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A Comprehensive Overview of Neuromarketing Techniques

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What is **neuromarketing?**

Neuromarketing is a form of market research that studies consumers through neuroscientific techniques to explain consumer preferences, motivations, and expectations by measuring sensorimotor, cognitive, and affective responses to stimuli. It aids in the creation of marketing campaigns and strategies that are successful and resonate with the intended audience.

How can neuromarketing help your business?

Neuromarketing studies human emotions and behaviors related to products and decision-making. It can significantly impact your business by uncovering what customers truly want, even subconsciously. By collecting data from neuromarketing techniques neuromarketers can gain valuable insights into how customers interact with brands. These insights inform and shape marketing strategies and craft more effective campaigns that capture the attention of the target audience to maximize impact on sales.

How effective is neuromarketing?

Neuromarketing studies give accurate results with small sample sizes. A neuromarketing study of a group of 20-30 people can be used to predict the behavior of the masses[1].

Consumers do not even have to pay attention to a product to evaluate it subconsciously during a neuromarketing study[2].

Using neuromarketing can result in significantly better sales forecasting compared to using only historic sales data. When neuromarketing data is combined with historic sales and consumer surveys, the accuracy of sales forecasts increases by nearly 39%[3].

Neuromarketing techniques

Neuromarketing techniques can be divided into two major categories: **physiological biometrics** and **brain biometrics.** While physiological biometrics are cost-effective, these methods measure physical responses that can indicate certain emotions or states, but they do not capture the full complexity of an individual's emotional and cognitive processes. Conversely, brain biometrics, such as EEG (electroencephalography) & FMRI can directly measure brain activity and provide a more accurate and detailed prediction of a wide range of emotions and cognitive states. However, these methods are typically expensive to administer due to the need for specialized equipment and expertise, making them less accessible for widespread use. Different neuromarketing techniques are discussed in detail below.

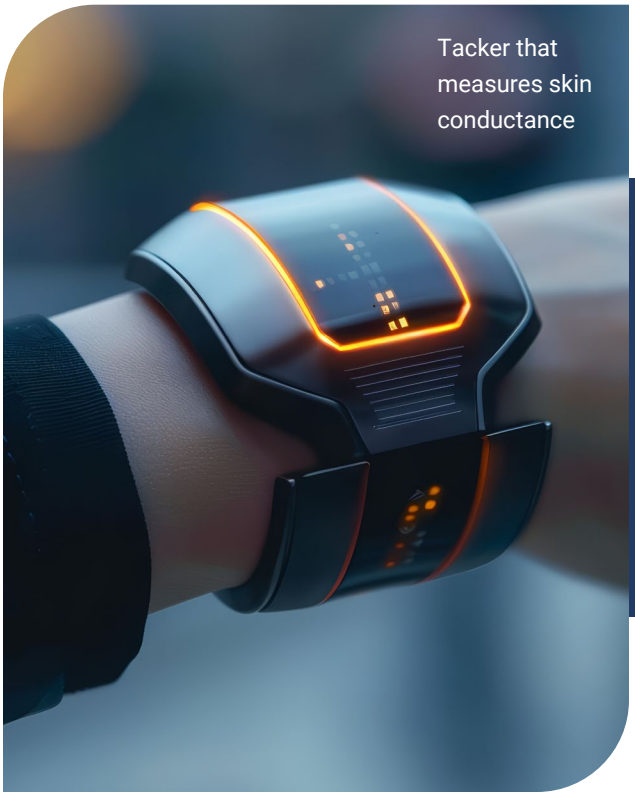
Eye tracking (physiological biometrics)

This technique measures eye movements and tracks where subjects move their gaze. Eye tracking is useful to analyze what captures consumers' attention, what confuses them, and how fast they can recognize brand elements. Generally, heat maps are made to show the results, a heatmap is similar to a weather map except instead of temperatures, fixations are plotted. Fixations are places where participants look for 100 to 500ms (a tenth to half a second). The "hotter" the colors (redder) the more participant fixations are in one area[4]. This technology is quite popular and used by several brands, however, it cannot measure emotion, so it should be used in addition to techniques such as biometrics to get a full understanding of the subconscious mind.

