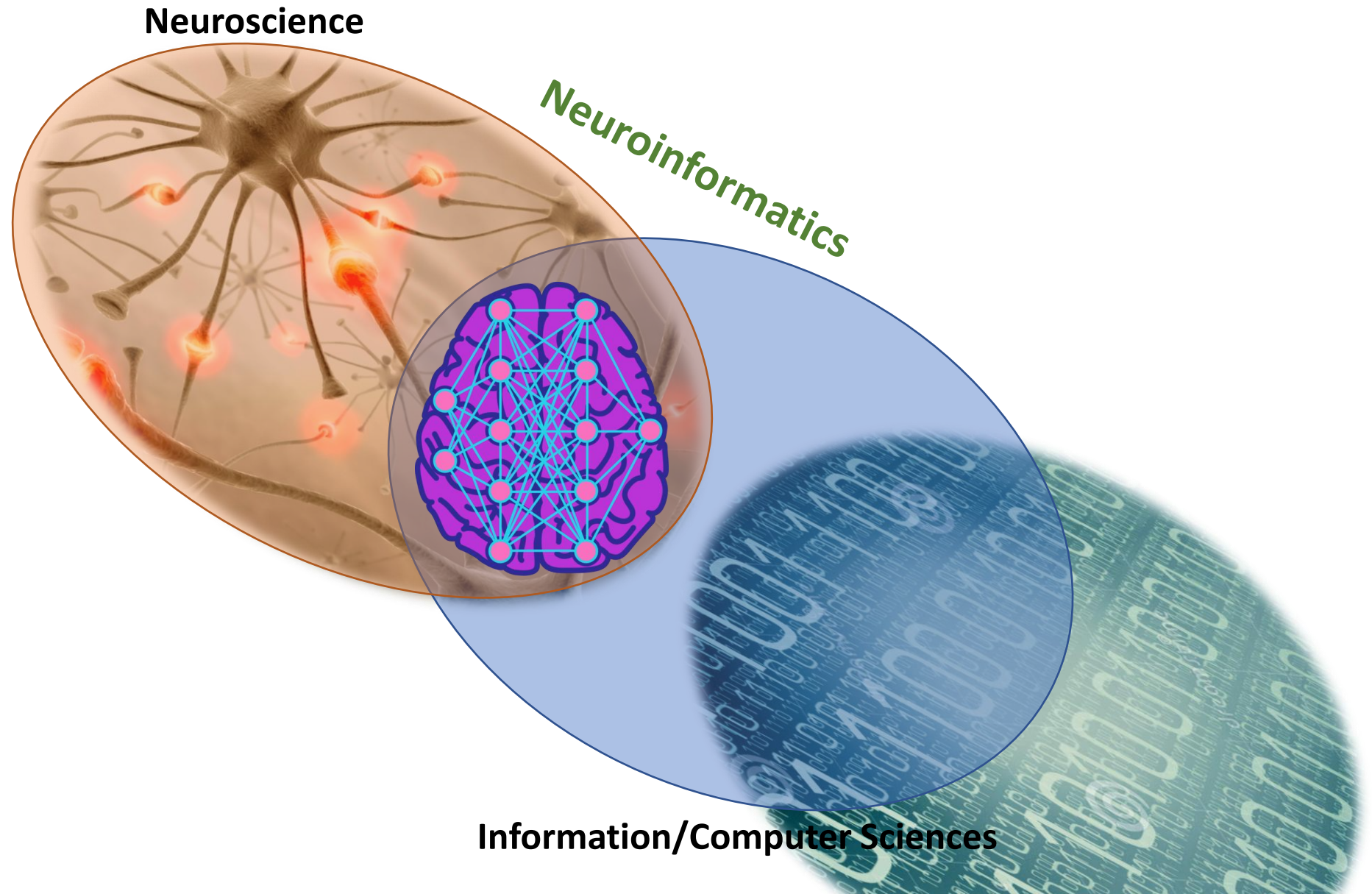
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**AUT KNOWLEDGE ENGINEERING &
DISCOVERY RESEARCH INNOVATION**

Neuroinformatics

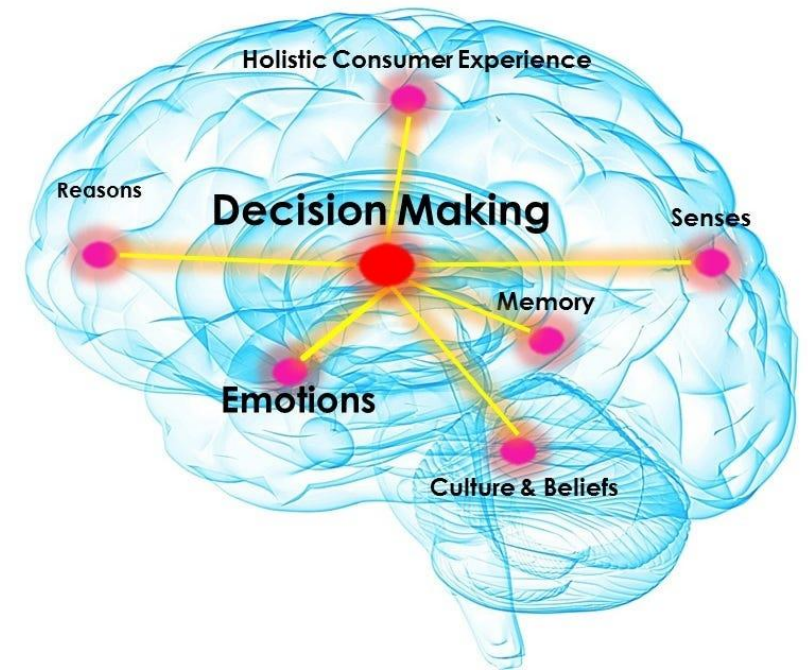


Agenda

- Conscious vs unconscious decision-making
- The brain and how we decide
- Neuromarketing application
- Future directions: AI and neuromarketing

What is Decision-Making?

- The process of making choices by identifying options and selecting one.
- Involves both conscious and unconscious processes.
- Influenced by emotions, habits, memories, and logical reasoning.

