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The challenge of Artificial Intelligence

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Abstract

It seems as if the current concern about the AI (Artificial Intelligence) is due to the fact that we intend to achieve a kind of universal panacea, a next-generation tool. Said tool would be destined to replace us in those mental or organizational efforts that are most painful for us (because they require a large amount of mental energy from us); although, it is a desire not exempt from fear of being subdued or displaced at some point (there are numerous dystopias in this regard), by this prodigious tool.

Both desire and fear seem unfounded to us, in view of the limited development that AI still has for these objectives, which leads us to think that it is neither a threat nor a panacea.

Because, we think, the AI is developing from copying learning patterns (for example, through the so-called "neural networks"), after observing and imitating the functioning of the human brain. It does this, often by ignoring or, worse still, confusing the rules of affective information processing; precisely because the most influential thinkers in this area of knowledge (Goleman, Mayer, Bar-On...) have not developed explanatory models of that affective processing of the information, which they have guarantees of success in that explanation1.

We offer a model of affective processing of information, which can give us certain guarantees of effective contribution to the current model of AI.

Finally, we express our reservations towards predictions that see AI as a threat or a panacea. Rather, we are inclined to consider that a correct study and correct advanced development of AI can provide us with ideas towards our own form of Natural Intelligence (NI), and with the advantage of offering us solutions for optimal functioning of the latter (NI), including dysfunctions.

Keywords: Artificial Intelligence, Affectivity, Emotions, Neuroscience.

INTRODUCTION

Where do we start from?

When we began our studies on affectivity (*, 1986), we tried to abide mainly by concepts firmly established in Psychology, so as not to enter into fields of confusion; for this reason, we start from authors with clear concepts that are generally accepted. Watson's starting point (Watson et al., 1965) seemed appropriate to us due to its simplicity that allowed us, apart from the ethical objections raised by his research, to begin a first analysis of these assumptions. By considering only three emotions, this allowed us to establish the first basic relationships between them, mainly with respect to their differences in relation to their destination objects, which would lead us directly to an observation of the nature of the affective bond, the which gives the more social dimension of affectivity –as opposed to the emotional experience: more subjective-. With this, we tried to overcome the manifestations of exclusively physiological theories, which seemed insufficiently explanatory for our purposes. With this background and purposes, we began the analysis of the small number of emotions that we had selected. In Figure 1 we show a representative scheme of said analysis.

During this analysis, when we looked at the type of relationship with the "object" that each of these three emotions had[1], we immediately noticed that there seemed to be a gap. Indeed, if we consider anger, rage, rejection..., it seems that an antagonistic

[1] *Anger, fear and attachment.*

relationship is established with the object, which tends to neutralise itself:

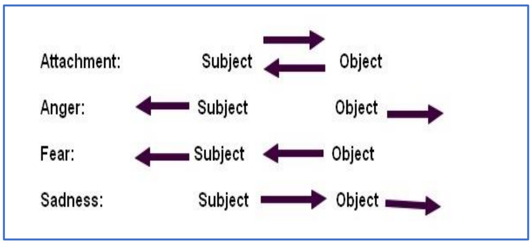

Illustration 1. Initial outline.

From this model, it seemed to be deduced that there was some kind of basic effect that followed the same scheme as the previous ones according to his logic. That affection could not be other than sadness, which seemed to occupy that mysterious empty place; just like when Neptune was discovered in 1846, thanks to the predictions of Le Verrier and Adams, based on the study of the orbits of the planets that was known then. They deduced in this way, to the conclusion that the anomalies in the orbits of the outer planets were due to the existence of a planet that had not been discovered, but that was there: shortly after Neptune was discovered, in the place where there had been predicted these researchers.

We then concluded that, in this scheme, we were missing an effect, the peculiarity of which would be that the subject is linked to the object while the object moves away, it had to be related to loss, and loss is known to provoke sadness.