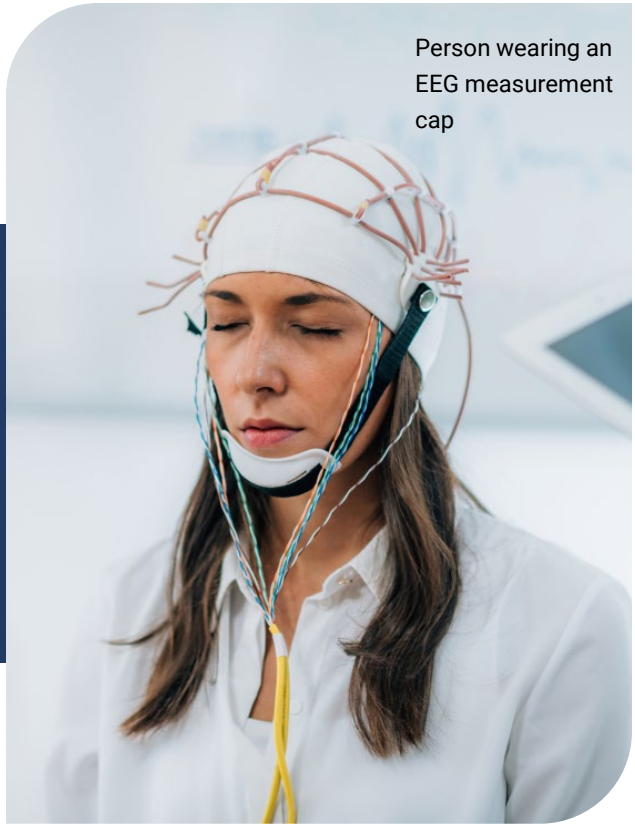
Employee wearing IoT device to track work progress

Biometric sensors (heart rate, skin moisture, and body temperature)

Brands, filmmakers, TV networks, and others continue to invest in biometric research to better understand and engage with consumers. Companies incorporate biosensors in focus groups, and interviews. In this way, brands obtain quantitative emotional information that can be combined with qualitative information about the emotions.



Tacker that measures skin conductance



Person wearing an EEG measurement cap

Electroencephalography (EEG)

In electroencephalography (EEG) studies, electrodes are placed on the surface of the scalp to capture the synchronous activity of neurons. Specifically, it detects large activity voltage from brain areas close to the skull. The EEG measurement cap looks like a swimming cap. It is attached snuggly to the head and consists of electrodes (sensors) that transmit the captured brain activity[5]. EEG only measures large and synchronous brain activity, such as attention, concentrated thinking, match/mismatch (noticing odd events, such as this sentence - the capital of France is London), and arousal. Emotions, such as fear, value, and trust, are not well measured with EEG.

Functional Magnetic Resonance Imaging (fMRI)

In contrast to EEG, fMRI offers a look deep inside the consumer's brain. It helps us better understand – and predict – consumer behavior. FMRI is the only technique that measures all the conscious and unconscious emotions, thoughts, and reason. With fMRI, you can capture detailed activity of the entire brain - no other technique is capable of doing this. Researchers of 'NeuroStandards 2.0' reported that fMRI has better predictive powers than other neuromarketing techniques[6]. However, setting up an fMRI experiment is more complex and requires more skill and knowledge, so the test has to be carried out by qualified personnel. Also, the purchase price of the machine is at least three times more expensive than other tools used in neuromarketing research. For these reasons, fMRI technology is not widely used by neuromarketing experts; instead, techniques such as eye-tracking and EEG are preferred[7].

Functional magnetic resonance imaging (fMRI)

Comparative analysis: Neuromarketing techniques

Neuromarketing techniques offer diverse insights into consumer behavior, each with distinct strengths and applications across industries. FMRI can predict a wide range of emotions with unparalleled accuracy which is ideal for in-depth consumer behavior studies in almost all types of industries. However, it's rarely preferred due to its high complexity and high cost. EEG is less costly and complex than fMRI and offers a reasonably high level of accuracy in predicting emotions. As a result, it is favored by the automotive, consumer electronics, social media, and FMCG sectors for real-time brainwave analysis.

