

Artificial Intelligence And Knowledge Representation Through The Use Of Emojis In Relation To Computational And Internet Semiotics

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Abstract

The proliferation of emojis in digital communication has sparked interest in their potential for knowledge representation in artificial intelligence (AI) systems. This study explores the role of emojis in conveying meaning and their implications for AI-driven communication. The aim is to examine how emojis can enhance knowledge representation in AI, with objectives to analyse emoji usage patterns, identify cross-cultural variations, and assess their semantic implications. Grounded in Ferdinand de Saussure's semiotic theory, this research views emojis as signifiers with culturally-dependent signified, allowing for an intensified understanding of their meaning and context. Using a mixed-methods approach, we analysed emoji usage data from diverse online platforms and cultures. Eight major emojis were identified and examined for cross-cultural variations in meaning. Findings reveal significant differences in emoji interpretation across cultures, highlighting the need for context-aware AI systems. The smiley face, for instance, conveys happiness in Western cultures but can signify embarrassment in Japan. The study's implications for linguistics include the need for more nuanced understandings of digital communication and the development of AI systems that account for cultural variations in emoji usage. Emojis offer a rich source of knowledge representation for AI, but their meaning is culturally-dependent. We recommend developing AI systems that incorporate emoji semantics and cultural context for more effective human-computer interaction.

Keywords: artificial intelligence, knowledge representation, emojis, computational semiotics, Ferdinand de Saussure

Introduction

Semiotics involves not only what we refer to as 'signs' in everyday speech, but of anything which stands for something else. Semiotics is not widely institutionalized as an academic discipline; it is a field of study involving many different theoretical stances and methodological tools. Eco, (1976) states that

'semiotics' is concerned with everything that can be taken as a sign. Semiotics is also an aspect of the field of applied semantics. That is, meaning interrogation that recognises the reconstruction and encoding social and cultural nuances of meaning in signs and the roles in communication in the real life of the society. Thus, semiotics is a discipline that examines how meanings are produced encapsulated and encoded in signs recognised by all members of the society. It is a discipline that represents theory and mode of analysis of the meaning systems prevalent in the society.

Semiotics is a means of communication which is beyond the explication of language. It is the totality of language dynamics. It is the aspect of communication in which context, object, symbols and signs are found as signifiers. The simple task of semiotics is to investigate sign notification pattern and structures in text. For example logo, colour, picture, etc.

Umberto (1976) gives a broad definition by stating that semiotics is concerned with everything that can be taken as a sign therefore, semiotics involves the study of not only of what we refer to as 'signs' in everyday speech but for anything which stands for something else. In a semiotic sense, signs take the form of words, images, sounds, gestures and objects. On the other hand, to the linguists, Cobley, (2001) in reference to Saussure's work, semiology is a science which studies the role of signs as part of social life. And for the philosopher Charles Pierce, (1931) semiotics was the formal doctrine of signs which was closely related to Logic (Peirce, 1931). He declares that every thought is a sign.

Contemporary semioticians study signs not in isolation but, as part of semiotic 'sign systems' (such as a medium or genre). They study how meanings are made; they are concerned not only with communication but also with the construction and maintenance of reality. Therefore, semantics as a branch of linguistics and semiotics have common focus of meaning. However, Sturrock (1986) argues that whereas semantics focuses on what words mean, semiotics is concerned with how signs work humans' life. For Oswald (2015), semiotics embraces semantics, syntax, pragmatics. According to him, he explains what linguistic derives from semiotics conceptualization.

Semiotics he believes has two major branches which include linguistic (personal) and non-linguistic (cultural). Communication is the meeting point for the two, which is the social aspect, this could be verbal or non-verbal. The levels of linguistic analysis include phonology (sounds patterning), morphology, syntax, semantics (meaning), pragmatics (how meaning is put in use within a context). The non-linguistics schemas include pre-linguistics, para-linguistics and extra linguistics.

Semiotic involves body language (kinesis), touch and signs (symbolic often known as Semeiology). The subject 'semiotics' was originally spelt 'semeiotics' to honour the English Philosopher John Locke who lived between 1632-1704 who in an essay concerning human understanding in 1690 first coined the term 'semiotike' from the Greek word 'semeion' meaning mark, or token or sign. Generally, semiotic is the study of signs or an epistemology about the existence or the actuality of sign in societal life.

