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# Characterizing Fake News: A Conceptual Modeling-based Approach

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**Abstract.** For some time, and even more so now, Fake News has increasingly occupied the media and social space. How identify Fake News and conspiracy theories have become an extremely attractive research area. However, the lack of a solid and well-founded conceptual characterization of what exactly Fake News is and what are its main characteristics, makes it difficult to manage their understanding, identification, and detection. This research work advocates that conceptual modeling must plays a crucial role in characterizing Fake News content accurately. Only by delimiting what Fake News is will it be possible to understand and manage their different perspectives and dimensions, with the ultimate goal of developing a reliable framework for online Fake News detection, as much automated as possible. To contribute in that direction from a pure and practical conceptual modeling perspective, this paper proposes a precise conceptual model of Fake News, an essential element for any explainable Artificial Intelligence (XAI)-based approach that must be based on the shared understanding of the domain that only such an accurate conceptualization dimension can facilitate.

**Keywords:** Conceptual Modeling · Characterization · Fake News · Explainable Artificial Intelligence

## 1 Introduction

Conceptual modeling is a discipline that contributes rich and diverse results when applied to well-understand the conceptual support of a particular domain of interest. One domain especially interesting nowadays is the Fake News one. Although Fake News is not a new phenomenon [20], questions such as why it has emerged as a global topic of interest and why it is attracting increasingly more public attention are particularly relevant in our times. The leading cause is that fake news can be created and published online faster and cheaper when compared to traditional news media such as newspapers and television [18]. In addition, recent discussions of higher education’s failure to teach students how to identify Fake News have appeared in leading newspapers [14].

Conceptual Modeling should play an essential role to understand and communicate what Fake News is. In a sound Information Conceptual Modeling context, a correct data management of Fake News must be supported by a precise conceptual characterization of “what” a Fake News is. This is where Conceptual Modeling becomes a crucial actor. If an information structure must represent a conceptualization, the entities that represent that conceptualization must be explicitly determined. Any information system intended to register information about Fake News must identify in detail what are the relevant entities that conceptually characterize the different dimensions that must be considered to treat Fake News data correctly. Ontologically speaking, a precise ontological commitment that involves a precise identification of the relevant entities that constitute the conceptualization must be stated. Our previous work has focused on exploring what are the concepts that should be considered for achieving that purpose. In this paper we introduce the result of such an ontological analysis, presenting a conceptual model of Fake News. This is the main contribution here addressed, by facing a fundamental question regarding the terminology and the ontology of Fake News: what constitutes and qualifies as Fake News?.

To achieve that goal, in Section 2 we discuss the literature and show that the views on the concept of Fake News are not unified. On the way to propose the conceptual model of Fake News, Section 3 explores the key notions that must be taken into account when the goal is to provide a sound conceptual characterization of the Fake News notion. As a consequence, a precise definition of Fake News is proposed, and a Fake News Conceptual Model is presented in Section 4. A discussion of the application of this conceptual model as an initial building block for an XAI approach is provided in Section 5. Concluding remarks and the list of used references complete the work.

## 2 Related Work

In recent years, different works were interested in studying and understanding the nature of information encompassed in Fake News. Indeed, to help online users identify valuable information, there has been extensive research on establishing practical and automatic frameworks for online Fake News detection [2, 25, 24].

An important element is to be able to identify very clearly what is a Fake News or what are the principal features characterizing it. However, what we can notice first in the literature is that the concept of Fake News is still ambiguous, and the frontier between the definition of Fake News and other related concepts, such as mis-information, des-information, hoax news, propaganda news, etc., is blurred. Indeed, as it is illustrated by some categorization examples [20, 21, 11], it is not always clear or precise how these different concepts are related, or how we can distinguish between them. On the other hand, as we can see in Table 1, several definitions of Fake News have been proposed in the literature, most of which include falsehood and the news form as common factors. Even if it can be argued that there is some common intuition on what a Fake News is, what we

can note is that it is difficult to have a consensus and a unified vision on what “exactly” -conceptually-speaking- a Fake News is.

