WeMind Group

Neural technologies

Neuroscience meets data science: a new era for marketing research

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Marketing research has a long history of interdisciplinary relations. In the past ten years, one that has attracted particular attention is that which has been established with neuroscience.
The premise is to move beyond the limits of naturalistic approaches, which have been mostly incorporated from experimental psychology, and look for more reliable markers of perception and pre-judgment. This new domain, which some people call neuromarketing and we prefer to call neuroscience-based research, superimposes two grand neuroscientific domains: affective neuroscience and behavioral neuroscience. As some research papers that we published show (Dias, 2012-2018; Akiba, et. al, 2014-2018), the application of neuroscience to marketing is more useful in some circumstances than others.

In particular, it is great to define directions involving about liking, preference, consonance and subtle perceptions, especially - but not exclusively - for stimuli on the time domain (like videos).

As we put in a well-known paper, there are inherent biases to liking and preference investigations a fortiori, which strongly encourage the use of methods that may collect these implicit judgments, or proxies to these, from fruition itself.
Another interdisciplinary trend that we endorse is the application of data science to specific marketing problems. Based on that, we developed our own methodologies, which we validated experimentally.
Our view is that neuroscience and machine learning have complementary roles and should be part of any serious interdisciplinary toolbox for marketing research: when under the “marketing law of small numbers” (apologies for the economists), where finegrained details are at their most importance, adequate applications of neuroscience is the way to go, whereas when under the “marketing law of the large numbers”, where population tendencies are at stake, machine learning tends to be the ideal statistical approach.
Obviously, one can also find the situation where marketing-related neuroscientific data should be treated by pattern recognition approaches for personalized results, but that doesn’t change the point in any relevant way.

Along the years, we have met with very good researchers applying the very principles that we endorse, as much as we have met with the opposite of that. There are four relevant aspects that separates us and some other academic groups and companies from the rest:

- We are genuine scholars, with relevant positions in the fields of neuroscience-based marketing research and neuroeconomics. This translates into a constant exchange with some of the most impressive minds that we know - our colleges; international publications where one can find concepts we created, great projects we conducted and patents we created to solve issues that both applied and investigational revealed to us.

- We were the first to answer one of the primary questions in this field: what are the ideal sensors and montage to use when trying to map the biological correlates of preference & liking for videos of different categories? Besides responding to that matter experimentally, we also conducted a systematic review, which originally collected 2000+ papers, to properly map how this issue has been treated by other researchers. In sum, we know what sensors to use, where to put them, how to analyze and how to produce reports that will produce the highest practical results. Check our latest paper in Frontiers in Neuroscience about that: https://www.frontiersin.org/articles/10.3389/fnhum.2019.00073/full

- We work with machine learning/AI in a daily basis and we have a track-record of sophisticated projects in that domain. We understand and apply deep-learning, generative adversarial networks, self-organizing maps, Bayesians trees, support vector machines, genetic algorithms, you name it. Beyond that, we know how to move from positions where the application of the “marketing law of the large numbers” should be applied, to positions where the “marketing law of the small numbers” is the way to go.

- We appreciate economics. Our team includes some respected economic professors and one of our main neuroscience-based patents describes a method to create/edit video ads to increase revenues, using an up-to-date utility model. Besides, our approach to marketing research is no different than our approach to any other corporate challenge: we believe that it only makes sense to contract our services if we can make the investment payoff itself. That’s precisely to what we are committed.

All that has been made possible because Neuraltechnologies is a division of WeMind Group, an interdisciplinary innovation office viscerally connected to the academic world, with scientists in USA, Brazil and France. Please check below the outline of the technologies we use and, most importantly, our main products.

Central nervous system (SNC) as a decision support system

The SNC is the pinnacle of interests of pretty much everyone involved with neuroscience-based marketing research and related. We are by no means special in that sense, except for the fact that we deeply assume that complex approaches should only be used when and only when a relevant question can only be answered by such means. As demonstrated by Prof. Dias, this happens, for instance, when evaluating preference between videos and other time-related stimuli, due to phenomenological consistence issues and working memory-related peculiarities, which bias a posteriori evaluations.
We have demonstrated proficiency in three different approaches to SNC-based translational investigations: neuroimaging, electroencephalography and functional near infrared spectroscopy.