Neuromarketing techniques	FMRI	EEG	Biometrics (ECG, GCR)	Eye tracking
Emotion prediction accuracy & range				
Cost				
Complexity				
Ideal companies	Applicable for all industries	Automotive, consumer electronics & FMCG	Entertainment (TV & Movies)	FMCG

Very high  High  Medium  Low 

Neuromarketing study

examples by industry

Neuromarketing technologies have significantly reshaped marketing strategies across various industries like FMCG, automotive, consumer electronics, and social media. These technologies have allowed companies to tap into subconscious consumer responses. Insights generated from neuromarketing studies are used to optimize product designs, advertising, and packaging, leading to more effective marketing campaigns and increased sales.

FMCG

Neuromarketing technologies are popular in FMCG companies. Different neuromarketing technologies are used to get accurate consumer feedback and optimize their promotion strategies and packaging accordingly. A few examples of the objective and impact of neuromarketing studies carried out by FMCG companies are shown in Table 1.

Table 1. Objective and impact of neuromarketing studies done by FMCG companies

Company Name	Technologies used	Objective of Study	Impact of Study
Sunsilk[8]	Eye Tracking	• Evaluate the effectiveness of advertisement design. • Identify opportunities to enhance engagement with product packaging.	• 84% increase in viewer attention towards the product pack. • 14 times more viewers looking at the pack compared to previous designs.
Baby Diapers[9] **(Fig. 1)**	Eye Tracking	• Determine whether the infant's gaze influences attention to the ad content.	• Infant gaze direction significantly influences viewer attention to the ad content • Viewers focus more on the baby's face when the infant looks face-on. • Viewers focus on the advertising content when the infant gazes at the product or text.
Unilever[10] **(Fig. 2)**	Eye Tracking	• Analyze the visual engagement of shoppers with branding and marketing features. • Use wearable eye trackers to determine which elements in product packaging attract shopper attention.	• Identified key elements that drew shopper attention. • Provided specific answers on how shoppers are visually engaging with branding and marketing features. • Clarified the impact of visual interaction on shopper behavior.

Frito-Lay (PepsiCo) [11]	EEG	• Conduct EEG-based neurological testing to understand how consumers' brains respond to eating Cheetos. • Explore the appeal of the sticky, tangy orange dust that accompanies Cheetos consumption.	• It was discovered that the sticky, tangy orange dust is a significant reason why people enjoy Cheetos. • A new advertisement focusing on the unique experience of Cheetos dust was created. • Despite negative responses in questionnaires, EEG scans indicated positive brain responses, suggesting the ad tapped into the thrill associated with Cheetos. • Released the commercial, which became a huge success, demonstrating the effectiveness of EEG-based insights in marketing and consumer engagement.
Frito-Lay (PepsiCo) [12 & 13]	FMRI	• Use FMRI brain scans to understand why women were less likely to snack on salted products compared to men. • Investigate brain activity related to advertising messages, memory, emotion, decision-making, and guilt in female consumers.	• Based on the insights of the FMRI study, Frito-Lay redesigned packaging to feature matte finishes and colors like beige, fresh greens, and light blues, which resonated positively with female consumers. • The campaign was highly successful, exceeding PR goals with over 195 million positive impressions in 6 months. • Women's snack aisle engagement increased by 1.8%.

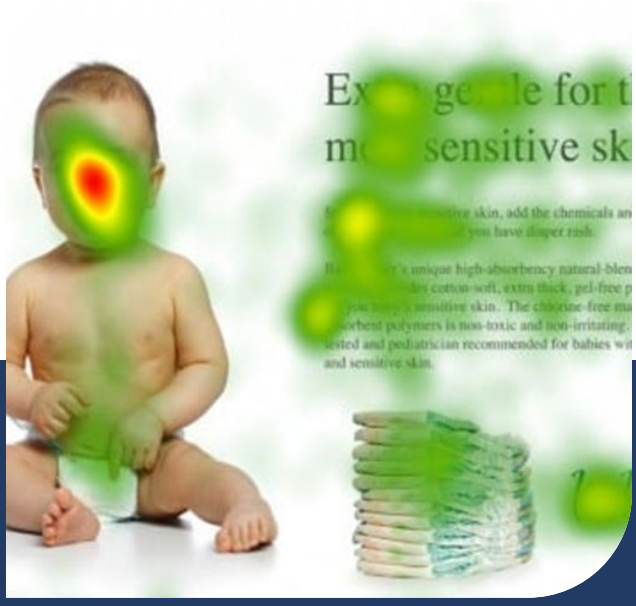


Fig. 1. Eye-tracking heat map

Fig.2. Using wearable eye trackers to record shopper attention data

Automotive

Several automotive companies use neuromarketing technologies to get accurate consumer feedback on car design and real-time brain activity data transmission of the driver.

