Third N3BG Summer School 2025, Sofia

Conscious decision making: A case on neuromarketing

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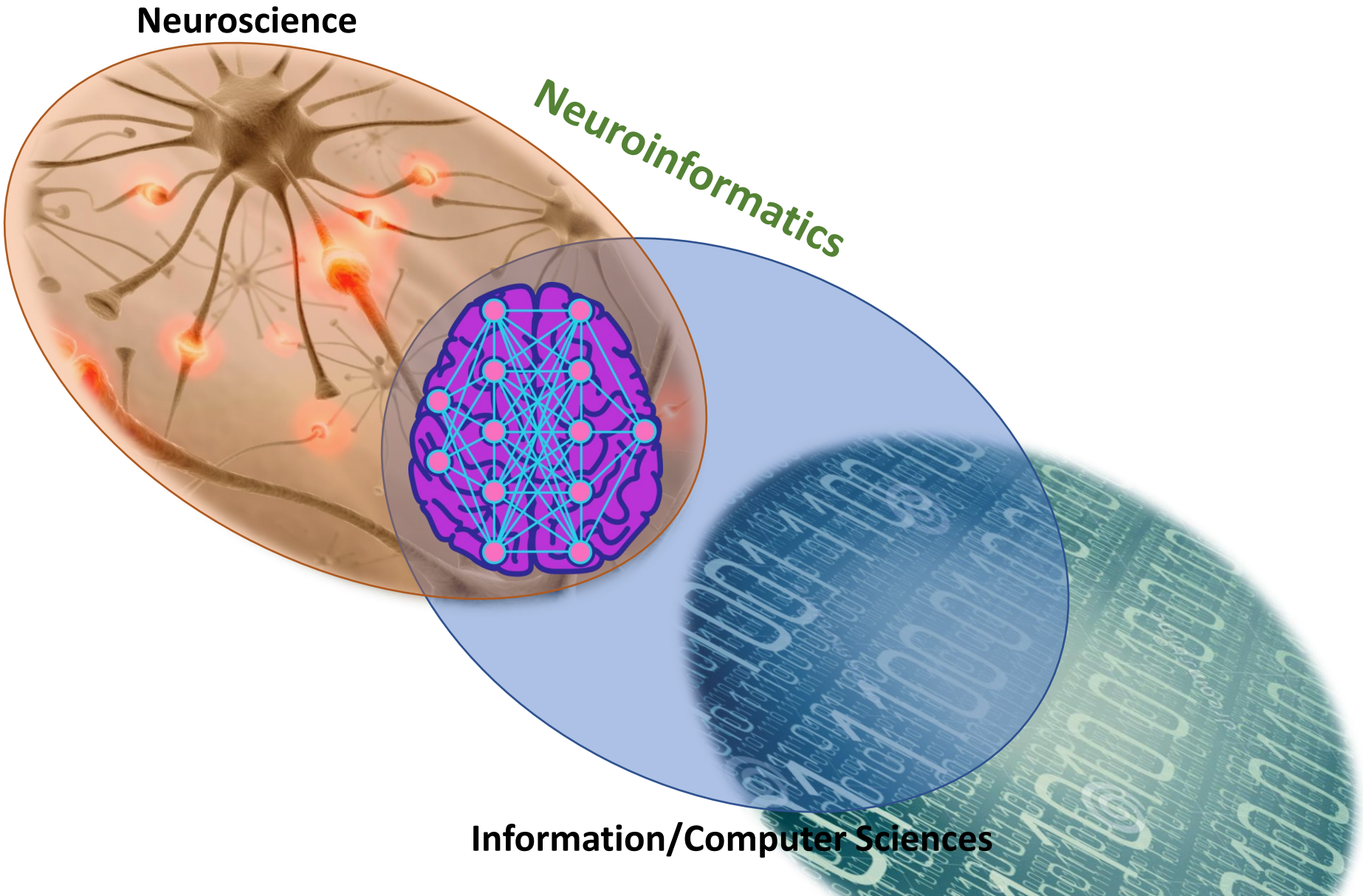
AUT KNOWLEDGE ENGINEERING & DISCOVERY RESEARCH INNOVATION

Neuroinformatics

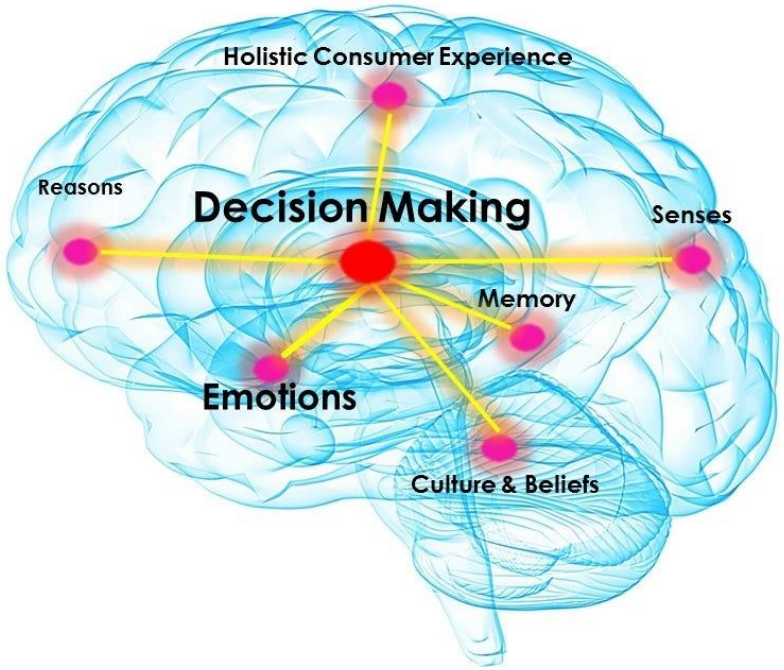


Agenda

- 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.