Many pioneers, researchers, practitioners and authors of semiotics such as Ferdinand de Saussure, Charles Peirce, Roland Barthes, Roman Jakobson, Charles Morris and Umberto Eco (Eco, 1979; Leeds-Hurwitz, 1993; Panuti & Zoest, 1996; Chandler, 2002) have agreed on the simple definition. For understanding and clarity, semiotics accounts for everything that can be seen or be interpreted as a sign as postulated by Umberto Eco (1976) in his book entitled *"A Theory of Semiotics"* indicated that *semiotics is concerned with everything that can be taken as a sign*.

In the development of the modern semiotic history, there are two pioneers from Western countries who have made big contributions towards the respected fields, namely Ferdinand de Saussure (1857-1913), a linguist from Switzerland and Charles Sanders Peirce (1839-1914), a philosopher from America.

The primary focus of Saussure's theory is the principle that emphasized language as a system of sign and besides language there are many other sign systems that exist in the world of mankind. However, in his opinion, the system of linguistic signs or language is the most superior sign system compared to other sign system that exists in the real world because it plays an important role in constructing reality.

He focuses on the underlying system of language (langue) as compared to the use of language (Parole or speech).

Terminologically, Saussure proposed the word semiology conceptually, according to him; a sign consists of two focal components, namely signifier – the sound pattern (maker-sound image) and signified – the concept (the outcome or the interpretation or conception of the signifier). *The relationship between signifier and signified is known as signification.*

Example I: A pen is a sign (i.e. letter p-e-n). The signified is the object itself while what I am holding is a signifier.

Example II: The word ‘open’ (when it is invested with meaning by someone who encounters it on a shop);

- **a signifier:** the word **open**
- **a signified concept:** that the shop is open for business.

Apart from signifier and signified, Saussure’s concept of dichotomy also refers to form and content, langue and parole, synchronic and diachronic as well as syntagmatic and paradigmatic associative.

- **‘Langue’** refers to the rules of language learnt by the users.
- **‘Parole’** refers to the actual utterances from the language users.
- **‘Form or structure’** refers to the fact that language is a symbolic system through which humans communicate and that language is made up of structures in which the individual parts become meaningful when they are related but meaningless outside the structures.
- **Paradigmatic and syntagmatic relation** also deal with the two relations in linguistic analysis. While the former reveals how words can be replaced with another and is seen as axis of choice, the latter reveals the relationship in presential and seen as axis of combination (sequence or chain).

Review of Related Literature

Chandler (2002) opines that Charles Sander Peirce is well known as a pioneer of pragmatism doctrine who has provided the basic in the general theory of signs through his writings and texts that have been compiled 25 years after his death in a single comprehensive piece of work. The main principles containing his theory are the human mind and sign boundaries, the three-dimensional system (triadic) and the relativity regarding the three typologies or taxonomies of signs (icon, index and symbol). He considers anything that can point to something else other than itself as a sign. To him, sign is not the smallest unit but anything that is imaginable, recognised and sensed. That thing may be simple or complex, but stands for something else in order to produce a meaning.

For example: A picture of a teacher known in a college and hanged on the wall. The teacher himself is the icon; the picture can be seen as an index or symbol of whom the teacher is. Also, a smoke is an index of fire. Fire is the icon. The cloud is an index of rain, the lightening is also an index of very stormy rain.

Pierce also observed that sign has three dimensions which are representament, interpretant and object. Representament refers to the form of a sign such as drawings, sneeze and so on. The interpretant refers to the mental image that a sign has in somebody’s mind while the object is that which the sign refer to. Therefore, the main goal of semiotics is the investigation of signification patterns and structure in texts identified and analyzing them. Its pre-occupation lies with meaning conveyed through any medium whether verbal or non-verbal and the study and description of signification.

However, its weakness lies on the fact that rather than being an independent academic discipline, it is a complex amalgam of wide range of studies. Some scholars have worked on different typologies of semiotics. For example: Osisanwo (2009) works on ‘A Pragma-Semiotic Analysis of ‘Aroko’. The Yoruba means of symbolic communication. The study sees Aroko (a Yoruba traditional way of coding and decoding messages through the use of objects) as one of the varieties and variation in communication.