We then came up with a model or paradigm of the functioning of affectivity, which could represent it as follows:

However, that was on the basis of Watson's model, what would happen if we started from other assumptions?
This model initially provided us with corroboration that affectivity evolved in human beings in stages. In addition, that it did so in a similar way to cognitive intelligence[2]since each of these basic emotions was attached to different objects at different cognitive stages, at least statistically speaking.

Later, when we decided to test the effectiveness of this model, some of the results obtained the first time were repeated, but new information was added, which gave us a new perspective (*** 2015). We based ourselves on the work of Galati and Sini (Galati & Sini, 2000) on semantic fields and on the work of Plutchik (Plutchik, 1980, 1983) and Panksek (Panksepp, 1982)[3].

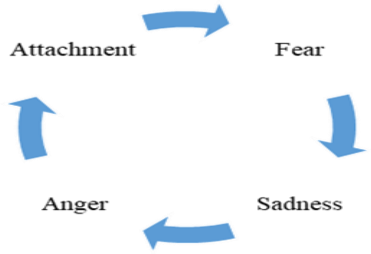

Illustration 2. Circular model.

This new perspective, which we called on that occasion the "semiotic method" (ibid), and which is based on grouping semantic families - or series of words that have a meaning that tends to be very similar or the same - led us to consider 6 pairs of basic types of emotions, instead of four. We based ourselves, on that second occasion, on the results obtained with our test, the T.D.E. (**, 2012), with a sample of 448 primary schoolchildren and 456 secondary schoolchildren (****, 2016).

“Negative”	“Positive”
Disappointment [expectations of each other] -][1]	Admiration [expectations of each other] +] [2]
Unhappiness/sadness/hopelessness/disillusionment/ boredom/abstinence/loneliness [“disabling” moods] [3]	Joy/happiness/hope/excitement/motivation/tranquillity/serenity [contributory moods]. [4]
Anger/hatred/enmity [segregating affects]. [5]	Love/family/empathy/sympathy/friendship/companionship [binding affects]. [6]
Guilt/shame/regret [position of self -] [7]	Pride [ego position +]. [8]
Powerlessness/fear/stress/anxiety/jealousy/insecurity [solidity of self -] [9].	Security/confidence [solidity of self +] [10].
Forced pleasure/sexuality [viscerality-sensuality -] [11].	Pleasure/sexuality [viscerality-sensuality +] [12].

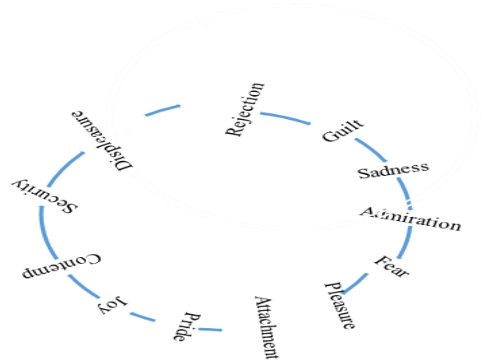

Illustration 3. Types of affects obtained with our semiotic method.

And using the above model of representation (itself derived from a critical selection of the answers given by our young people), we

[2] *We will call it this to distinguish it from what is currently defined by various authors as emotional intelligence, opposing this term to intelligence, in a more classical sense and even in colloquial language.*
[3] *Chapter: Brain Emotional Circuits and psychopathologies.*

could be left with a paradigm similar to the following (Illustration 4)

This methodology results in a graphical model similar to Plutchik's "circumplex model" (op. cit.), although we consider our model to be dynamic, unlike Plutchik's, which seems to be somewhat more structural and static.

Illustration 4. Wheel of affect types obtained from the semiotic method.

Once in front of this new model, which is somewhat disorganised, because the elements of the circle are randomly positioned (following the shape of our first four-element model), we decided to simplify it, in order to try to see it more clearly, by halving its components.

In this way, it has been easier for us to perceive an order between its component elements; and, furthermore, lexical oppositions can function, in practice, as a conceptual or practical whole. With these premises, the model could look like the one in *Illustration 5*.