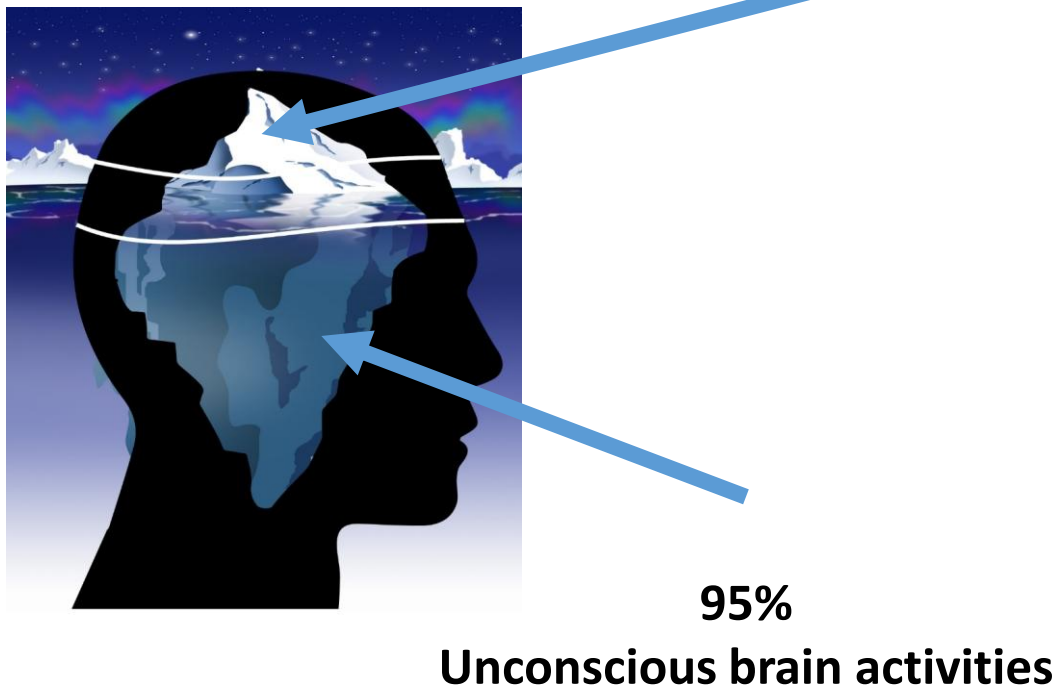


Driving Forces behind human decision making

The power of subconscious mind

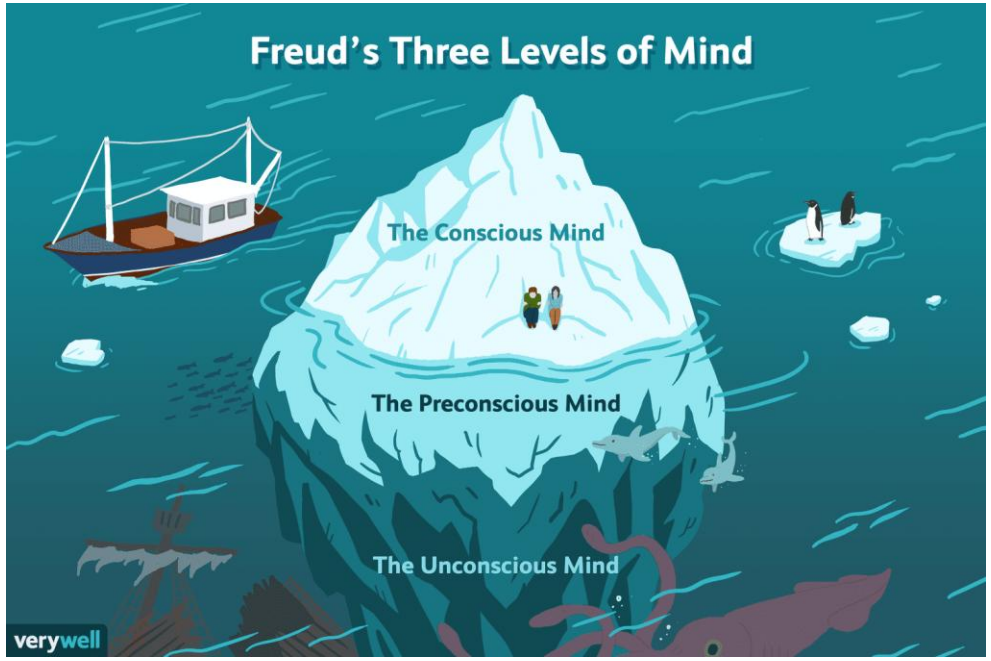
Freud's theory of mind:

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.