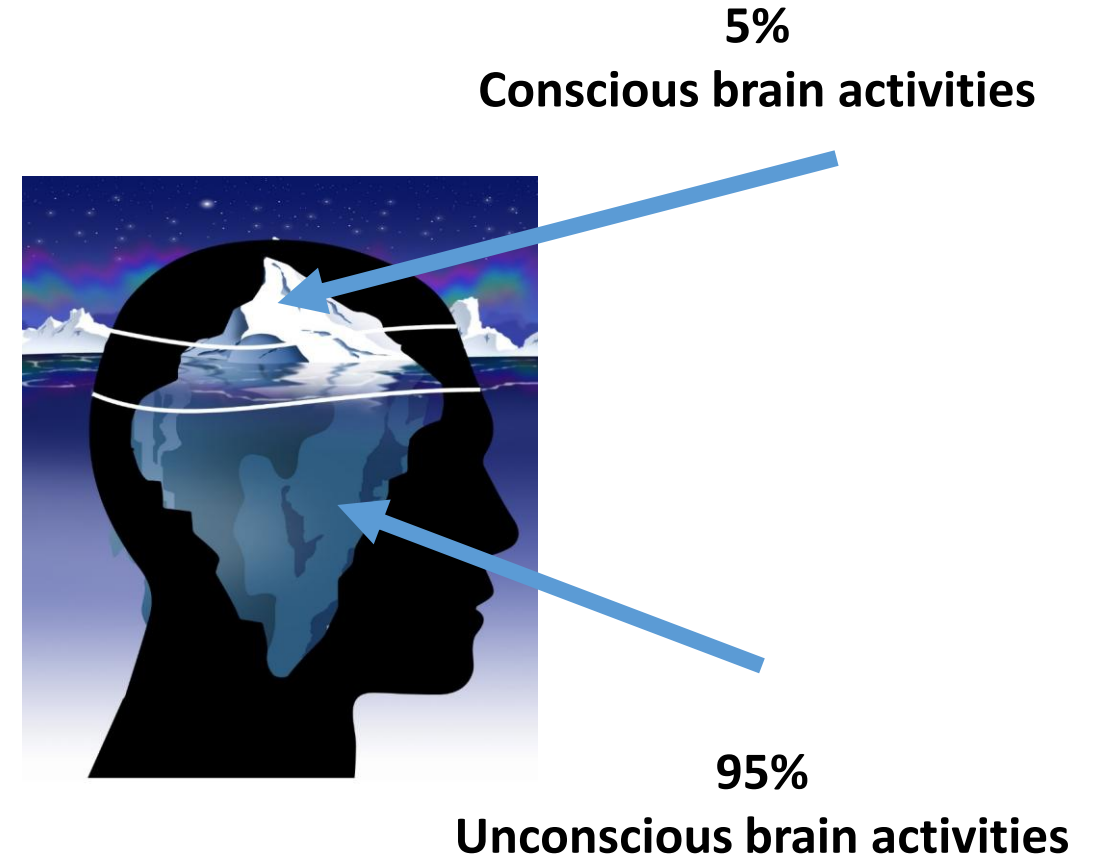


Driving Forces behind human decision making

The power of subconscious mind

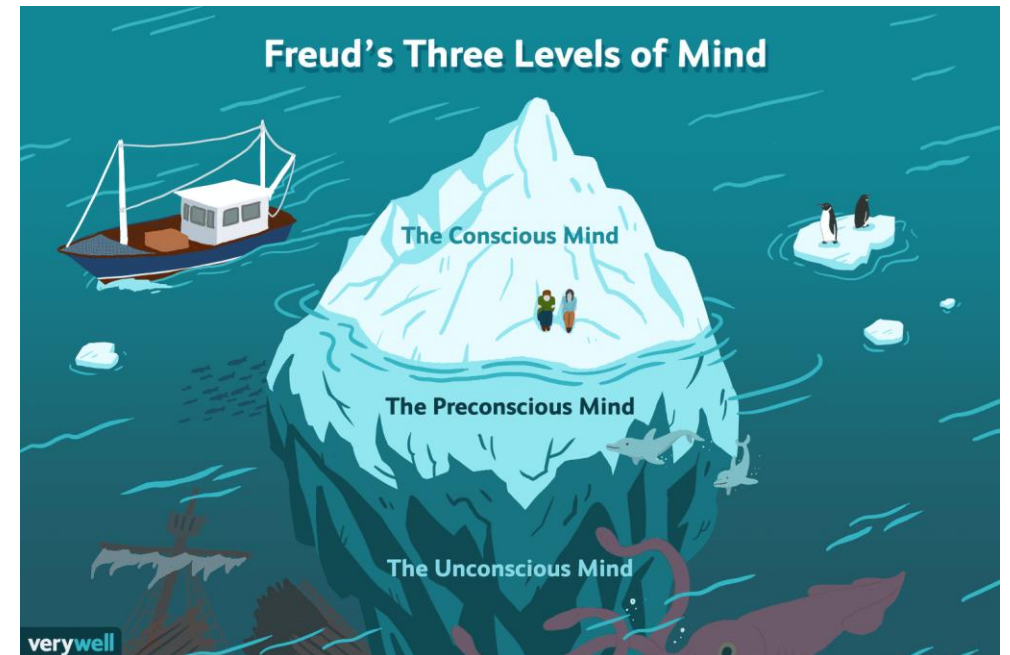
Freud's theory of mind:

Freud (1900, 1905) developed a topographical model of the mind, whereby he described the features of the mind's structure and function. Freud used the analogy of an iceberg to describe the three levels of the mind.



Conscious vs Unconscious Decisions

- Conscious: Slow, deliberate, logical; Requires attention and effort
- Unconscious: Fast, automatic, emotional; Based on intuition and habits
- 95% of daily decisions are unconscious



Driving Forces behind human decision

The Mirror Neuron System

Mirror neurons are brain cells that fire both when we perform an action and when we observe someone else performing the same action. They help us understand, empathize, and imitate — forming the basis of social learning.

How Do They Work in Marketing?

Emotional Contagion

- We feel what others feel. Seeing someone enjoy a product makes us want it too.