Definitions	Reference
Fake News is a news article that is intentionally and verifiably false.	[18]
Fake News are intentionally false news published by a news outlet	[25]
Fabricated news articles that could be potentially or intentionally misleading for the readers	[15]
News articles that are intentionally and verifiably false, and could mislead readers	[1]
Fabricated information that mimics news media content in form but not in organisational process or intent	[12]
Fake News are fabricated stories presented as if they were originating from legitimate sources with an intention to deceive	[10]

**Table 1.** A Sample of Fake News Definitions

A recent work has proposed a first step towards a characterization of Fake News [13]. It introduces a taxonomy of operational indicators in four domain (message, source, structure, and network) to distinguish seven types of online content under the label of “Fake News” (false news, polarized content, satire, etc.). The proposed characterization is of interest, but it is not based on a precise conceptual model, which is our contribution in this paper. As a representation that captures the conceptualization of a person’s understanding of a domain, a conceptual model is the natural strategy for obtaining a reliable representation of the domain that is used by human users to support communication, discussion, negotiation, etc. In our context, it allows us to define a domain with specific and precise semantics. Moreover, the conceptual model will expose the relationships between the concepts composing the Fake News in a more informative and robust way, which will offer a reliable and practical means for the detection or even automatic generation of Fake News. In this line, [22] have proposed a conceptual model to examine the phenomenon of Fake News. Their model focuses on the relationship between the creator and the consumer of the information, and proposes a mechanism to determine the likelihood that users will share their Fake News with others. In contrast, in this paper, we are particularly interested in the conceptualization of the content of Fake News.

A further advantage of relying upon a conceptual model is its ability to facilitate building well-justified and explainable models for Fake News detection and generation, which, to date, have rarely been available. Works as [4] explores and integrates the use of ontologies (OWL-based) trying to detect fake news on social media by identifying contextual features for news articles. However, as it was emphasized by [25, 23], despite the surge of works around the concept of Fake News, how one can automatically assess news authenticity in an *effective* and *explainable* manner is still an open issue, especially due to the lack of the precise conceptual characterization of the Fake News concept that this paper advocates.

Facilitating explainability and interpretability has been of great interest in artificial intelligence and machine learning research (see for instance [6, 7]). Indeed, eXplainable Artificial Intelligence (XAI) is recognized as a major need for

future applications. It aims to produce intelligent systems that enhance the confidence of users to understand the underlying reasoning and automations [9, 3]. For Fake News context, to our knowledge, works involving explainability feature within Fake News detection methods are still at their beginning [17].

In this paper, we propose an original approach to contribute to understanding what is a Fake News. Our proposal is novel at different levels. First, we offer to characterize Fake News content by relying on a Conceptual Model. A conceptual understanding of Fake News will help us distinguish them better and rule them from real news. A well-grounded conceptual characterization would make feasible to go beyond what the classical approaches normally do, by opening the door to design a Fake News generation process fully guided by the Conceptual Model. More precisely, we follow the XAI-based process proposed by [19] to facilitate building well-justified and explainable models for Fake News generation. Our aim is to propose an approach that is understandable, trustable and manageable to humans, as suggested in [8]. More specifically, the different steps suggested by [19] are: (i) Get a shared understanding of the domain, (ii) Understand the task and select the right scope, (iii) Collect the right data and improve its quality, (iv) Select AI techniques that deliver results, (v) Generate good explanations, and (vi) Evolve the solution over time. Our contribution establishes the foundation of such a process by solving the first, essential step of getting a shared understanding of what a Fake News is by introducing a precise conceptual model of Fake News. From that sound conceptual basis, the rest of the proposed XAI process can be applied in a reliable way. The explainability with our approach is conceptually guided by the conceptual model which conforms the core of the contribution: to have an ontologically well-grounded definition of what a Fake News is, which is directly derived from the conceptual model.

### 3 Characterization of Fake News

We briefly present our definition of the concept of Fake News and a summary of the essential semantic elements to be considered in the characterization of the concept of fake news. Both have been proposed and discussed in a previous publication [5] and we invite the reader who wants more details to consult it.

**Definition 1 (Fake News).** *A Fake News is false but verifiable news composed of false facts based on real ones. Drafted in a way to trigger an emotional load, it aims to deceive its readers and influence their opinion through an implicit conclusion.*

Among the highlights that have been identified, one concerns the origin of fake news. Indeed, in the same way that a cyber-attack is rarely the work of a single person but rather that of an organized group or even a state service, fake news is rarely created by an isolated person. However, identifying the chain of creation of a fake news allows us to understand what objective it serves, and therefore to better understand and counter it. Thus, a conceptual model of fake news must be able to take into account the entities that were involved in the

creation of a fake news and the different levels of decision-making involved. For example, at the moment fake news targets pro-Ukrainian political figures. This is part of an operational context aimed at manipulating pro-Ukrainian opinion and part of a strategic vision that seeks to justify the Ukrainian-Russian war.