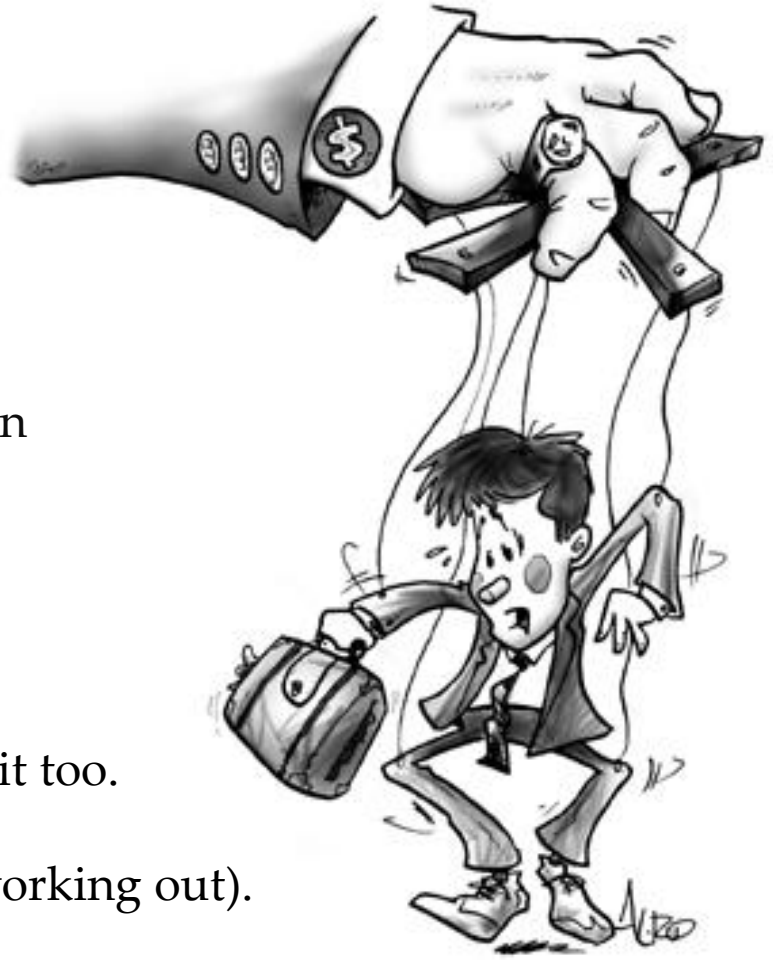


Conscious vs Unconscious Decisions

- 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

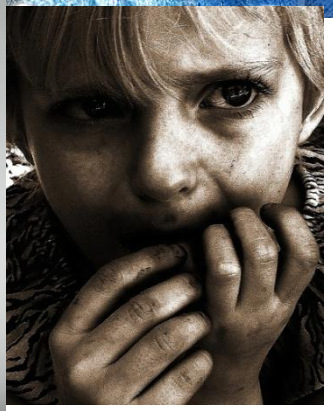
- Consumers mimic behaviors seen in ads (e.g., smiling, using a product, working out).

Empathy & Identification

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

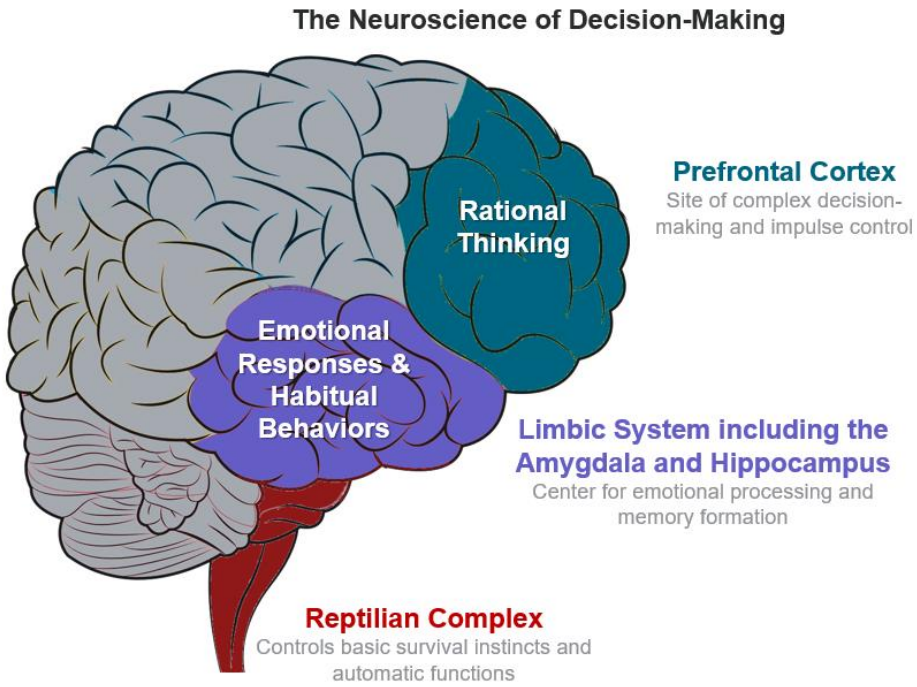
Example : A commercial showing a happy person sipping , coffee triggers the viewer's mirror neuron system making them feel warm, relaxed, and craving that same experience.

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



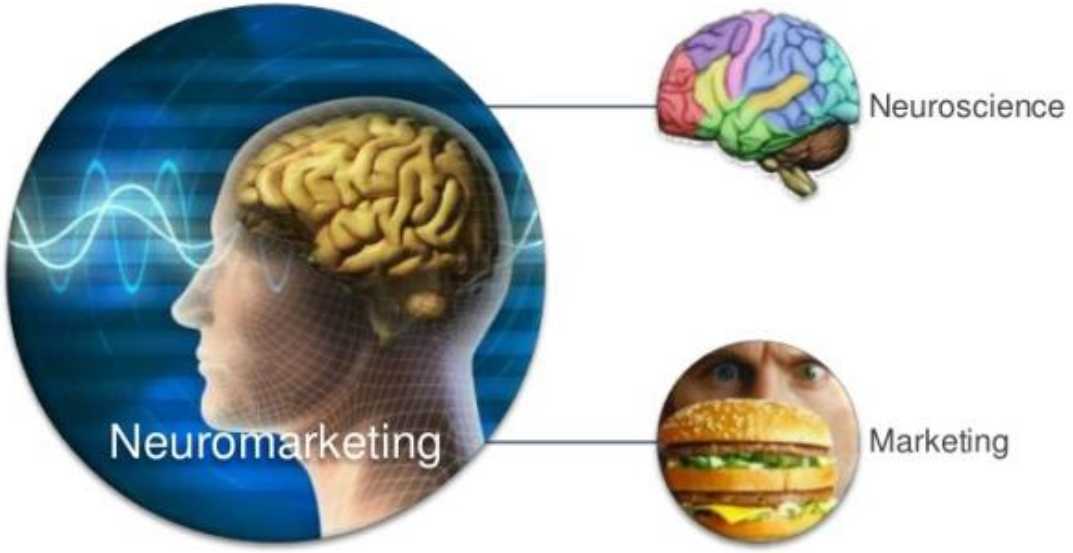
- Prefrontal Cortex: Conscious thinking, planning
- Amygdala: Emotional responses
- Striatum: Habit formation and routine behavior

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.