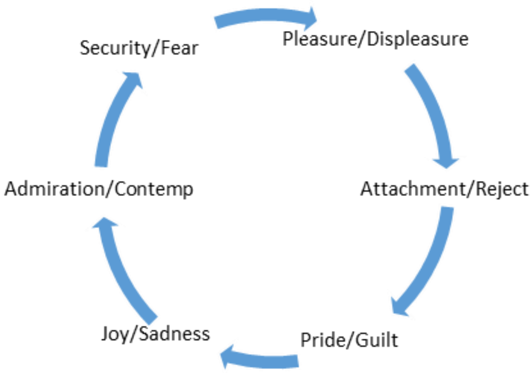

Illustration 5. Wheel of affects, grouped by opposing pairs.

Moreover, this model is best understood by breaking down its affect pairs into two different wheels:

a) First of all, we describe the situation that arises when events occur according to the will of the individual. It begins with the Recognition of the value of the object or Admiration for it; for if this is not recognised as "valuable", it is not possible for the subject to show any interest in the object. Thus the "starting" of the circle takes place. As a natural consequence of the recognition of the value of something or someone, it seems obvious that what occurs is the development of an Attachment or attachment to that "object". Once the circle is "set in motion", events follow by their very nature: the attachment is satisfying in itself and this produces pleasure; the pleasure is usually short-lived, then joy is usually experienced; this joy leads to self-confidence; the next step is pride and narcissism because of the satisfying relationship with the object. This successful chained process induces the person to look for new objects that trigger these successful events, thus returning again to the establishment of an attachment.

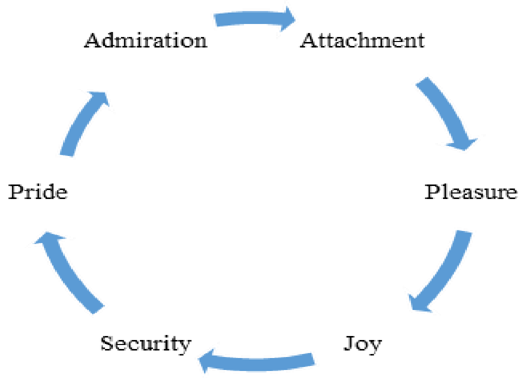

Illustration 6. Wheel of affects perceived as favourable by ego

The graphical representation of this rotation will produce a sinusoid, the exposition, and interpretation of which we will leave for later.

But the model also includes another "wheel": the one that starts with Rejection, which is described below:

a) When this will is not satisfied, the Rejection of something or someone produces displeasure - and not the other way round; this displeasure saddens, which leads to the feeling of unhappiness and later to guilt and, as an expression of Frustration: to contempt of the object towards the individual or subject. Later we return to Contempt; which is the cause of many Rejections; thus, the circle closes.

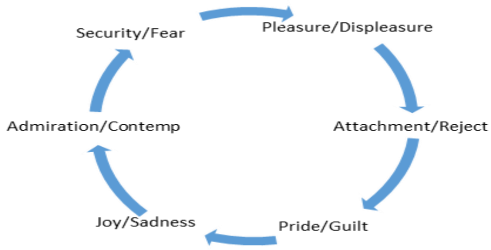

Illustration 7. Wheel of affects considered unfavourable by ego.

Phenomena that could produce the oscillations of affect, represented by circular movements.

But do these two wheels turn simultaneously? We think so, especially considering that a multitude of stimuli (Objects) usually act on us, with very different valences for our subjectivity. In addition, without a doubt, all of them can act simultaneously; although, luckily for him, our nervous system is capable of establishing priorities and deciding, at any moment, which stimulus is most relevant, or at least almost always capable of it.

Either way, we think that the important thing is to know that there are interactions between the influences that each of these stimuli – potential triggers of affections or emotions- exerts on us. And also that, frequently, this wheel suffers interruptions, and we would even say that it rarely reaches port happily, provoking with this procedure a kind of affective chaos, in the person in question; chaos that will be received with oscillations of more or less affectation, depending on the circumstances.