Solusa (2009) works on Literary Semiotics Analysis of Drum Poetry: metaphor, imageries. Signs

and code were displayed in the use of drum in the study. Hou (2013) worked on the semiotics of internet celebrity in the content of multimodal media representation and super diverse semiotic repertoires. It identifies lyrics, beat, dance-gestures, characters, objects and places as the major semiotic modes of expression in the video.

Oloruntoba-Olu (2000) worked on understanding semiotics and he really delved into the origin of semiotics, important moments and all the rudiments in semiotic. According to Chandler, (2014), semiology is a branch of semiotics science which studies the role of sign as part of social life. Semioticians study sign not in isolation but as part of semiotic 'sign-system' (such as a medium of genre). They study how meanings are made and not only concerned with communication but also with the construction and maintenance of reality. For the philosopher Charles Peirce semiotics was the formal doctrine of signs which was closely related to logic (Pierce 1931 to 1958). This is seen in the use of emojis on social media conversations. Referential use of language implies how signs are used to refer to certain items. A sign is the link or relationship between a signified and the signifier as defined by Chandler (2014). The signified is an entity or concept in the world, while the signifier represents the signified.

For example:

Signified: the concept "chair" signifier: the word "chair"

It is the relationship between the two that gives the sign meaning. According to Chandler (2014), the study of signs is the study of the construction and maintenance of reality. Semiotics as earlier observed involves the study of not only what we refer to as signs in everyday speech, but of anything which stands for something else. In a semiotic sense, signs take the form of words, images, sounds, gestures and objects.

Semiotics is important because it can help us not to take reality for granted as something having a purely objective existence which is independent of human interpretation. It also helps us to be aware of reality as a construction of the reality of individual's roles played in a situation, and further helps us to know that meaning is actively created according to a complex interplay of codes on convention of which we are normally unaware (Chandler 2014).

Research reveals that people use emojis in addition to expressing emotions, perform pragmatic functions such as assisting message interpretation, avoiding misunderstanding or substituting textual expressions using graph icons or supplementing textual messages in different contextual environments. This study therefore examines how emojis helps in communication, their interpretation and implications, using artificial intelligence and knowledge representation in order to understand the roles of signs as part of social life as Saussure declared. It further examines the structure in which communication takes place.

Theoretical Framework

The theoretical framework upon which this work is hinged is the theory of Ferdinand de Saussure the theory of sign. This theory was published posthumously in 1916 in his book "*Course de linguistic generale*" (course in general linguistics). This theory is chosen because apart from the fact that he developed theories of language structure, where he observed that language is a symbiotic system through which humans communicate, his theory of sign which is made up of the signifier and signified is appropriate for this study.

The main justification for choosing Ferdinand de Saussure's semiotic theory as the theoretical framework is that it provides a foundational understanding of signs (like emojis) as having a signifier (the emoji symbol itself) and a signified (the meaning conveyed by the emoji). Saussure's theory emphasizes that the relationship between signifier and signified is arbitrary and culturally-dependent.

This fits the study because emojis are visual signs with meanings that vary across cultures. By applying Saussure's framework, the study can analyze how emojis convey meaning differently in various cultural contexts, informing how AI systems interpret and represent emoji-based knowledge.

Artificial Intelligence and Knowledge Representation

Artificial intelligence is a branch of science which deals with helping machines which finds

solution to complex problems in a more human-like fashion. It generally involves borrowing characteristics from human intelligence and applying them as algorithms in a computer friendly way (Adeyemi and Ajayi, 2022). It is a part of computer science concerned with designing intelligent computer systems. That is, systems that exhibit characteristics we associate with intelligence in human behaviour, understanding language, learning reasoning, solving problems and so on.

Knowledge representation is a field of artificial intelligence, dedicated to representing information about the world in a form that computer system can use to solve complex tasks such as having a dialogue in a natural language. However, for this study, we are considering the structuralism approach which is concerned with the deep structure seeking to explore the use of signs in specific social situations.

Origin of Structural Semiotics

The Swiss linguist, Ferdinand de Saussure (1857-1913) was a founder of linguistics, and also of semiotics in his *Course of General Linguistics*. Saussure was a key figure in the early development of semiotics. Others were the American philosopher Charles Sanders Pierce (1839-1914) and later Charles William Morris (1901-1979) who developed behaviourist semiotics. Leading modern theorists include Roland Barthes (1915-1980), Algirdas Greimas (1917-1992), Yuri Lotman (1922-1993), and Christian Metz (1931-1993). Structuralism is an analytical method which has been employed by many semioticians and based on Saussure's linguistic model. Structuralisms aim to describe the overall organization of sign systems as languages. They engage in a search for deep structures underlying the surface features of phenomena.