Imitation

- Consumers mimic behaviors seen in ads (e.g., smiling, using a product, working out).

Empathy & Identification

- Mirror neurons help us relate to people in commercials — creating connection and trust.

Example : A commercial showing a happy person sipping , coffee triggers the viewer's mirror neuron system making them feel warm, relaxed, and craving that same experience.

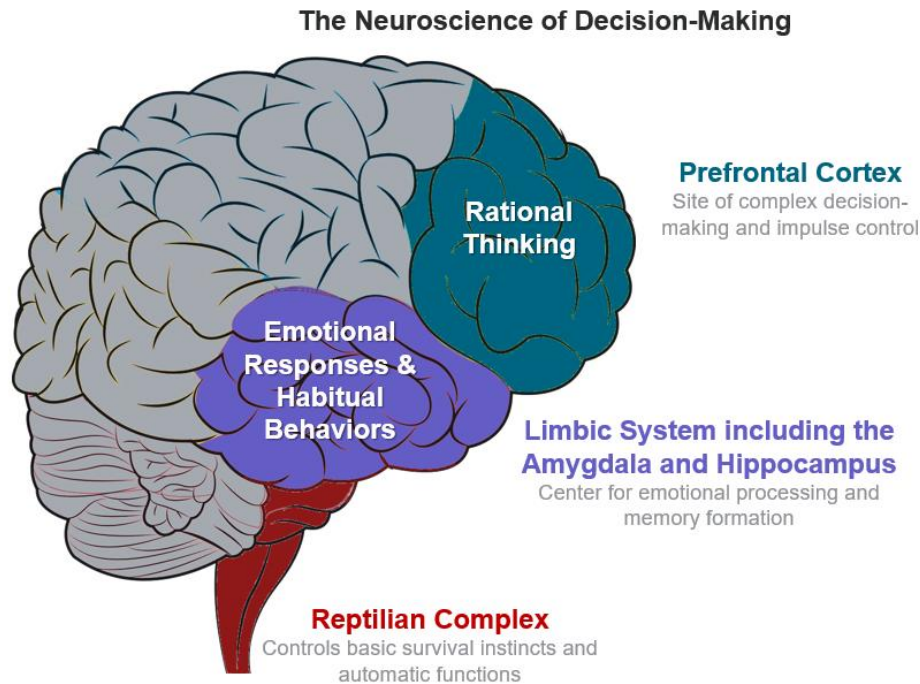


Consumer psychologist use the MNS by creating advertisements and content that evoke emotional responses and engage consumers on a **deeper level**.

Decisions Are Emotional



Brain areas involved in decision-making



- Prefrontal Cortex: Conscious thinking, planning
- Amygdala: Emotional responses
- Striatum: Habit formation and routine behavior

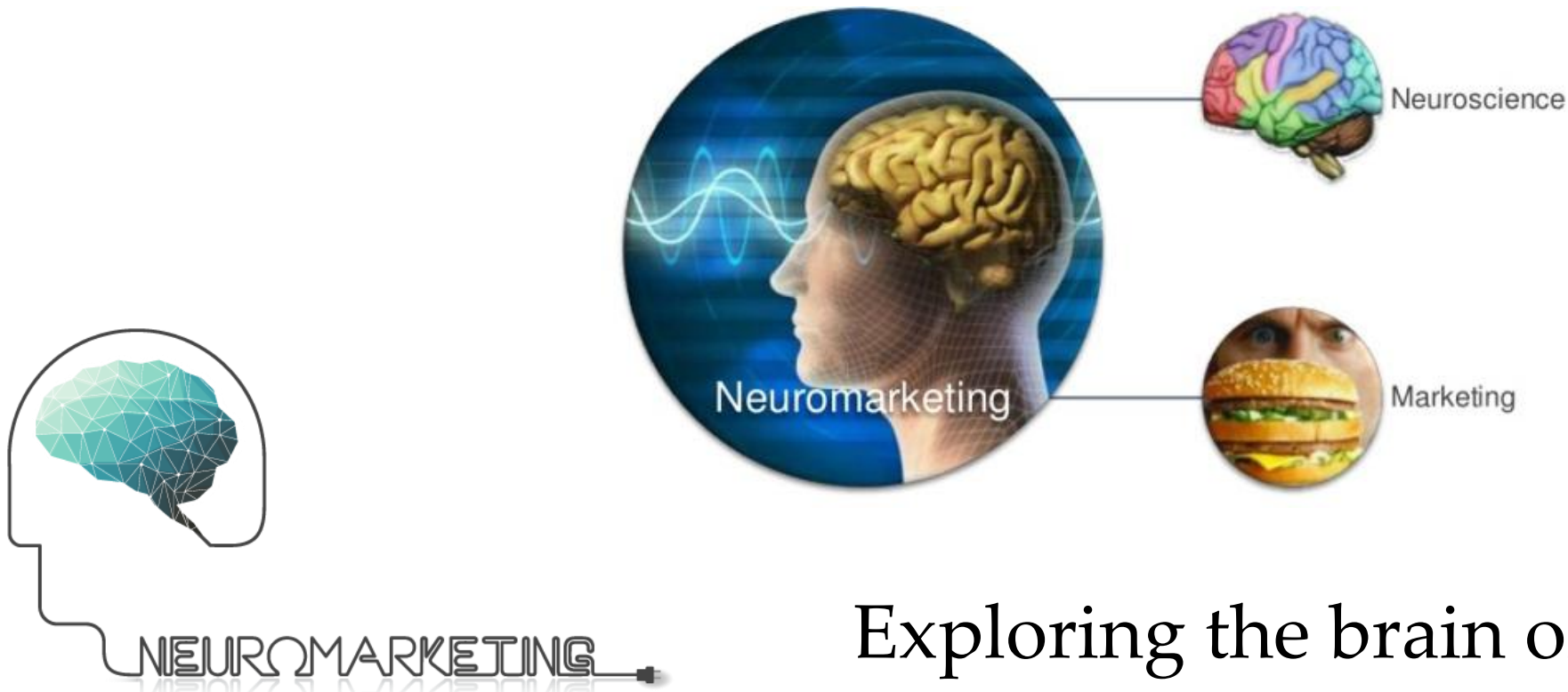
Why does it matter?