NEUROMARKETING

Exploring the brain of the consumers

Neuromarketing application

Prof Nik Kasabov,
Auckland University of Technology

Assoc prof Alexander Sumich,
Nottingham Trent University

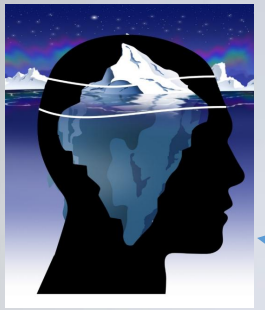
Dr Maryam Doborjeh,
Auckland University of Technology

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 Even-related potential (ERP) data analysis



5%
Conscious brain activities

95%
Unconscious brain activities

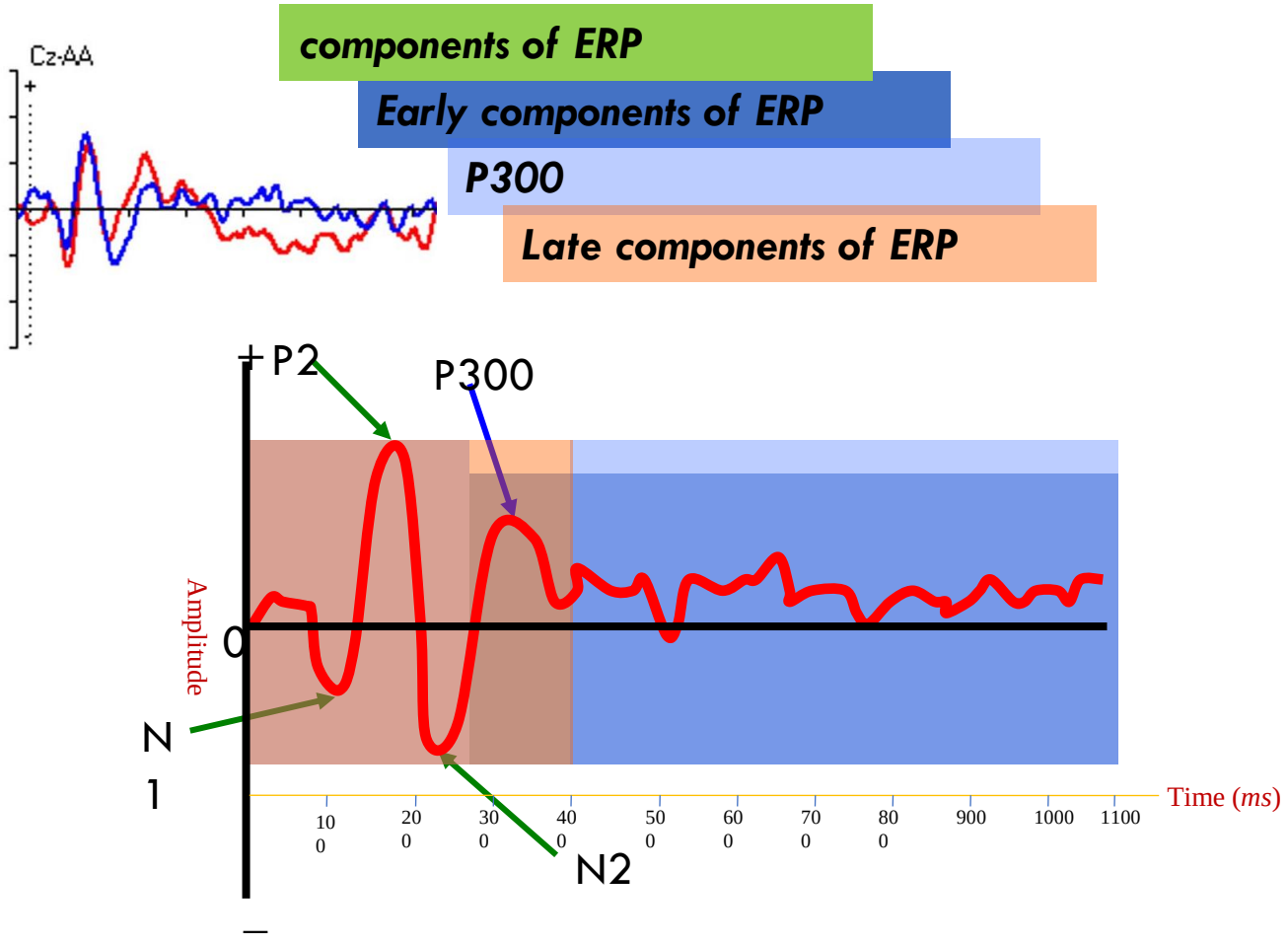
A person’s buying decisions are affected by subconscious motives that even the buyer may not understand.