Neuroimaging

In the field of neuroimaging, we have conducted and published in some of the most prestigious international journals studies on functional neuroimaging (fMRI), connectivity (diffusor tensor imaging/DTI), and AI-based/support vector machine-based approaches to personalized brain mapping for medical research and decision-making research, including marketing-related issues. We know how to create and manipulate protocols for images, videos and odors and also to integrate EEG to fMRI. That said, it is important to note that we do not posses a MRI scanner, but rather work in partnership with hospitals and clinics for very specific studies.

Electroencephalography (EEG)

We have almost two decades of continuous experience with EEG and multiple studies, using ERPs/ENPs/wavelets and other approaches to this import proxy to brain functioning. From montage, artifact cleaning and data normalization to the most sophisticated insights, EEG has always represented a means with which we are very comfortable to work with, not only in the marketing research and neuroeconomics, but also on clinical diagnoses, assistive technologies, neurofeedback, brain-controlled art, and neural correlates of different cognitive functions.
In particular, we believe that the best approaches to marketing challenges involve the combination of very specific EEG measures with proxies to the autonomic system (i.e., heart rate variability) and to attention (i.e., eye tracking). We have best in class high density QEEG amplifiers, sets of ultra-high precision dry electrodes and exclusive analytical tools, developed by our team.

Functional near infrared spectroscopy (fNRIS)

Whereas fMRI has high brain spatial resolution, it has low temporal resolution; whereas EEG has high temporal resolution, it has low spatial resolution. Together they embody the so called inverse problem of the neurosciences. fNIRS is a technique that aims to join together good temporal resolution, with a pretty reasonable spatial resolution for cortical events. Besides, it is portable and much easier to mount than MRI. We have experimental practice with fNIRS and the capacity to aggregate it to specific protocols.

Autonomic system as a proxy to global affective experience and decision-making

The autonomic nervous system produces general level bio-computations, whose ultimate significance can only be interpreted contextually. Accelerated heart beats, increased skin conductance and pupil dilatation may signify the unkind experience of fearing a threat, the call of passion, the mixed feelings of engaging in passion with someone that produces some sort of fear and the pleasure of fearing a threat in a mocked virtual reality experience. Whereas pretty much everyone is aware of the first case, and few consider the second, pretty much all the others run aside of any sight or debate, which is another way to say that neuroscience-based approaches to marketing research make pretty unworldly uses of autonomic data. In contrast to that, we are totally committed to the practice of exclusively making meaningful uses of these data sources, which we collect with FDA-graded electrophysiology equipment.

Eye tracking and psychophysical proxies to attention and perception

Attention and perception are some of the most important dimensions of information processing. Often, ads are impactful but fail to produce any brand recall for the simple fact that attention was placed completely out of the regions of interest of the brand elements of style and recall. For that reason, we nurture a very high respect for perceptual/attentional markers, which can be both based on eye tracking and psychophysics.

We have some high quality eye trackers (Tobii and others), including glasses and many other related devices and intangibles, including our own micro-expression script for “covert” emotional reaction to movies and video ads, which runs in the browser and is completely suited for large neuroscientific-studies, conducted through the internet.

Patents
Conversion rate per second

From a brand’s perspective, a video ad fulfills its purpose not by winning a Cannes Lion[1], but rather by maximizing the attractiveness of a determined product or concept.

In contrast to non-advertising videos, in which the main objective is aesthetic or entertainment, advertisement should achieve these aims within the smallest duration as possible, in order to maximize expected utility.

This premise sheds light into the possibility of backing briefings & scripts, or editing raw materials (1st cuts) & released versions in order to maximize the economic relevance of each second of exhibition.

The general guideline for such aim is clear to us and won’t hurt sharing: to rip-off whatever will not brake the storyline, diminish brand recall and sales pitch and, whenever faced with the possibility of choice, keep the most engaging scenes.

Using cutting edge neuroscience-based approaches and a solid data science approach to economics, our team of scientists developed Conversion Rate per Second®, a proprietary methodology to assess the relevance generated by each epoch (scene) and insert into an economic model, which allows the determination of the piece with the highest chances of maximizing ROI, in light of campaign duration, mean costs of exhibition and others.

What are the typical questions that CRS can answer?