A few examples of the objective and impact of neuromarketing studies carried out by automotive companies are discussed below.

Table 2. Objective and impact of neuromarketing studies done by automotive companies

Company Name	Technologies used	Objective of Study	Impact of Study
Toyota[14] **(Fig. 3)**	Eye Tracking	• Assess the effectiveness of their initial awareness campaign. • Compare ad recall, consumer consideration, and campaign attribute perception between the test group and control group.	• 64% uplift in ad recall. • 60% higher consumer consideration. • 23% higher campaign attribute perception. • With the help of the eye-tracking study, Toyota optimized its ad campaign, resulting in better lower funnel performance.

BMW[15]	EEG	• Use EEG scans to understand emotional reactions to car designs. • Compare emotional responses to curved lines versus straight lines.	• Curved lines evoke stronger emotional reactions compared to straight lines. • Based on these insights, BMW designed the 3 Series model with curved lines and contours in 2012. • The design choice proved highly successful with consumers, reflecting the effectiveness of EEG-based emotional analysis in car design.
Audi[16]	EEG	• Use EEG scans to understand emotional reactions to car designs. • Compare emotional responses to curved lines versus straight lines.	• Integration of curved lines gave the Audi A4 a sleek appearance. • Achieved superior sales compared to previous models and competitors in its segment. • Demonstrated the effectiveness of neuromarketing in influencing consumer perception and purchasing decisions in automotive design.

Fig. 3. Eye tracking heat map for Toyota

Technology

Several technology companies like Apple, Samsung, and Meta use neuromarketing techniques. A few examples of the objectives and impact of neuromarketing studies done by technology companies are discussed below.

Fig. 4. iPhone 6S & MacBook Pro designs were made using EEG studies

Table 3. Objective and impact of neuromarketing studies done by technology companies.

Company Name	Technologies used	Objective of Study	Impact of Study
Apple[17] **(Fig. 4)**	EEG	• Utilize EEG to understand consumer emotional reactions to design elements. • Compare emotional responses between curvilinear and linear designs.	• Curvilinear designs elicited stronger emotional reactions from consumers compared to linear designs. • Apple incorporated curvaceous lines into products starting from the iPhone 6S and MacBook Pro.

Samsung[18]	fMRI	• Employ neuromarketing techniques to understand and influence consumer behavior and loyalty among Samsung customers in Qom province, Iran. • Decode the brain's response to marketing stimuli to tailor more impactful and memorable campaigns.	• Neuromarketing strategies significantly altered consumer behavior. • Samsung tailored its campaigns based on brain responses, enhancing their impact and memorability. • Neuromarketing helped forge stronger emotional connections with customers, dramatically enhancing loyalty.
Facebook[19]	FMRI & EEG	• Utilize neuromarketing techniques to ensure Facebook visitors come to the site often and stay to browse content. • Design the platform using effective layouts, color schemes, and content to keep visitors engaged for extended periods. • Increase the success of advertisements on Facebook by leveraging neuromarketing insights.	• The key blue color of Facebook's layout conveys trust and reliability, boosting positive perceptions and engagement. • Nostalgia created through tracking personal events forms tangible brain connections, leading to daily visits and content interaction. • Neuromarketing increased the effectiveness of ads, driving growth for both Facebook and advertisers.

Entertainment

Filmmakers and TV networks continue to invest in neuromarketing research to better understand and engage with consumers. Most companies incorporate biosensors like GSR and ECG into focus groups and interviews.

Table 4. Objective and impact of neuromarketing studies done by entertainment companies

Company Name	Objective of biometric sensors study	Impact of biometric sensors study
New Regency Productions[20]	• Identify physiological responses to specific moments in the film by Employing ECG and GSR sensors as wearable wristbands on viewers during a screening.	• 15 fight or flight responses were identified. • 14 heart-pounding moments were identified. • Insights about viewers' emotions during the film were also recorded. • These insights were used to design trailers for the film.