- Consumers are not always aware of why they buy.
- Traditional marketing relies on conscious feedback.
- Neuromarketing taps into the real drivers of behavior.

Understanding of Human Decision (Neuromarketing)



- Neuromarketing is a new field of marketing that studies consumers'
 - Sensorimotor;
 - Cognitive;
 - Affective response to marketing stimuli.



Exploring the brain of the consumers

Neuromarketing application



Prof Nik Kasabov,
Auckland University of Technology



Assoc prof Alexander Sumich,
Nottingham Trent University



Dr Maryam Doborjeh,
Auckland University of Technology



Dr Zohreh Doborjeh,
Auckland University of Technology

Objective:

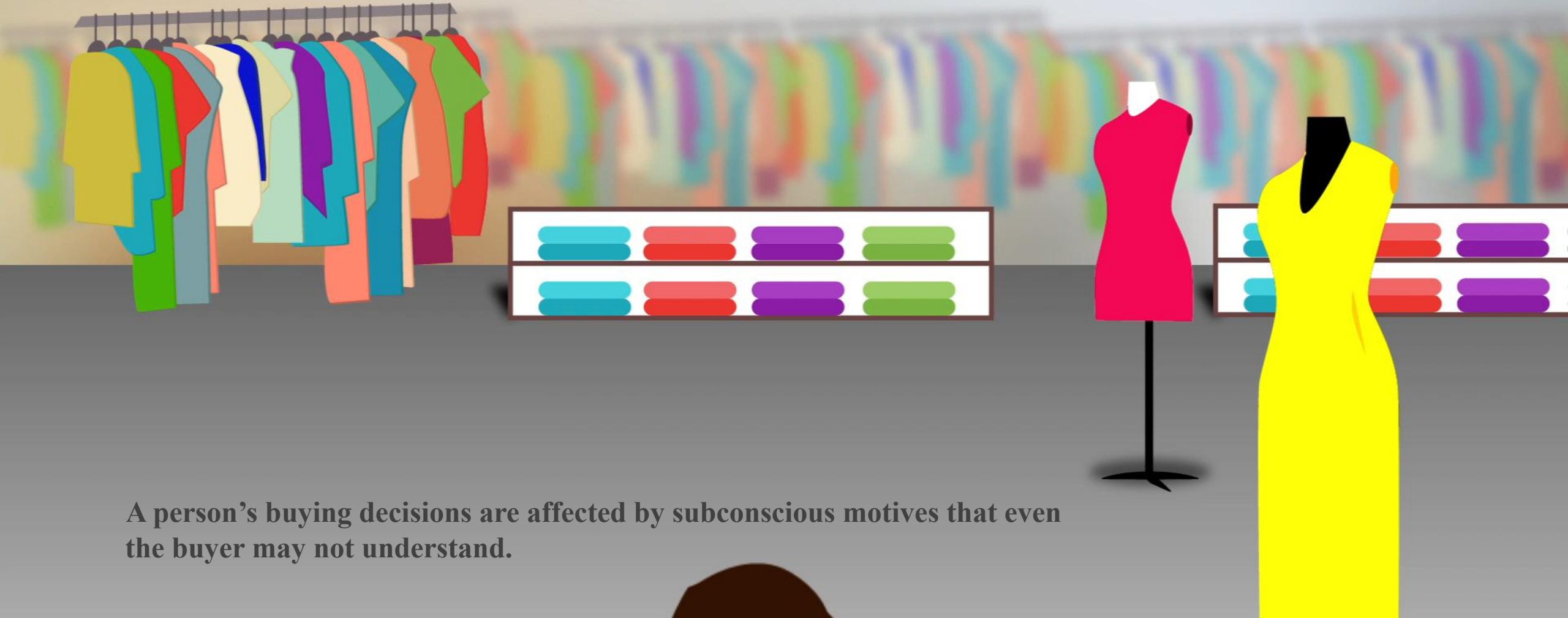
How do marketing materials impress consumers even when they are not consciously attending to them?

Spiking Neural Network used for Event-related potential (ERP) data analysis



5%
Conscious brain activities

95%
Unconscious brain activities



A person's buying decisions are affected by subconscious motives that even the buyer may not understand.