- Which scenes may have the greater impact on my audience? What´s the nature of this impact?
- How does people from a specific audience engage with my video ad?
- What kind of message is actually being held by the audience?
- What´s the optimal duration of a specific video ad, from an expected utility perspective?
- What are the fine-grained impacts of campaign duration and mean costs of exhibition in the determination of the ideal video ad?

[1]For that purpose, we recommend this: https://blog.sprinklr.com/what-it-will-take-to-win-a-cannes-lions-award/ and this: https://www.businessinsider.com/winning-cannes-award-costs-agencies-a-ridiculous-amount-of-money-2014-6

Defining relevance to feed the Economic Model of Conversion Rate per Second

Epoch selection in the CRS framework is conducted in two phases. First, the most efficient combination of declarative measures and neural correlates is extracted and converted into standardized data points, using our minimally-invasive patented device for simultaneous declarative/non-declarative evaluations in the time domain; second, these metrics feed a model that situates this whole debate in the world of economic reality, by returning indications of what should remain and what should be ripped-off to maximize ROI, in light of campaign duration, mean costs of exhibition and other variables.
But how to establish meaningfulness herein? To advance our model, we had to innovate in this domain as well. This was done by the proposal of a two-step model for relevance in the context of ad maximization. Our double approach first finds the epochs that are necessary and sufficient for the narrative formation, the ideal order in what they should fit and, finally, the epochs that should be added to enhance the narrative till the point that the cost/benefit becomes negative, from an economic perspective. The result is much more realistic and powerful than alternatives that assume that all that matters is finding what's relevant or engaging in pre-existing videos.

The economic basis of scene conversion rate per second

The score that emerges from data integration is plotted into the economic model, with a beta-binomial probability mass function (Danaher & Rust, 1996), whose sophistication allows the inclusion of the campaign's main features.

An economic approach to ad evaluation

Approach ad campaigns from a highly sophisticated, economic-driven probabilistic model. Make your ads adhere to economic policies and not the other way around. Foster business-oriented decisions. Stop money waist and create a culture where more is less.

Some features we provide in the constructing of the ideal ad

Intra-scene evaluation

Know which part of the scene are more engaging and which parts could be cut out without any meaningful loss for cognitive engagement and conversion rate of your advertisement.

Inter-scene evaluation

Avoid redundant information which may hamper the quality of your advertisement and make confident decisions regarding which scene should be maintained and which scene should be removed.

Global evaluation and informational assessment

Know whether your audience actually understand and like your advertisement working the best strategy for the current campaign and using the experience to ever improve your branding communication.

Time-dependent likeability

Avoid redundant information which may hamper the quality of your advertisement and make confident decisions regarding which scene should be maintained and which scene should be removed.

This evaluation is comprised by three complementary analyses:

Narrative likeability curve:

Provides information regarding the accumulated likeability along time. Allowing to understand effects of habituation and impact along the storytelling as a whole.

Narrative consistency analysis:

Provides a measure of internal consistency of the narrative, indicating whether the video is perceived in a more similar or variable way through the audience.

Peak analysis:

Provides information regarding likability fluctuations second by second, allowing us to determine the most relevant moments on each scene.