NBC Universal[20]	• Examine scenes in movies and TV programs to elicit the strongest emotional responses using biometric sensors to gather data on viewer reactions.	• Scenes that elicit the strongest emotional responses from viewers were identified. • According to Alan Wurtzel, president of research and media development at NBCU, information from biometric sensors was a great help in optimizing promotional strategies.
Game of Thrones[21] **(Fig. 5)**	• Use biometric sensors to compare engagement levels between audiobook and video scenes from Game of Thrones.	• Participants rated video segments as 15% more engaging. However biometric sensors indicated higher engagement with audiobooks. • Audiobooks recorded a higher average heart rate by about two beats per minute. Warmer body temperature by roughly 2 °C, and higher skin conductance by 0.02 micro-siemens. • It was concluded that audio content engages users more due to the active participation required to create scenes in the mind's eye.

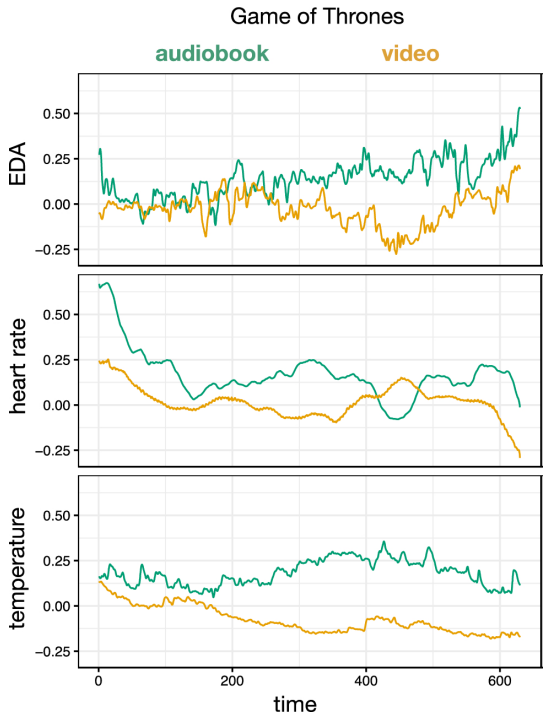


Fig. 5. Biometric sensor results for video and audio versions of Game of Thrones (bioRxiv)

Future technology and

use cases for neuromarketing

Most innovations in neuromarketing have been focused on integrating neurotechnology with consumer electronics such as headphones, earbuds, and smartphones. More recent investments include the integration of neuromarketing technology with AI, and future integration with Neuralink, developed by Elon Musk, is possible.

Recent neurotechnology patents

Apple: Biosignal Sensing Device Using Dynamic Selection of Electrodes (Fig. 6)

Apple filed a patent for a wearable electronic device, potentially an advanced version of their AirPods, equipped with EEG, EMG, and EOG sensors to monitor brain signals. This technology aims to provide insights into a user's emotional and physical state, similar to a smartwatch. Additionally, it may function as a controller for other Apple devices, such as the Vision Pro headset. This offers a powerful combination when paired with eye-tracking technology, contributing to advancements in neuroscience research [22].

Fig. 6. AirPods by Apple

Fig. 7. MN8 smart headphones by EMOTIV

EMOTIV: Project City Vibes (Fig. 7)

Project City Vibes will utilize EMOTIV's MN8 smart headphones (2-channel Wireless EEG earbuds) to measure brain activity (EEG) in real-world settings. The project aims to understand how residents and tourists in Newcastle respond to various urban and cultural stimuli. The collected data will enhance NICA's City of Longevity program, focusing on citizen experience, engagement, and well-being. The Glasshouse International Centre for Music is a strategic partner in this initiative[23].

Evoke Neuroscience: Gaming headgear with EEG measurement sensors (Fig. 8)

This headgear is designed for collecting electrophysiological EEG data and providing neurostimulation to a player in gaming. It uses dry sensor technology and adjustable sensor placements to record brain activity and deliver currents to influence electrophysiological parameters. The headgear supports biofeedback by giving direct feedback to the user through sensors and can deliver low-intensity currents or electromagnetic fields. It also includes auditory and visual components for immersive neurogaming, integrating balance and movement sensor data for enhanced experiences[24].