Piaget Semiotics

Piaget is another scholar in structuralist semiotics. According to Piaget (1971), language has a structure. She postulated the structure of structure and that the main properties of structure are wholeness, self regulation and transformation. Wholeness implies completeness. It indicates internal coherence. Self-regulation refers to the internal rules with which the structure regulates its behaviour. For example, rules of concord in English. Transformation refers to the fact that the structure has mechanisms for constant internal regulation. Therefore, semiotics concerns itself with how a few set of rules account for all the occurrences in the structure.

The two types of signification relationships are syntagmatic and paradigmatic relation. They are systems that produce meaning in language. According to Culler (1981) in Ferdinand de Saussure paradigmatic relation are the oppositions between elements that can replace one another, it refers to a vertical obtaining between an item present in a sequence and similar items that are not present, syntagmatic relationship on the other hand refers to the horizontal association of elements in a text of chain in linguistics. It has to do with the ordering of elements in a text.

Computational Semiotics

Computational semiotics is a quite new field of research, which emerged from advanced studies on artificial intelligence and intelligent systems. It is an alternative to the mainstream approaches – those based either on cognitive or on biologically inspired techniques. Instead computational semiotics seeks its inspiration on semiotics, a tradition on the philosophy of mind, dealing with the concept of representation and communication from a more technical perspective.

The Internet

The internet is an electronic medium which presents a channel which facilitates and constraints the ability to communicate in ways that are functionally different from those found in other semiotic situations.

Internet and digital media have broken the boundaries across the world to take to others who live in the other corner of the world, it has also removed the barriers of communication through the development of Emojis to make it an effective and instant tool to express and state their ideas and thoughts through images and icons instead of going through the hard process of word construction alphabetically.

The word written as Emoji is an English language expression for the Japanese word. In the Japanese language the letter 'e' stands for 'picture' and moji means 'characters'. By combining these two will become 'picture character'. An Emoji is an icon or a digital symbol used as a text in electronic communication to express an idea, thought, opinion and emotion. They are tiny and colourful emotive characters designed to add an emotional nuance to the simple texting process. It is an image representing a situation through symbol or sign.

Digital is the in-thing today in the world. Consequently, the Emoji has turned out to be an essential instrument of communication and may likely become a lingua Franca for the ages to come. For example, on May 18th in 2018, the US-based Consortium launched the new 10th version of the computer-based text which also included the Emoji. This made the users excited to use approximately 1900 Emojis as medium of communication.

It should also be noted that cultural and racial sentiments are attached to the use of Emojis. Below are some examples of Emojis used by difference individuals, extracted from the *Journal of Review of Education, Administration and Law (REAL)* by Mushtaq and Sumaira (2020).



According to Maryan E., Mushtaq, F., Sumaira and Shahzadi, H. (2020), in different countries, the use of different Emoji icons is banned due to cultural and religious sensitivity. The most sensitive Emoji to be discussed here are the horn Emoji, the hug Emoji, thumbs up Emoji, folded hand Emoji, waving Emoji, winking eye Emoji and double chin Emoji. The horn Emoji raised the controversy after its release through different phone companies where Apple Company and Google were on the hit list. In many western countries, the horn Emoji is considered a good luck sign or considered a sign to avoid bad omen, bad luck

and evil eye. The popularity of the horn Emoji has been found in different countries such as Italy, Greece, Argentina, Colombia, Cuba and Spain.



Figure 1: Horn Emoji

The horn Emoji on one side presents a symbol of good luck for the people of many countries but on the other side is considered as an allegation at a particular individual who had cheated on his or her partner. This seems something strange and absurd but undeniably true. In most of the Asian countries, the use of the horn Emojis is banned due to the sensitivity attached to it. The cultural sensitivity attached to it has urged many companies to remove or replace the horn Emoji from the Emoji list which is still a very controversial issue among the users.