The final result will be a complex network of sinusoids, which intersect, interrupt each other, or influence each other; and that, in addition, they act in interaction with the cognitive way of processing information: cognitive intelligence. That is, a complex network of biorhythms that intersect and interfere with each other.

These sinusoids could be represented according to the following graph:

With a propagation velocity that would be governed by the equation $v=\lambda/T$ where λ is the wavelength and T is the period. Which would allow us to predict - if we know the amplitude (intensity of the affect) and the time T we are in - the period of the sinusoid, which would be equivalent to saying that we could predict how long that affect would last and at what time and how it would interact with others.

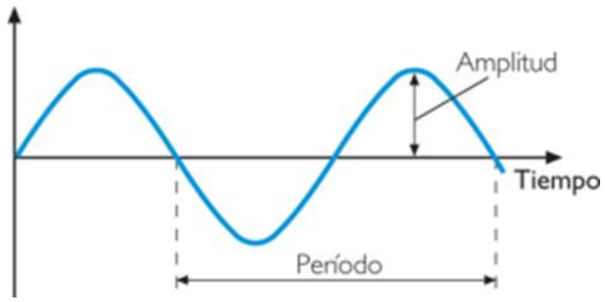

Illustration 8. Perfect sinusoid that is produced over time when the intensity of an element varies in oscillatory mode.

An added difficulty: the sinusoid is not perfect

Indeed, to sketch this model, we have assumed an element oscillating uniformly, along the timeline (x-axis), and this element is describing a harmonic curve in the usual way.

However, it can happen that:

a) If the wheel represents the oscillations of only one of the affects (e.g. fear), the manifestation of that affect in some or all individuals may be labile (for reasons that cannot be determined now, e.g. biological, characterological, environmental...). This turns the wheel into a flattened or bulging oval at some points, which will cause the resulting sinusoid to be irregular, although can be predicted its evolution if we can determine the "amplitude" variations[4] at any time[5].

b) Whether it represents the four affects as a whole. Each of them is likely to have a different pattern of intensity[6]; this means that its graphic representation - as in the previous case - nor is it a perfect circumference[7]. The sine curve will therefore vary in appearance and become more complex.

Of course, only interdisciplinary work can clarify the feasibility of this model, which is largely a mathematical model. We do not intend to predict behaviour 100%, but rather to establish more or less fine-tuned probabilities for it.

The two ways of processing information

And what does this have to do with artificial intelligence? Cognitive intelligence and affectivity represent two ways of processing the information that comes to us from the outside. The first deals preferentially with data received synchronously and the second with data received diachronically. What does this mean? Well, in the former, the response is produced based on syllogisms and with individualised responses to specific situations, and in the latter, the response takes shape with a predisposition towards some kind of response, and with standardised behavioural patterns for "types of situations".

Does this mean that when one of these two modes of information processing is at work, the other is not: it is stopped, i.e. that they take turns? Rather, daily experience and the most spontaneous observation seem to tell us that they overlap; or even that they "hinder" each other, although this qualification is generally attributed to the "affective mode", assigning them in these cases the role of undesirable: prejudices of exacerbated rationalism...

Instead of adding to these a priori, perhaps research should look into the ways in which these sine waves act, which we have here didactically assumed, for the moment, to be similar to those of electromagnetic waves. How do they interfere? Well, perhaps in the selection of stimuli to be observed, in the selection of responses, or, not surprisingly, in selecting the types of interaction that occur between stimuli.

The "neural network" models, on which artificial intelligence is partly based, test types of behaviour (in this case designated as types of response to stimuli) in order to predict them. If we take into account this new factor of the two modes of information processing - cognitive and affective - we will then have not only a prediction based on trial and error but also on mathematical patterns which, added to the previous ones, may increase the possibility of prediction accuracy.