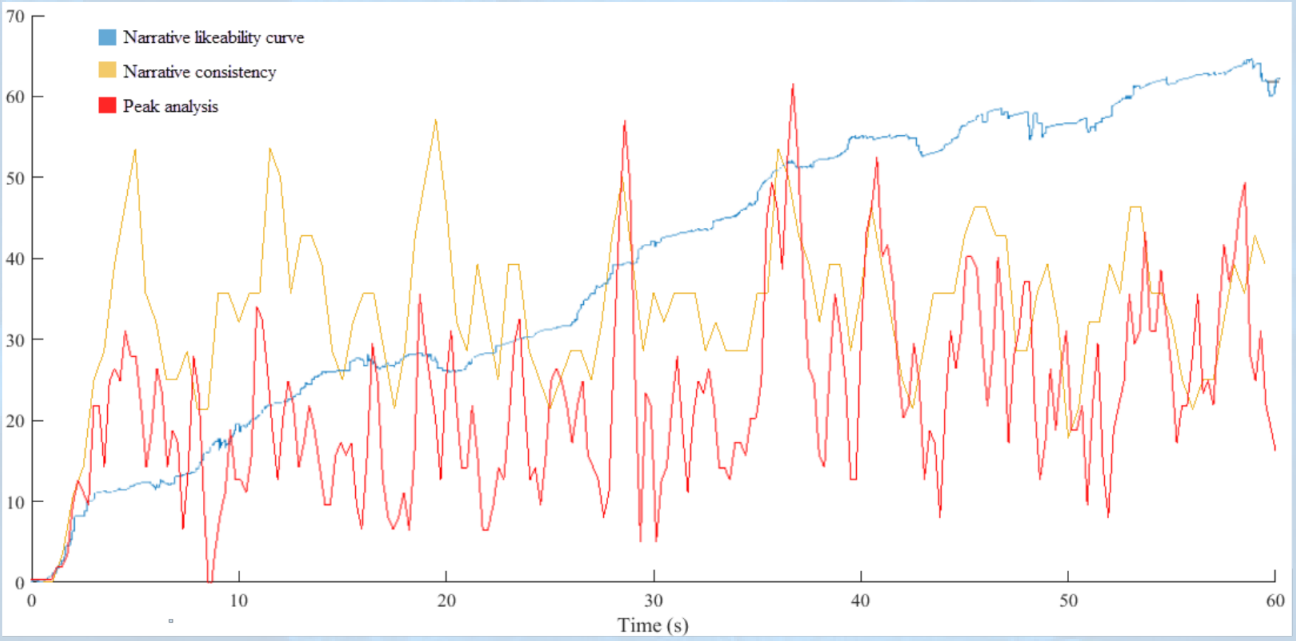


Figure I. A graphical representation of dimensions that we have developed for CRS.

Movie Power Law (MPL)

Art critique is the land of controversy. Conserved certain ethical limits, there are no right/wrong preferences and success definitively does not correlate with ultra-sophistication.
On the other hand, three of the most fundamental cognitive capacities that we carry are fundamentally sensitive to whatever appears to the subject as a dispatch from his idea of a well-designed informational construct: syntactic computations; mental model production; and Theory of Mind (ToM).
The first compare linguistic discourses to genetically defined and culturally acquired frames for verbal constructs, prosody, relation between prosody and bodily expressions, as well as it computes the broader relation between syntactic constructions and semantics to ultimately evaluate discourse adequacy. The second, converts and integrates abstracts concepts, sensorial memories and inflowing stimuli in mental representations that can be consciously assessed and as such mentally manipulated. The last prospects the intentions behind someone else's and our own verbal and motor behaviors in their correlations to expectancies.
Whatever is perceived as a dispatch from logic, in any of these domains, tends to feel bad and by that means generate a low subjective evaluation. A character that suddenly behaves in a sense that departures from her earlier pattern; a dramatic closing in a narrative that does not follow from the events that preceded it; a sudden change in the speed by which events succeed one another, all that may devaluate the piece from the client's perception. It is not to say that they should be avoided by all means, but rather that it is important to have sufficient knowledge about their existence in the public's phenomenological field of perception, before shooting or releasing the piece.
Movie power law is a proprietary method to evaluate an audiovisual narrative's efficacy, from both a connotative and a denotative perspective, which aims at mapping the perception of narrative discrepancies, using neuroscience. The method involves a series of sequential steps, which ultimately warrants that tasks as complex as identifying subtle logical weaknesses in a narrative, identifying dramatic disentangling, and stylistic ruptures can be tackled in an experimental fashion, generating unequivocal directions to improve the piece.
The three fundamental resources of the method are the capacity to break the narrative in epochs and qualitatively map the connotative and denotative flow of it, from the start to the end, using a exclusive software-based strategy; use of a specific neuroscience protocol for mapping subconscious dissonance between epochs, concepts and alike; and use psychophysics to evaluate logical associations over time.

PSC: a AI-based method to increase movie ads effectiveness

For humanity and its tastes, the present is not a linear consequence of the pass and the future will always be somehow non-deterministic. Yet, in areas where predictive knowledge is at stake, evidence-based hypotheses are about all we got to maximize an enterprise success.
In the realm of movie ads, these hypotheses spread into a dichotomy: on one side, we find the narratives' structures and elements that are likely to stimulate the retrieval of positive experiences, where on the other, we find the ones that are likely to amaze by disrupting expectancy.
Predictive Successful Content (PSC) draws on both to increase the chances of success of a movie ad. It is an AI-based method that generates consistent predictions about the chances of success of different types of narratives and different narrative elements, based on past results, while boosting the essence of creativity of a briefing.