Figure 2: Waving hand Emoji

The waving hand Emoji expresses a goodwill gesture to say fare well and valediction. It is use to say good bye and also denote to meet again at several occasions. The waving hand Emoji also denotes goodnight at the same time and many users have been noticed using the waving hand Emoji likewise. But a major allegation has been put on the use of waving hand Emoji due to cultural diversity as in Chinese, the waving hand Emoji is interpreted as a sign of breaking the friendship off and in many countries of Asia the waving hand is considered to be a symbol for curing someone or to abuse someone at several points. The Asian avoid using the waving hand Emoji and instead prefer to mention and write the exact linguistic express of good-bye.



Figure 3: Thumbs up Emoji

The thumbs-up Emoji is often used at many events to express willingness and agreement. The gesture has gained a lot more popularity among many countries around the world and is recognised as the ultimate icon to express the affirmation for an agreement. But still many curiosities have been attached to the thumbs-up Emoji across many cultures. In many countries, it is considered an abusive sign and most probably means sit on it which is a very offensive gesture for Nigerian, Iranian, and Iraqi and for Afghans.

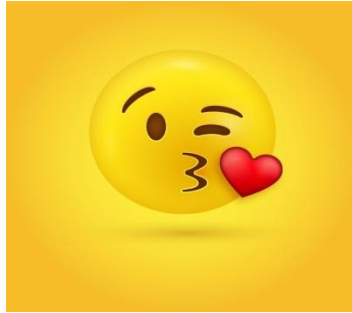


Figure 4: Winking eye with kiss Emoji

The winking eye with a kiss has now been recognised as a platonic expression to express deeper love in different situations. Interestingly the use of winking eye with a kiss is famous among different groups of people around the world. The people belonging to different age groups express it differently in comparison to the other; as people of twenty-five to forty age groups use it to express love in a relationship such as among boyfriends and girlfriends; married couples and lovers. Whereas people around forty to fifty-four age groups use it as an expression to flirt message.



Figure 5: Folded hands Emoji

The Folded hands Emoji is a very complex one for users across the globe. The Folded hands Emoji has many interpretations across the world as many take this gesture as thanking someone. Whenever the user types in “Thanks” this particular folded hand Emoji pop up which confuses the users to use it instead or not due to its complex interpretation according to cultural coding. This particular Emoji has multiple meanings such as one can get confused assuming it as a gesture to thank someone, as applause or clapping for appreciation; as an ironical fold to feel sorry at a situation; literary sorry or pardon after a situation to express regret; two people or friends high-fiving; prayer or blessings. In originality, the folded hand Emoji is a Japanese gesture to say “thank you”.



Figure 6: Hug Emoji

The Emoji representing a hug is also very controversial one. The hug Emoji according to many users across different cultures and countries convey different meanings. To some of the users, the hug Emoji refers to a funny shrug such as represented by a clown to amaze someone at the party at certain occasion while to some other users, it is something with the weather condition. In originality, the Emoji is designed to give a hug to some loved one as a sign to express love.

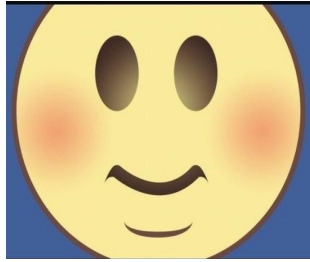


Figure 7: Feeling Fat Emoji

The controversy arises in understanding the meanings of the Emoji famous as feeling fat Emoji. To many of its users, the confusion is raised by interpreting it as a feeling or not. The feeling fat Emoji according to many is body shaming where fat people are humiliated and ostracized by other emoji icons.



The last controversial Emoji is the peace sign Emoji. For many years, the sign is considered to relate victory and as a peace-seeking sign. This sign is very popular among its users across the global village. But this peace sign Emoji is banned in the United Kingdom. The use of the symbol or the peace sign Emoji is considered as an abusive mark according to Maryan, E., Mushtaq, F, Sumara and Shahzadi, H. (2020).

Conclusion

Issues of artificial intelligence and knowledge representation are best projected through the use of Emojis. However, there is need to understand the intended meaning the Emoji icons generate in communication. There is complexity of interpretation when people from diverse cultures use Emoji icons in their communication. Although, language is the highest means of communication, but it differs according to area, dialect, culture, religion etc. Some Emojis may be seen as taboos in some cultures while in others the same is socially acceptable. Hence, acceptance or rejection highly depends on social construct behind the specific Emoji, difference in the mind-sets of people and the difference in subjective perceptions.

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