Data collection

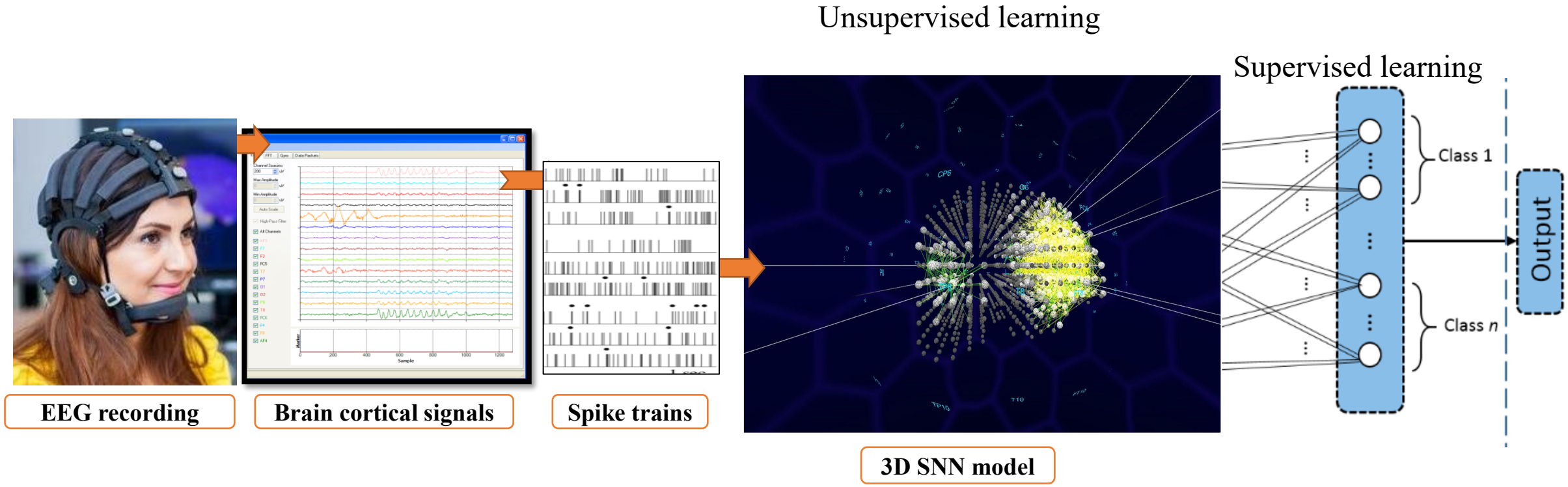
Cognitive Task

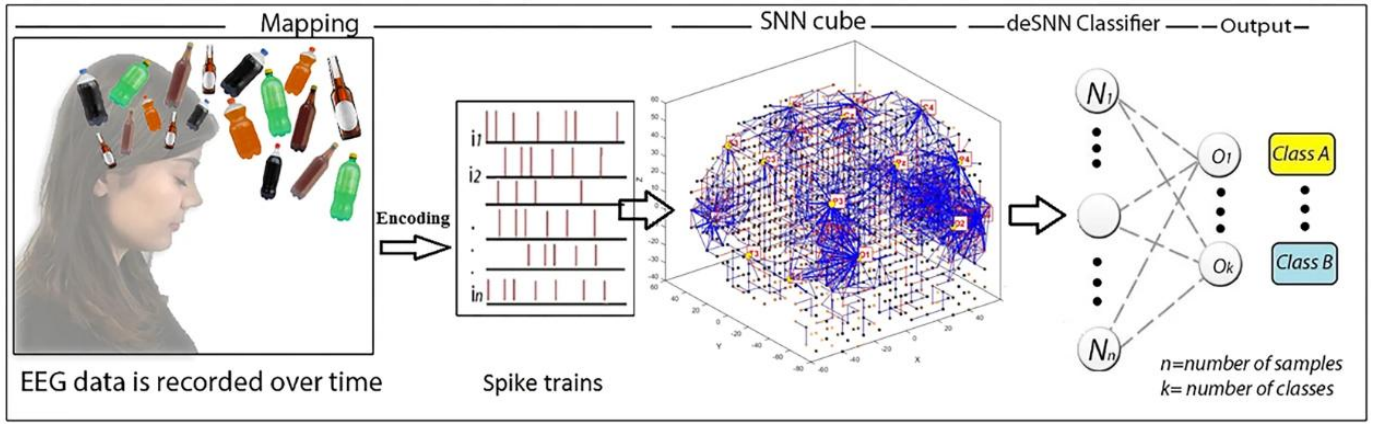
Familiar vs unfamiliar logos

We collected event-related potentials ERP



Method: Modelling EEG using Brain-inspired SNN Architecture





Ultra-high risk for psychosis

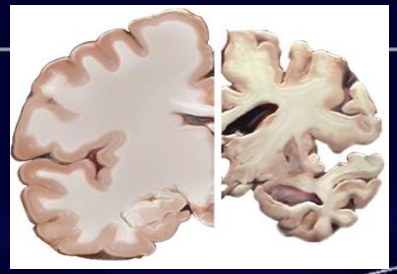
Nature Schizophrenia

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 Budhraja, Wilson Goh, Edmund M-K Lai, Margaret Williams, Samuel Tan, Jimmy Lee & Nikola Kasabov