Data collection

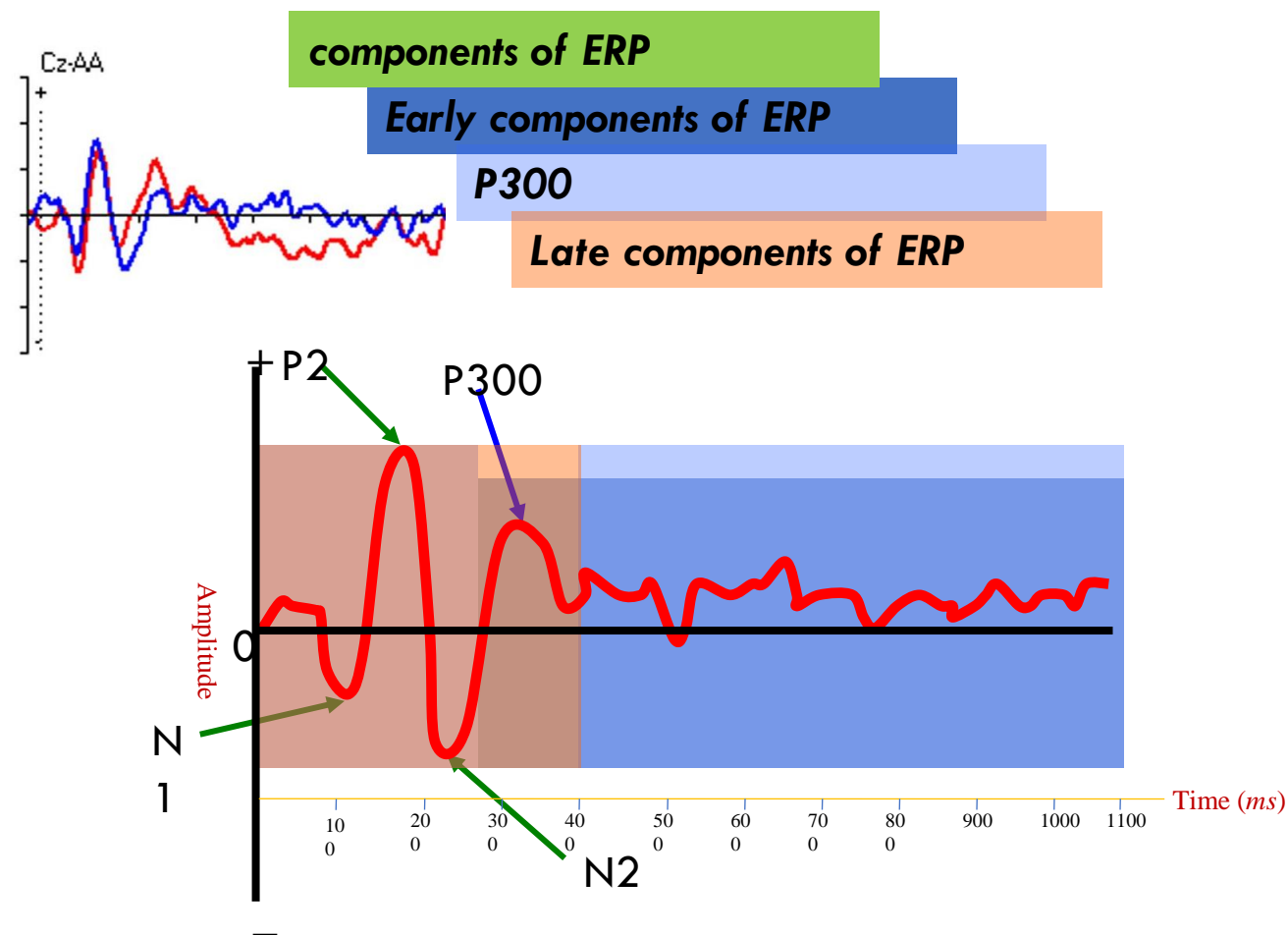


The background of the slide features a stylized, glowing blue brain. Numerous bright blue lines, representing neural connections or data pathways, radiate from the brain's surface across a dark blue background. In the center of the brain, there is a large, empty white rectangular box with a thin black border.

Cognitive Task

Familiar vs unfamiliar logos

We collected event-related potentials ERP



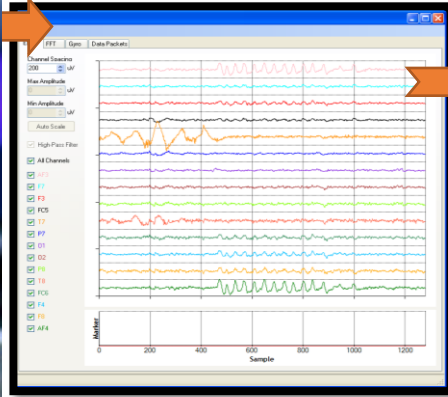
Method: Modelling EEG using Brain-inspired SNN Architecture