Fig. 8. The Versus EEG headset by Senselabs

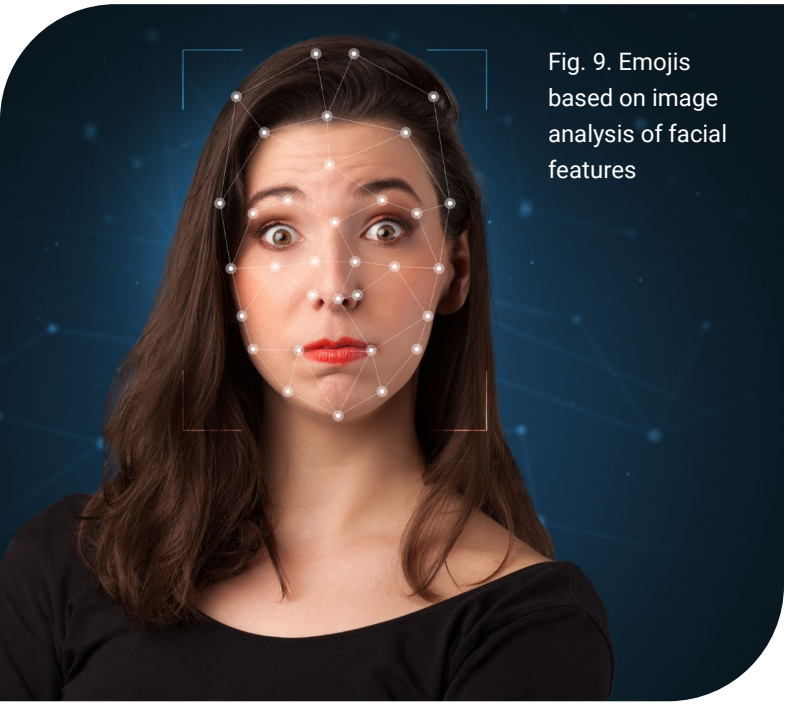


Fig. 9. Emojis based on image analysis of facial features

Meta: Emotion detection and content delivery (Fig. 9)

This patent is called “techniques for emotion detection and content delivery”. It captures the user’s image via the camera to track their emotions when viewing different types of content. Meta could tie a person's emotional states when checking out videos, ads, or baby pictures and serve up content in the future just by reading their initial state of emotion. Another patent by Meta, “Systems and methods for dynamically generating emojis based on image analysis of facial features” captures real-time image data of a person's face through a selfie and sends an emoji based on their face and gestures [25].

Emerging
use cases

Application of AI in neuromarketing

Neuromarketing and Artificial Intelligence (AI) will be a game-changer for the future of marketing, providing profound insights into consumer behavior and creating personalized experiences. Currently, neuromarketing employs neuroscience techniques to explore subconscious preferences and decision-making processes by analyzing brain activity, eye movements, and biometric reactions. AI transforms marketing through predictive analytics, personalized recommendations, and automation.

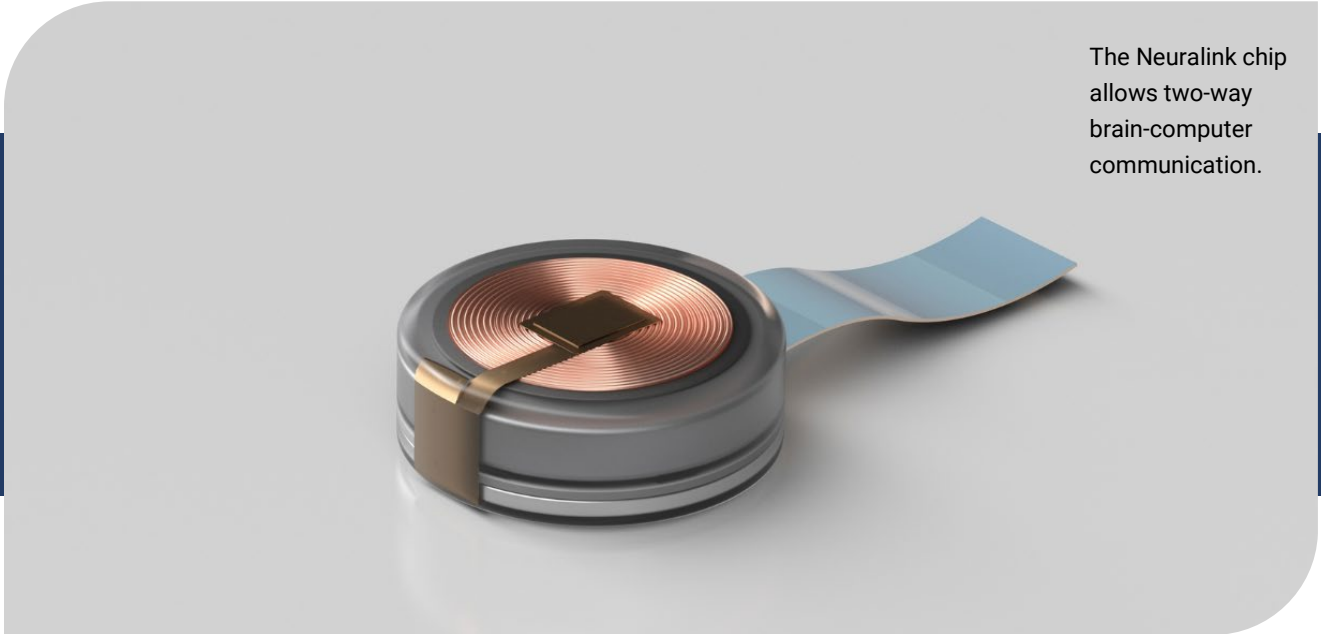
To predict consumer behavior, various machine learning algorithms can be employed based on the specific task. For customer segmentation, clustering algorithms like K-Means and hierarchical clustering are used to group customers by similarity. Churn prediction often utilizes logistic regression and random forests to determine if a customer is likely to stop using a service. Recommendation systems rely on collaborative filtering and neural networks to suggest products to customers based on their past behavior. Demand forecasting leverages time-series models and LSTM networks to predict future product demand. For sentiment analysis, natural language processing (NLP) techniques combined with neural networks analyze customer reviews to determine sentiment. Furthermore, AI-driven chatbots and virtual assistants enhance customer interactions with instant support and tailored suggestions.