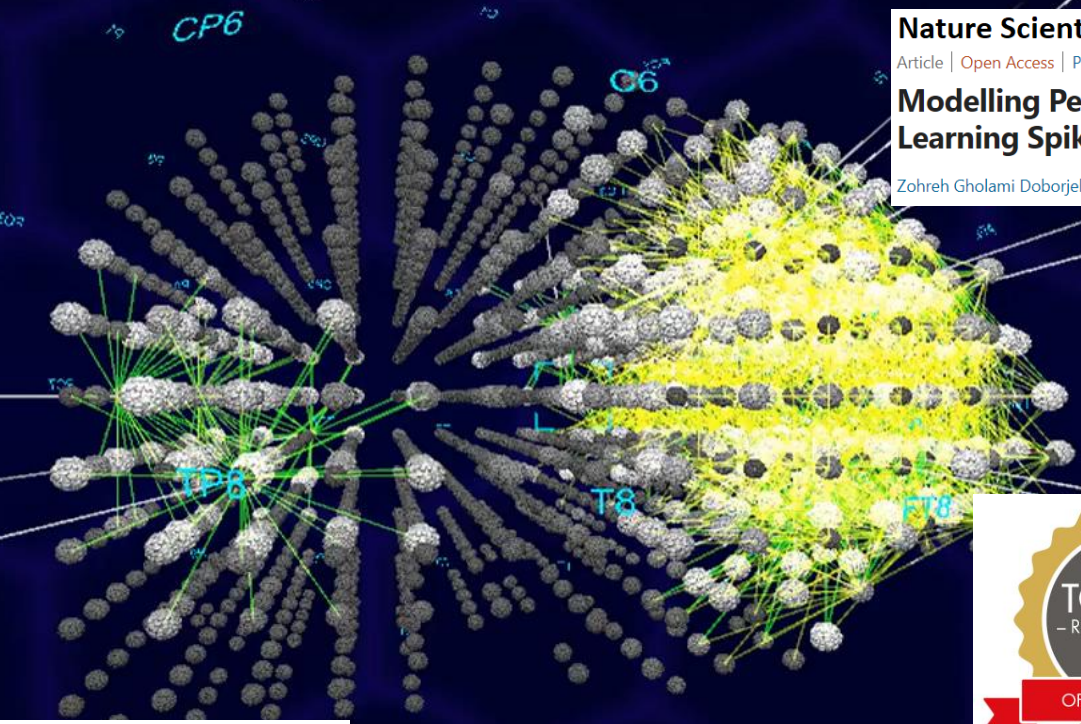
Mental/neurological Health



Healthy vs Alzheimer

Visualised by Stefan Marks, AUT

Response to Tinnitus therapies



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

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 Siegert & Alex Sumich

ELSEVIER

Neural Networks

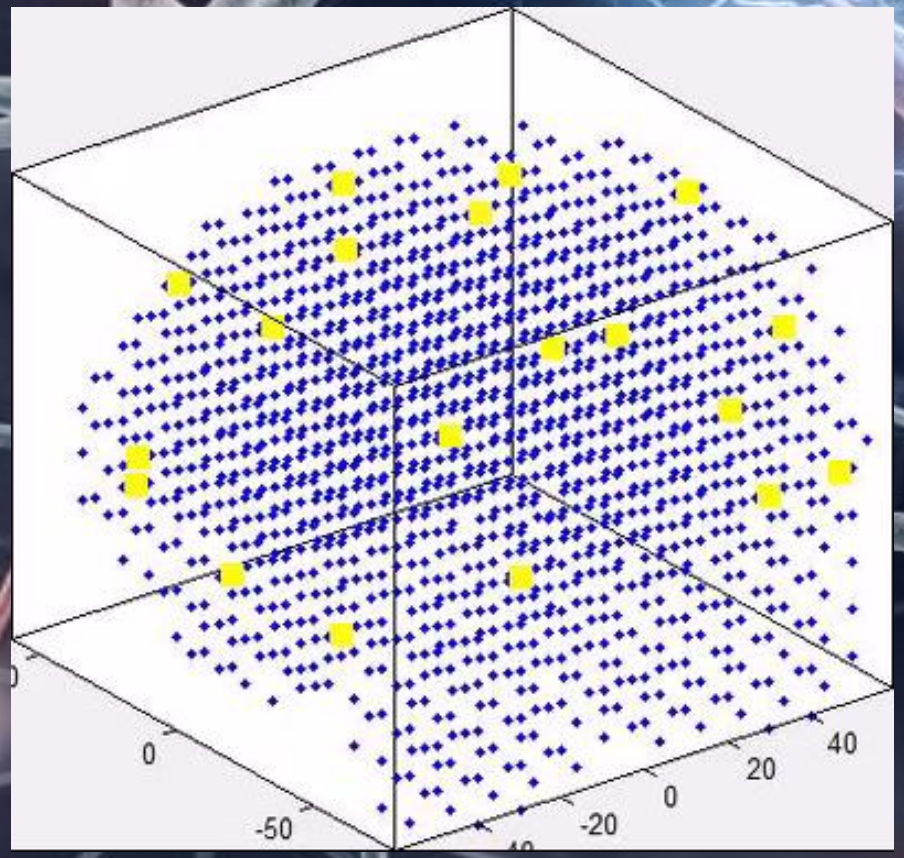
Volume 119, November 2019, Pages 162-177