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[4] *Intensity of affect.*
[5] *Another problem to be solved would be the unit of average to be used for this intensity and the instrument to obtain it.*
[6] *Together we could call it an "emotional profile" or "affective profile".*
[7] *Or circle.*

What is more important: they are two modes of information processing, qualitatively equivalent, and both equipotentially adaptive[8] and functional. We are not going to stop here to describe the cognitive mode of information processing, since this has already been done over and over again, even since Antiquity; for example, with Aristotle's Logic (Aristotle, 1972, 1982, 2016). However, here we are going to try a conceptual approach to the affective processing mode since it seems to us a new and unknown concept.

The affective mode

We have said that emotion is a form of information processing, but what is it, what does it consist of?[9] At a first approximation, it seems that emotions are a mode of processing, so that we have as many modes of processing, as we are able to experience. That is, if someone is in anger or fury mode, whereas if we are in fear mode everything will be interpreted as a threat. But this point of view should not lead us to the position of the peripheral theory of emotions, defended by James, Lange (Cannon, 1927) and others; or even the thalamic or central theory, defended by Cannon and Bard (Bard, 1928), among others. In these theories, the emotions are confused with visceral or organic reactions, depriving them of their character of sophisticated procedure of interpretation of, and action in reality.

But, what advantages or peculiarities does this form of processing reality have over cognition? In principle, emotion's approach to information is coarser and not very adjusted to small details, compared to cognition; which, on the surface, seems to give it more advantages over the latter. Nevertheless, if we reflect a little on the subject, we begin to see some advantages in emotion, at least in certain situations:

1. It is a faster way of reacting to stimuli, which is a skill that, if used appropriately, can be extremely useful in adaptive terms. However, this does not mean that, without training, overreacting emotionally can be catastrophic.
2. It saves a lot of energy by working with *perceptual configurations*, i.e. stereotyped situations, usually coming from the individual's previous experiences.

On a comparative level, we could also say that while cognition is by nature analytical and meticulous, emotion is globalising and holistic, not attending to questions of precision or unusualness, but to everyday questions that require the use of experience and more or less agile responses. We can say that, in contrast to cognition, emotion is synthesising and not analytical. Emotion offers patterns of behaviour, but also predispositions to interpret the stimuli (or configurations of them) of the environment in one way or another. So we can say that it also affects perception, as it helps us to decide in a few seconds whether what we have in front of us is a threat or an opportunity (as in the famous SWOT model) and to act or feel accordingly[10].

In short, it seems as if we are dealing with two processors inside our brain, which act in a coordinated way when everything goes well, although until now we have only been unduly concerned when something goes wrong.

In a certain sense, we could say that cognition and emotion (better to say affectivity) are two parallel and complementary ways of knowing; that is to say that, in a certain sense, both are cognitions with which we have arrived at a paradox, especially for the exalted of rationalism.

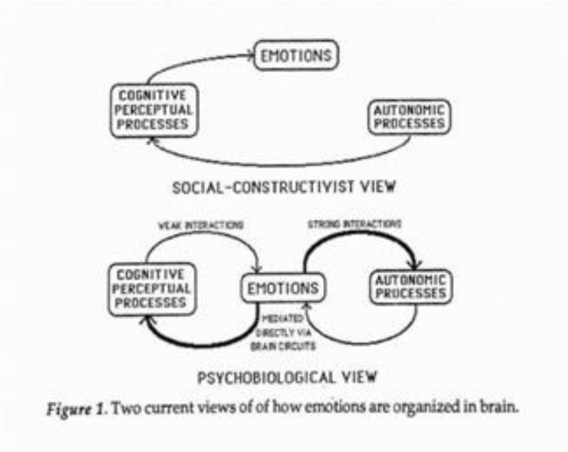

Figure 1. Two current views of of how emotions are organized in brain.

Illustration 9. Panksek's version.

Current studies linking Artificial Intelligence and affectivity

Thus, our proposal is to bring to the informational model of Artificial Intelligence, this double brain functioning, this double way in which our nervous system processes information; however, we have not found any proposal that goes in this direction.