The synergy between neuromarketing insights and AI capabilities enables marketers to significantly improve customer engagement and loyalty.

The future of Neuralink and neuromarketing possibilities

Elon Musk's Neuralink, founded in 2016, introduces groundbreaking possibilities for neuromarketing through its brain-computer interface (BCI) technology. By implanting a coin-sized device in the skull with ultra-thin wires into the brain, Neuralink records brain activity and transmits it to a smartphone via Bluetooth. This BCI technology offers unprecedented opportunities for hyper-personalized marketing, predictive analytics, and immersive brand experiences. Neuralink's ability to directly interface with the brain could allow marketers to gain real-time insights into consumer preferences, emotional responses, and decision-making processes.

This deep understanding would enable the creation of highly targeted and emotionally resonant campaigns. The synergy between Neuralink and neuromarketing could revolutionize the industry, providing marketers with powerful tools to understand and connect with their audience on a deeper level. This fusion of cutting-edge neuroscience and marketing holds the promise of a future where marketing strategies are not just informed by data but are seamlessly integrated with the human mind.



The Neuralink chip allows two-way brain-computer communication.

Neuromarketing **at Fuld**

At Fuld, we recognize the transformative potential of neuromarketing to unlock deep consumer insights that traditional methods often overlook. Our expertise in technology and innovation research enables us to help clients harness the power of neuromarketing to enhance their marketing strategies, refine product designs, and create compelling campaigns that resonate with their target audiences on a subconscious level.

Custom neuromarketing studies

We can aid in designing and conducting neuromarketing research using various cutting-edge techniques, including eye-tracking, EEG, and fMRI. Our studies are crafted to answer specific business questions, providing actionable insights that drive tangible results.

Data-driven marketing strategies

Leveraging the insights gained from our neuromarketing studies, we help companies optimize their marketing strategies, ensuring that every campaign is creative, scientifically grounded, and strategically sound.

Industry-specific expertise

Our experience spans across multiple industries, including consumer products, retail, automotive, healthcare, entertainment, software, and electronics. We understand the unique challenges and opportunities within each sector and provide neuromarketing solutions that are both relevant and effective.

Integration with advanced analytics

We combine neuromarketing data with advanced analytics and AI to deliver a comprehensive understanding of consumer behavior. This integration allows us to predict market trends, tailor marketing efforts, and maximize ROI for our clients.

Let's innovate together

Whether you are looking to launch a new product, revamp your brand strategy, or simply want to understand your customers better, Fuld & Company is here to guide you every step of the way. Reach out to us to discover how we can help you leverage neuromarketing to drive your business forward.

Contact us

Learn More **about our Technology & Innovation Research solutions**

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