2019 Special Issue

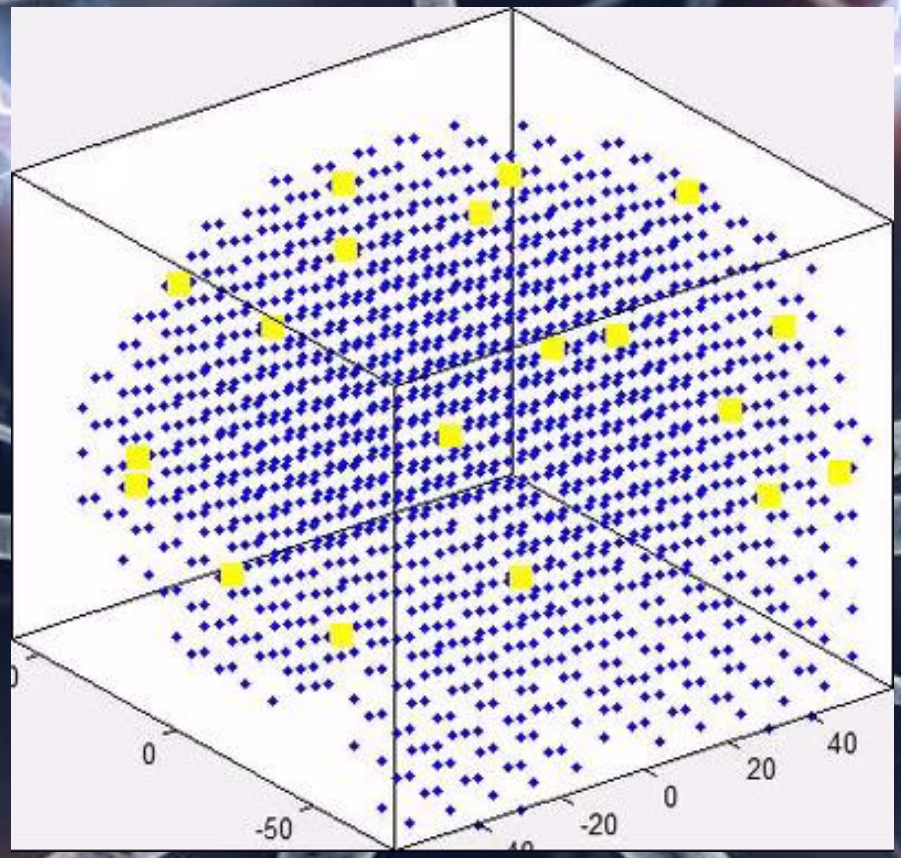
Personalised modelling with spiking neural networks integrating temporal and static information

Maryam Doborjeh, Nikola Kasabov, Zohreh Doborjeh, Reza Enayatollahi, Enmei Tu, Amir H. Gandomi

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



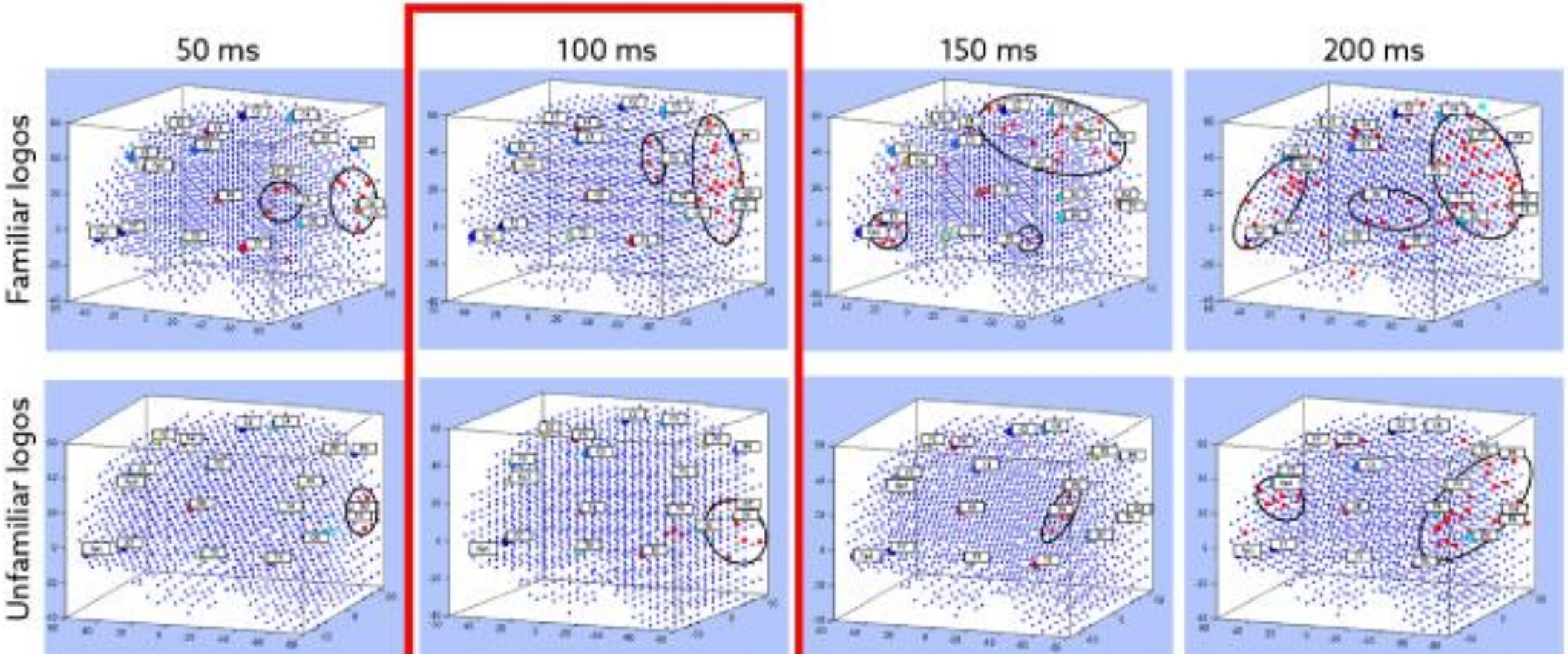
Spiking activity of familiar marketing stimuli