Indeed, everything we have found that is similar to this proposal of ours is a pragmatic attempt to make the android robots that some industries are developing more credible (Masuyama et al., 2018; Xianyu Qi1, Wei Wang, Lei Guo, Mingbo Li, Xiaoyu Zhang, 2019). But if we delve into these proposals, the emotional component has in these cases a cosmetic value, to appear natural, but does not seem to play any role in helping or carrying out information processing. Therefore, we believe we are initiating a novel approach in the development of Artificial Intelligence.

All these studies start from Plutchik's 8 basic emotions: Fear, Anger, Joy, Sadness, Acceptance, Disgust, Expectation, and

[8] *Useful for adaptation to the environment.*

[9] *As Palma Muñoz (Palma Muñoz, 2009) tells us, following Solomon, that the subject positions himself before reality by making an evaluation (p.213), as well as reminding us how all this connects everyone with the world: "[...] the concept of engagement is fundamental in his elaboration of a theory of emotions. Emotions are implications of subjects in the world. Subjects are embedded in the world around them through their emotions. Through them, emotional agents position themselves in the world in a certain way; they make it present itself in certain ways that situate and guide the course of their action". Palma Muñoz (2009: 212).*

[10] *We thus abandon the old diatribe among interactionists as to whether cognition (Lazarus, 1982, 1999) or emotion (Zajonc, 1980, 1984) had primacy. In our case, it makes no difference whether emotion is a prior cognitive evaluation or not, as Lazarus wanted, since affect and cognition are considered here as two somewhat parallel forms of evaluating reality.*

Surprise (Plutchik, 1980: 259). For example Kaminska and Pelikant (Kaminska & Pelikant, 2012).

Others, like Prinz, reduce them to 6 (the Big Six, he calls them): Fear, happiness, Surprise, Anger, Sadness and Surprise (Prinz, 2004).

There are even those who, like Pansek, propose a model different from Plutchik's (Panksepp, 1982: 44). From this author we present here an outline of this model. In this model, however, the epiphenomenal character of affective processes is also emphasised - in our opinion, wrongly -.

Conclusion

In view of the state of theoretical research on affectivity, it seems that the delimitation of the number of emotions has been a driving force that has forced many researchers to reflect beforehand on what are emotions and what are other types of experiences, which can also be attributed to our psyche. In this sense, it seems that the main advances have emerged from the neuroscientific approaches to affect, arising from the initiative of Robert Plutchik and his "circumplex" structural model. However, the valuable contributions of this structural model, or those of other neuroscientific thinkers such as Pribram (Pribram, 1980), are self-limiting, as they are only interested in the expressive value of emotions and do not consider them as a form of knowledge.

However, some of these models only aim to give a realistic look to the expressions of android robots, to make them "more human", which are currently being researched and hardly commercialised, as in the aforementioned work of Matsuyama (et al.) and Xianyu qi, (et al.). Although there are other projects, somewhat more ambitious, but more ethically controversial, such as the iBorderCtrl project, based on the idea of an "emotional AI", whose objectives seem to be reduced to the police sphere and the control of migratory processes (Romano, 2023).

However, the model obtained by us, based on the phenomenological paradigm and the semiotic method of analysis, has not only provided us with a more accurate list of basic emotions or affects[11], but has also allowed us to understand, we believe, better what it means and what the main function of affectivity is. Not only in humans but in many other species.

For the structural approach, although it provides a wealth of knowledge about affective processes, this knowledge always ends up highlighting the role of emotions as witnesses of internal states of each individual - mainly biological internal states - whose description will be useful in numerous subsequent studies. However, by ignoring the meaning that these affects have for each individual, they do not adequately perceive the value they have for those who manifest and feel them, as instruments and capacities for interpreting and dealing with reality. In short: they are a form of cognition, parallel to that of cognitive intelligence, and are therefore essential for any emu8lation of human intelligence, and, as a consequence, for the development of an artificial intelligence that (apart from other practical issues) allows us to better understand the way our psyche perceives, interprets and transforms the world.

[11] *And, in our view, better explained.*

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