PSC is a method to be used during movie and campaign planning.

How does it work

The PSC method draws on recent work of our team in neuroscience and artificial intelligence (Dias AM, et al, 2012-2018) to curate private and public movie ads databases, tag narrative types and narrative elements, extract data-driven outcomes for different target audiences as KPIs, and finally apply state of the art n-dimensional neural networks, with back-propagation, to extrapolate from correlation to prediction.

As one may note, the mere application of AI to movie ad success will render evidence-based patterns recommendations. Nevertheless, it is not always possible to combine, for instance, humor with 40-45% of pop music and 3-4 young adults inside vehicle, when aiming to reach a target audience of entrance-level cars; sometimes, it is not possible to enforce the usage of a single of element of these. There usually are indications from the client or the creative agency that should be followed, irrespective of departing from the outcome of predictive analysis. More than acceptable, these indications tend to be central to the originality of an ad briefing; these are the truly creative contributions that should amaze through novelty.

Recombining successful elements through AI may win battles, but will ultimately lose the war to someone that put the approach aside and just try to be creative.

With that in mind, we developed an approach that goes beyond the thoughtless application of advanced computational mathematics to publicity, as we learned to also identify and tag the truly creative elements of the briefing and implement them as higher order nodes (parent nodes) in our networks. By these means, the endpoints of the predictive analysis are selectively tailored to the proposal, without ever suffocating its pioneering properties.

AI-based predictive analysis emerges in PSC much more as a decision support system than a substitute to human mastery. And that's precisely what we believe our mission to be: assist the talented and the gifted to achieve even grander success, through artificial intelligence and neuroscience.

Subjective Brand Scoring

One of the main struggles involved in branding strategy is to determine its existential metaphors. Despite of the efforts of marketing departments and advertising agencies, the translation of expert´s ideas not always reflect what their audience actually have on their minds.

Solving this communication gap is not simple task due to its multifactorial nature, which may vary from aspects such as logo design to advertisement script writing. Nonetheless, a great share of answers to these problems lies below client´s consciousness and are not readily available for evaluation.

Subjective Brand Scoring© (SBS), makes a complete assessment over the conscious and subconscious aspects of brand-clients relationship, providing definitive resources for branding strategy insights and decision making.

In the next pages we'll give you an idea of how to foster the bonds with your target audience.

Typical questions that can be answered through SBS:

-What images are best related to my brand?
-Is my logo easily recognizable?
-What kind of feelings people have towards my brand?
-What concepts are best related to my brand?
-What is the real value of my brand on purchase decision-making?
-What place my brand has on people´s mind in comparison to my competitors?

Methodological approach

Our approach targets four fundamental domains, as explained below: cognitive availability, affective bonds, semantic networks & key metaphors; and financial aggregated value.

Cognitive availability

One of the first steps to evaluate branding strategy and relationship is to assess its availability on people's mind, answering the question: "Do people remember my brand?". Since people tend to make judgments about the likelihood of an event based on how easily an example, instance, or case comes to mind, spontaneous brand availability can strongly influence decision-making.
Cognitive availability is through specific memory and perceptional tasks, in which the individual is encouraged to spontaneously recall the brand name and recognize its logo or product.
The easiness in which the brand is remembered or recognized provides its level of priming, which lowers the entry barrier to covert attention and relevant information processing,
which are demanding in certain types of ads.

Affective bonds

Knowing what emotions mediate the relationship between the brand and the target audience is crucial for branding strategy and positioning. Since emotions have both conscious and unconscious aspects, we developed a methodology that assesses and integrates conscious and non-conscious measures of your client's feelings towards your brand.
Conscious emotional aspects are assessed through specific questionnaires, such as NET promoter score, global and relative likeability and psychophysical scaling, while unconscious emotional aspects are assessed through reaction time tests and psychophysiological evaluation, such as Event Related Potentials (ERP).
ERPs are time locked brain measurements that can accurately assess the cognitive engagement related to a certain stimulus, therefore representing a valuable tool for brand affective categorization.