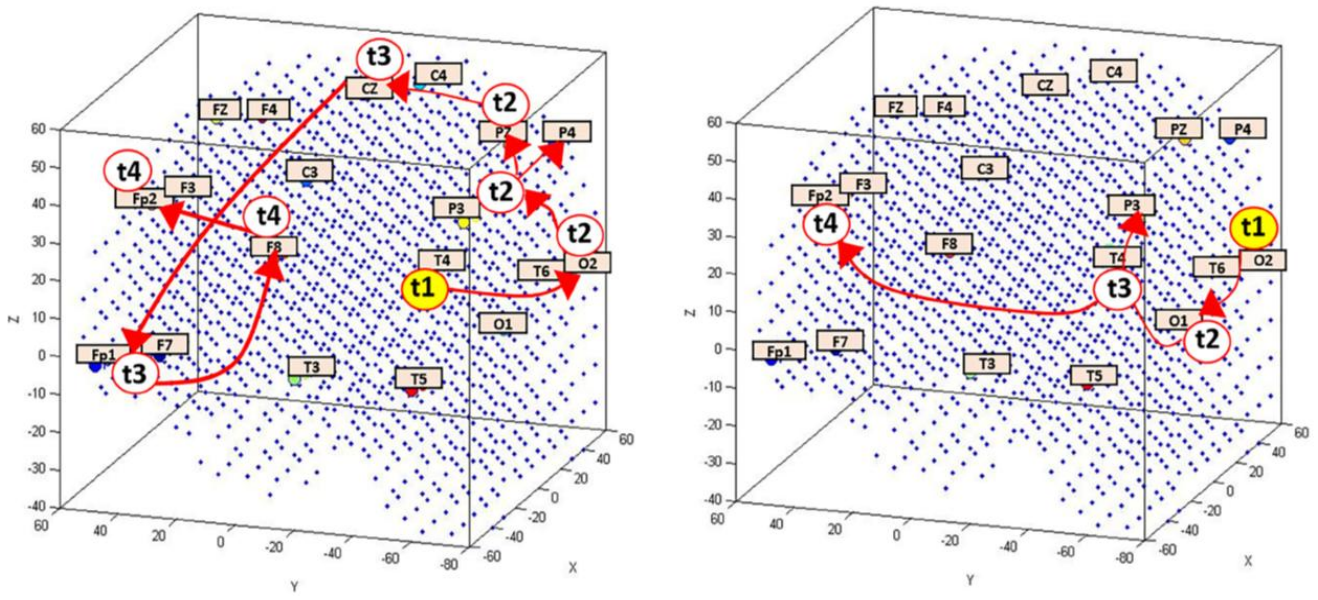
Spiking activity of unfamiliar marketing stimuli

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

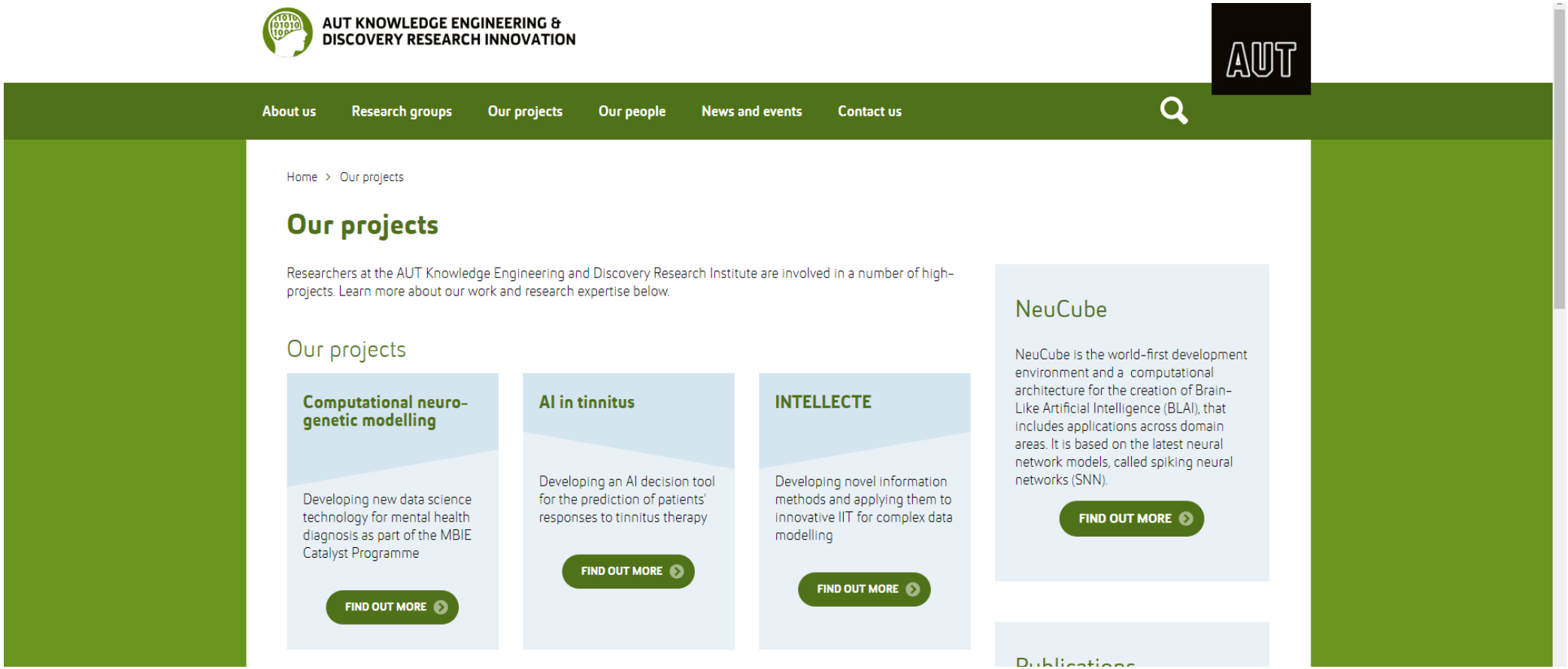
References:

- 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

KEDRI
Neucube Software



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