Unsupervised learning

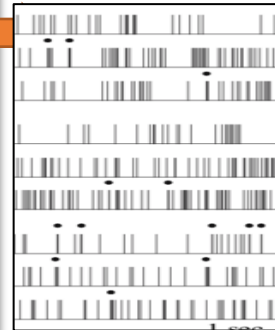
Supervised learning



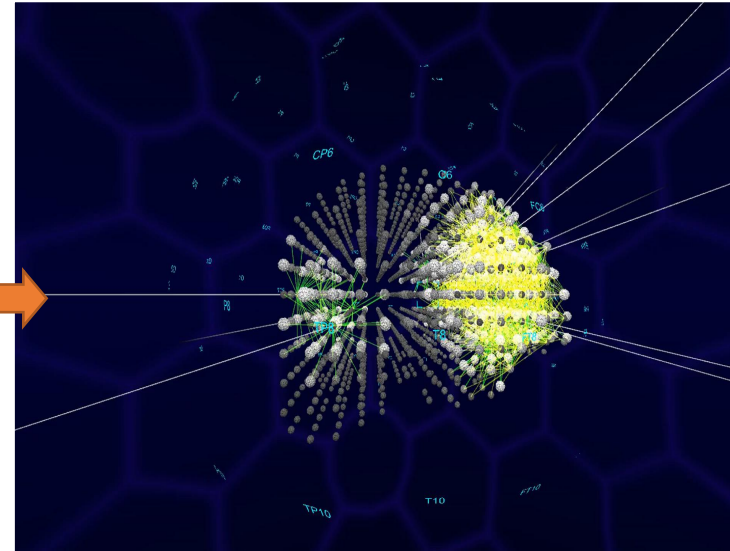
EEG recording



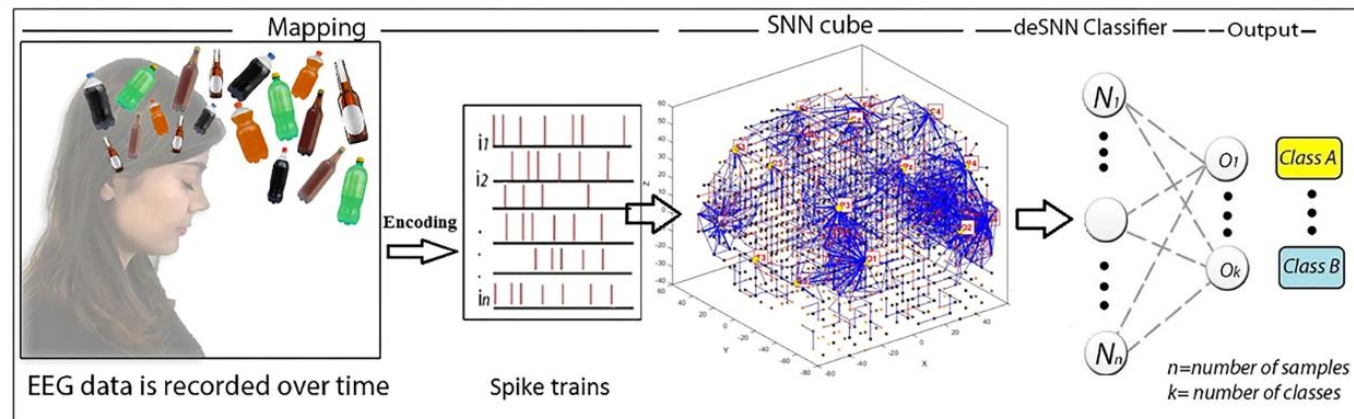
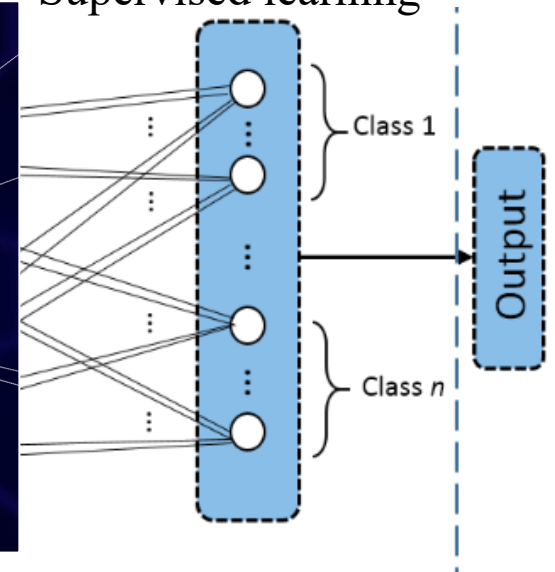
Brain cortical signals



Spike trains



3D SNN model



Ultra-high risk for psychosis



Nature Schizophrenia
Article | [Open Access](#) | Published: 15 February 2023

Investigation of social and cognitive predictors in non-transition ultra-high-risk' individuals for psychosis using spiking neural networks

[Zohreh Doborjeh](#) , [Maryam Doborjeh](#) , [Alexander Sumich](#), [Balkaran Singh](#), [Alexander Merkin](#), [Sugam Budhraj](#), [Wilson Goh](#), [Edmund M-K Lai](#), [Margaret Williams](#), [Samuel Tan](#), [Jimmy Lee](#) & [Nikola Kasabov](#)

Mental/neurological Health



Healthy vs Alzheimer



Visualised by Stefan Marks, AUT

Neural Networks
Volume 119, November 2019, Pages 162-177

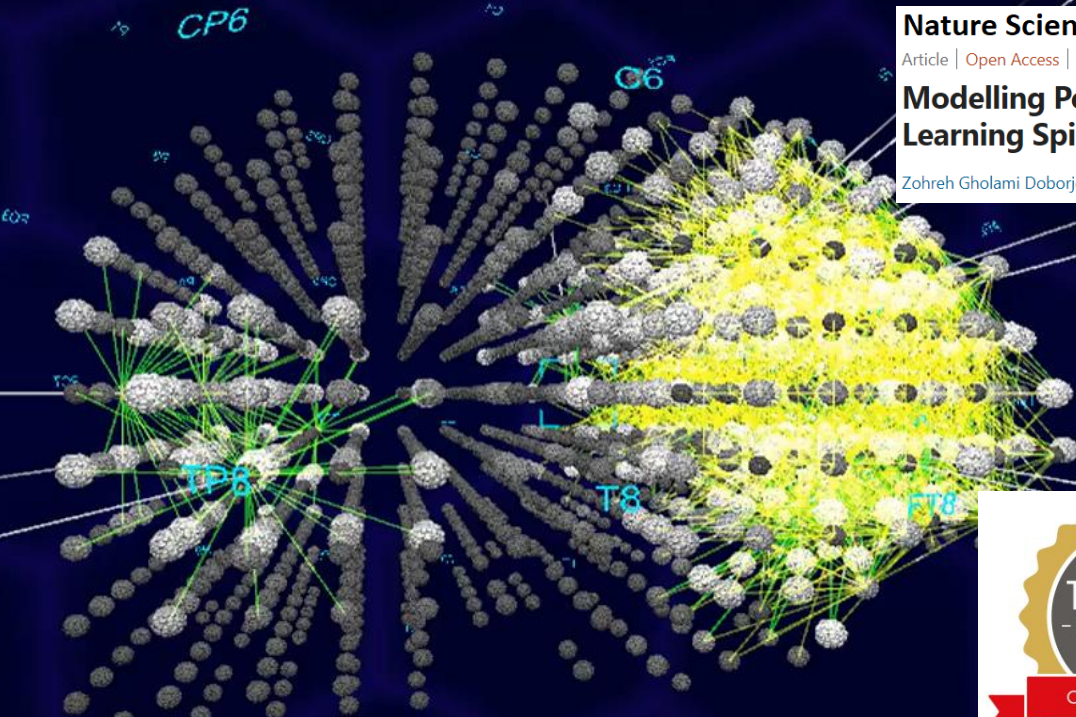
2019 Special Issue

Personalised modelling with spiking neural networks integrating temporal and static information

[Maryam Doborjeh](#) , [Nikola Kasabov](#) , [Zohreh Doborjeh](#) , [Reza Enayattollahi](#) , [Enmei Tu](#) , [Amir H. Gandomi](#)



Response to Tinnitus therapies



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2018

OFFICIAL AUTHOR

SCIENTIFIC REPORTS



Nature Scientific
Article | [Open Access](#) | Published: 11 June 2018

Modelling Peri-Perceptual Brain Processes in a Deep Learning Spiking Neural Network Architecture

[Zohreh Gholami Doborjeh](#) , [Nikola Kasabov](#), [Maryam Gholami Doborjeh](#) & [Alexander Sumich](#)

Mindfulness on depression

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SCIENTIFIC REPORTS | nature research