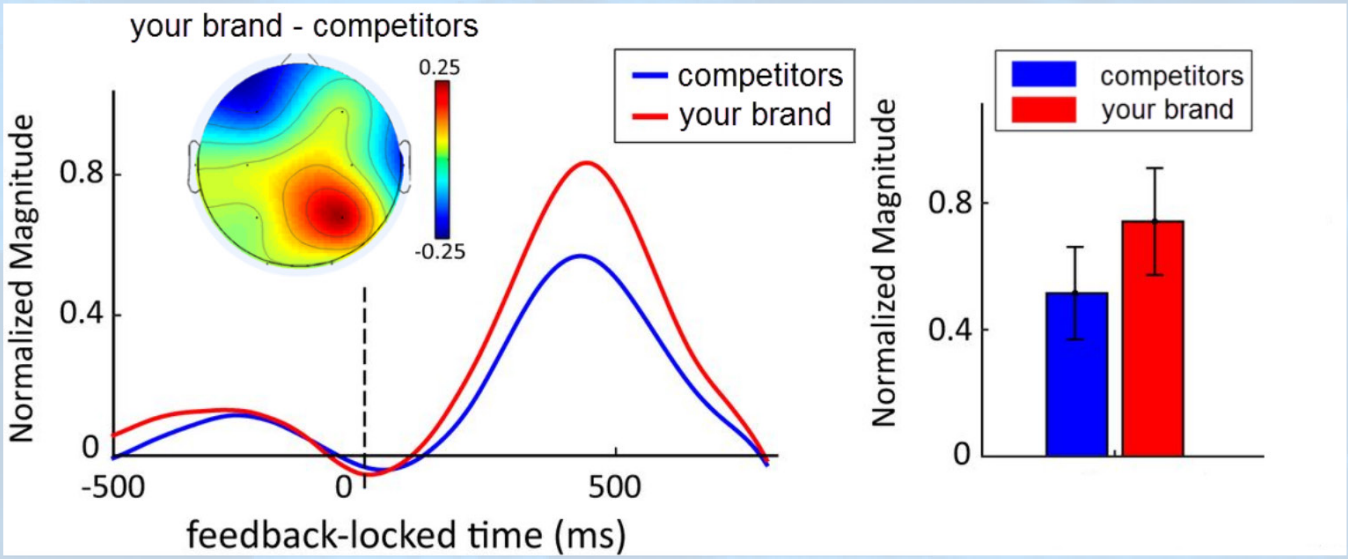
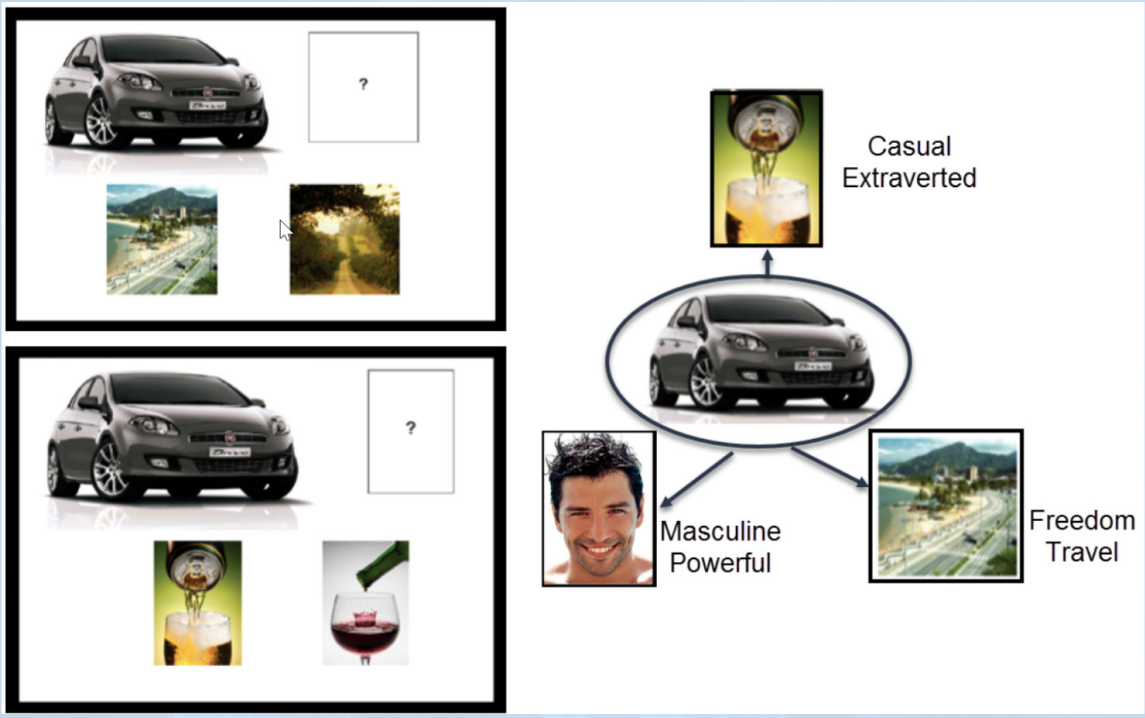