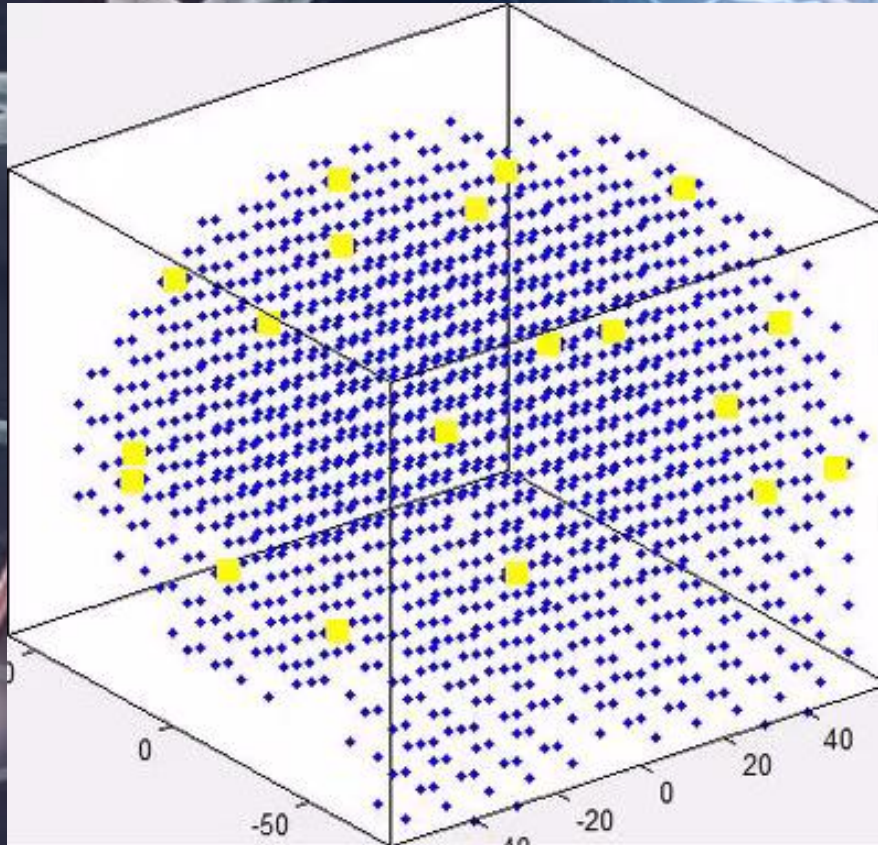


Nature Scientific
Article | [Open Access](#) | Published: 23 April 2019

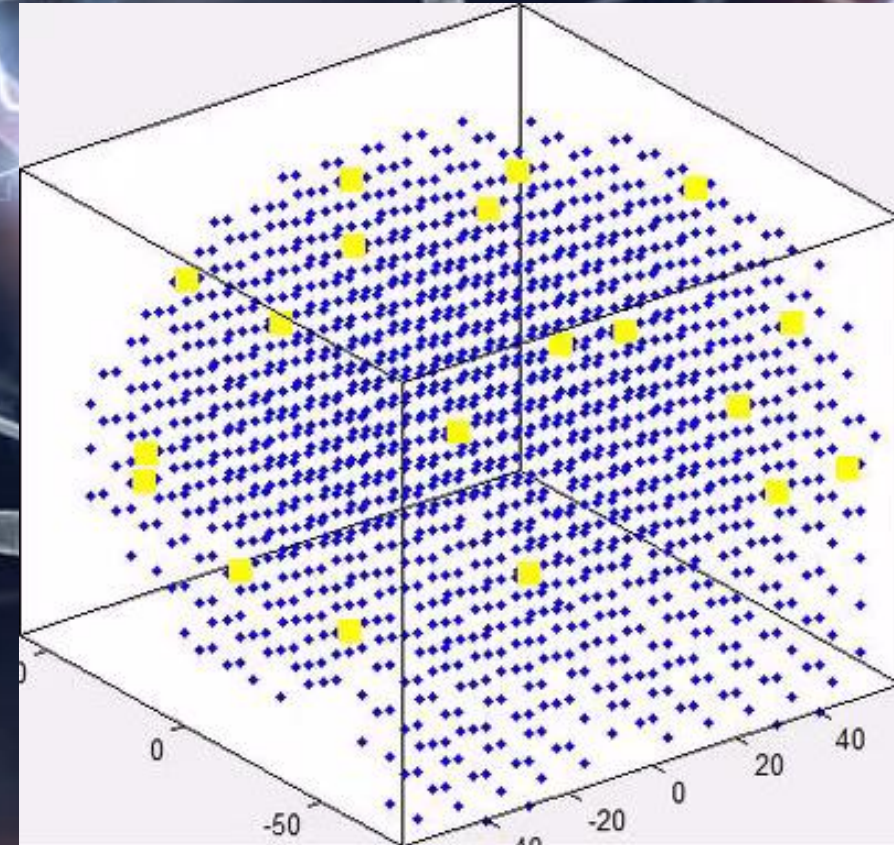
Spiking Neural Network Modelling Approach Reveals How Mindfulness Training Rewires the Brain

[Zohreh Doborjeh](#) , [Maryam Doborjeh](#), [Tamasin Taylor](#), [Nikola Kasabov](#), [Grace Y. Wang](#), [Richard Siegart](#) & [Alex Sumich](#)