Figure II. ERPs in brand comparison.

Semantic networks and key metaphors

Each brand has its representations on semantic networks which mediate the relationship with their clients, our approach assesses which concepts and imagery comprise the existential metaphors of your brand, answering questions such as “What does water means for X?”.
Thorough non-declarative software-based assessments, concept-image association and other techniques, our research approach integrates the best of qualitative and quantitative assessment on a structured methodology to provide you with the most complete and useful inputs.



Financial aggregated value

Another parameter in brand study that we developed is the financial aggregated value of a brand, that is, how much does its mere tag adds to in comparison to a generic version of it. We created a software-based methodology and defined several parameters that serve to estimate a campaign’s preferred goals.

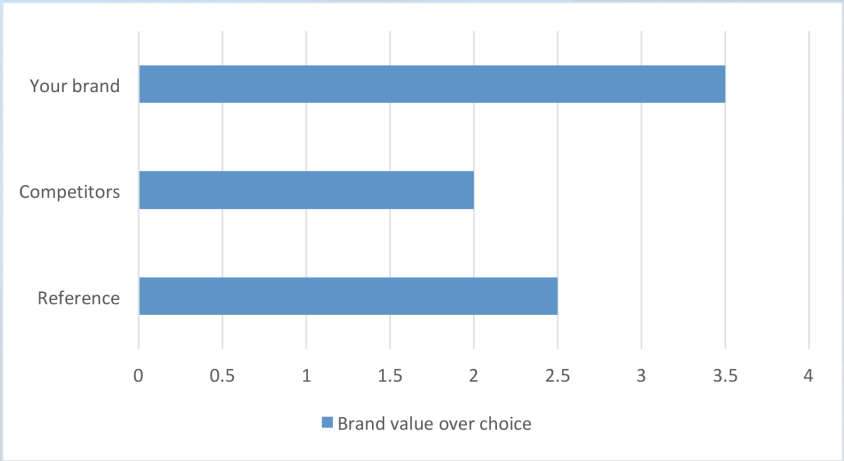


Figure IV. A graph from a real experiment on the aggregated value of a famous brand.

Final remarks

Here we show some of our main methodologies, pointed to papers where anyone interested in studying them can learn more and most importantly laid simple arguments about why certain practices should be endorsed and others shouldn't.
The WeMind Group has multiple divisions. Neuraltechnologies is certainly the most complex, demanding and science-oriented. We feel that it is our mission to give full transparency to our ideas and to work in a collaborative fashion with agencies and clients to explore the frontiers of communication.
In the academic arena we have applied principles as above to blood donation and other topics that usually only interest those working with social marketing.
In the end of the day, we want to meet good challenges and try to provide some insights into it. If these have a greater meaning, fantastic; if not, we'll try our best anyway.

Why hire us?

Neuroscience-based marketing research still didn't reach its full potential for two reasons: most projects are no more than poorly designed proto-scientific experiments; cost/benefit of adding sophisticated know-hows of any kind to ad construction tends to be negative, if the proponents have no idea on how to direct technologies to profit maximization.
Neurotechnologies is part of the WeMind Group. Our team joins internationally rewarded scientists, neuroeconomists, affective neuroscientist, AI experts and top-notch software engineers to deliver the cutting edge innovations, 100% market-oriented.

Come visit us at our offices in Atlanta, Paris or Sao Paulo, or just book an online demo.