Study of Pre-perceptual patterns of brain activities in response to familiarity



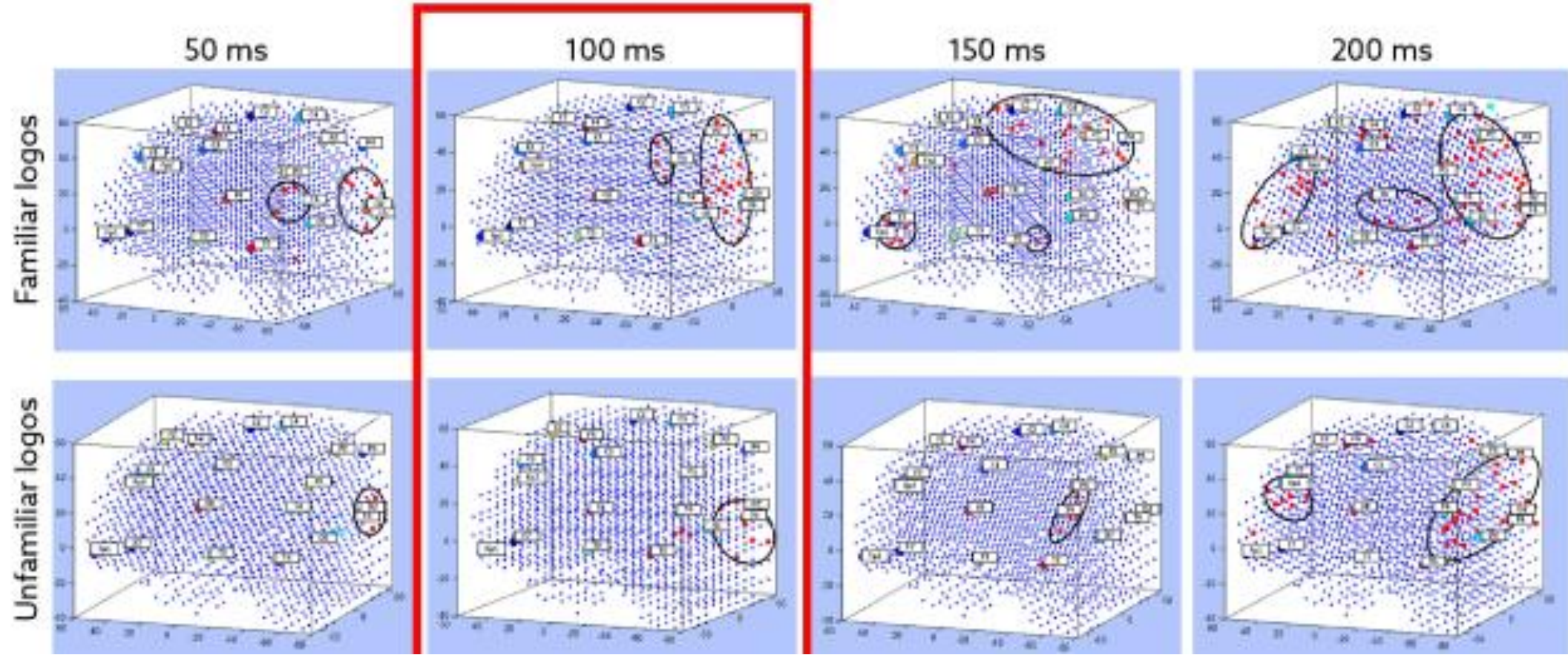
Spiking activity of familiar marketing stimuli



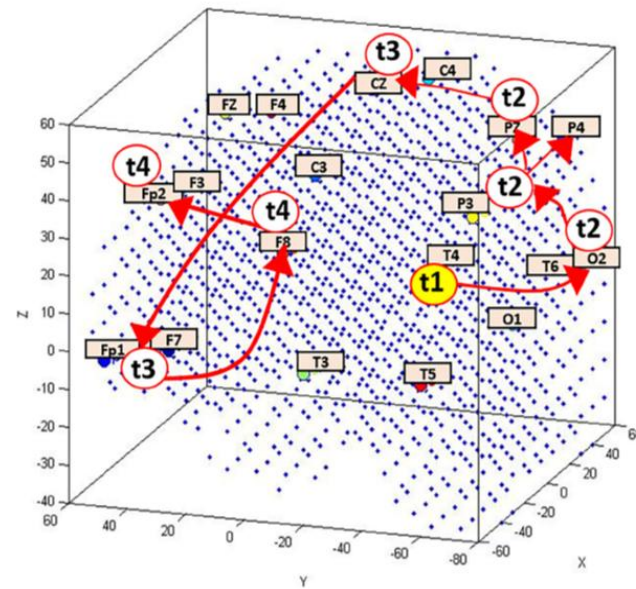
Spiking activity of unfamiliar marketing stimuli

Results:

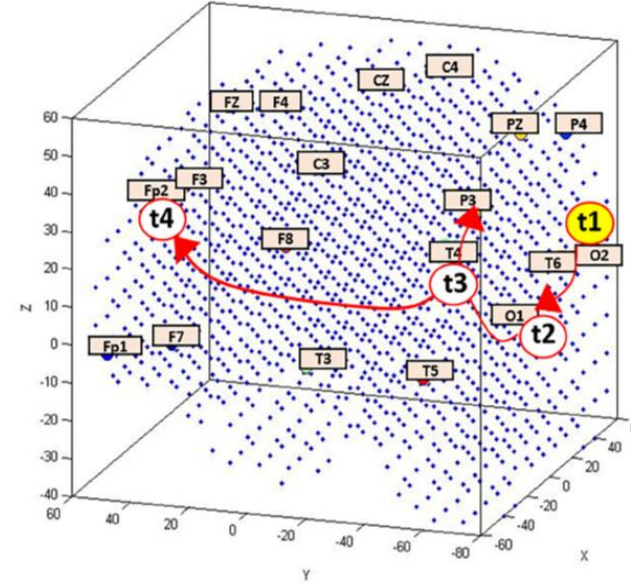
How early information is transferred into different areas of the brain at different times (every 50 milliseconds) towards familiar and unfamiliar logos.



Functional pathways of differently activated areas over the 200 ms time (post-stimulation) based on the number of spiking neurons.



Familiar logos



Unfamiliar logos

t1 = 50 ms t2 = 100 ms t3 = 150 ms t4 = 200 ms

References:

- Doborjeh, Z., Kasabov, N., Gholami Doborjeh, M. *et al.* Modelling Peri-Perceptual Brain Processes in a Deep Learning Spiking Neural Network Architecture. *Nature Sci Rep* **8**, 8912 (2018).
<https://doi.org/10.1038/s41598-018-27169-8>.
- <https://www.youtube.com/watch?v=tWsmhCP7hs>
- <https://www.researchsquare.com/article/rs-5744/v1>

nature > scientific reports > collection

SCIENTIFIC REPORTS a natureresearch journal

COLLECTION | 04 MARCH 2020

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NeuCube

NeuCube is the world-first development environment and a computational architecture for the creation of Brain-Like Artificial Intelligence (BLAI), that includes applications across domain areas. It is based on the latest neural network models, called spiking neural networks (SNN).

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[Publications](#)

Thank you

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“We are shaped by our thoughts; we become what we think. When the mind is pure, joy follows like a shadow that never leaves”.

Buddha