Fake News is usually built on a distortion of reality. Representing this distortion is a second point of interest for the characterization of a fake news. Indeed, even if we can find fake news totally false, most of the time they are built by mixing true facts and false facts. This increases its credibility. The thinner the border between the two, the harder the fake news is possible. The real facts can take different forms. For instance, real facts can come from a political statement, an event that occurred, or real data such as a photo or video. In the same way, there are different forms of false facts. Indeed, as mentioned earlier, false facts may not be based on any real element. This makes it less credible. Other times, the false fact may be constituted by distortion of real elements. Photos or videos can be altered, articles can be falsified. Finally, one can take them out of their context of real facts for example, or associate several real facts but independent of each other.

In order to reinforce the credibility of a fake news, their authors often use an authority. The latter can be of different nature but its objective is always to reinforce the realistic side of the Fake News by relying on a reassuring element. This authority can be of three types: internal, external or false. In the first two cases, the authority is real. For the first one, the authority can be a person or an entity in direct link with the subject carried by the Fake News. In the second case, it may be a reference to a historical authority whose word or deed is considered true and safe. Finally, in the last case, the authority may be totally invented or its field of competence may have nothing to do with the information carried by the Fake News.

Fake news is constructed to influence the opinion of its target by generating an emotional charge. The reaction of the target leads him to draw certain conclusions and to change his opinion on a subject. That is the objective. Identifying the latter and knowing who the fake news is aimed at is therefore a challenge in order to try to counter it.

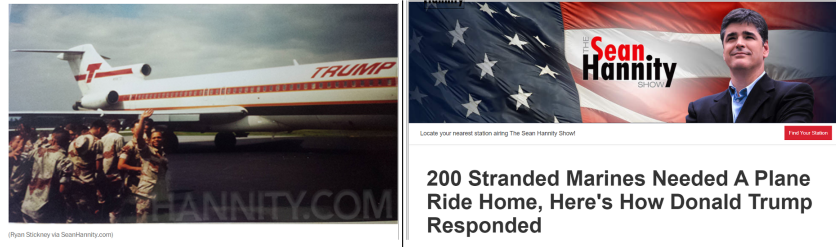
Thus, in a conceptual model, three aspects need to be addressed: the target, its opinion on a topic and the way in which the fake news will change it. It can seek to strengthen or weaken it. We talk about the goal of fake news. The human mind can be seen as a two-tiered system. The first is instinctive, almost automatic. It reacts to perception, to emotion. The second is slower, more analytical. Fake news takes advantage of these two systems. It generates an emotion which makes the first system react. Then, in a second step, the second system analyzes the reaction to the emotion and to what generated it and draws conclusions. A fake news must therefore be able to trigger an emotion. It does this by a catalyst mechanism. Then, the target of the fake news reacts to this emotion and goes where the fake news wants to take him. A conceptual model must therefore be able to capture this mechanism.

The conceptual model that we present is articulated using the three main dimensions of: (i) identification of the origin of the fake news (the 'attacker' dimension), (ii) the relationship between true and false fact (the 'fact' dimension), and (iii) the target including opinion and reactive emotion (the 'target' dimension). They all together vertebrate the conceptual model of Fake News that we present in the next section.

## 4 Conceptual Model

In this section, we present a Fake News conceptual model. It captures the main points of view identified through Section 3. The *Attacker sub-model* describes the context in which the Fake News is created. The *Target sub-model* allows designing the target population of the Fake News and the psychological effects generated by it. The *Fact sub-model* allows specifying the real fact on which a Fake News is based and the way it will be altered to produce the desired psychological effect.

To illustrate this section, we draw on an identified Fake News that was disseminated during the 2016 U.S. presidential campaign: it was published by a Donald Trump's supporter named Sean Hannity and stated that Trump helped 200 marines to come home after Iraq war as illustrated by the Figure 1.



**Fig. 1.** Fake News stating that Donald Trump helped 200 Marines return to the US

### 4.1 Attacker sub-model

The Figure 2 is a part of the complete conceptual model describing the actors directly or indirectly involved in Fake News creation process. As mentioned above, it is common that the creation of a Fake News is the result of a structured disinformation campaign, in which we find a classic division into three levels of responsibility: strategic, operational and tactical. At the head of the organization is the **Strategic Attacker** managing the **Information Warfare** and commanding **Campaign Leaders**. These Campaign Leaders manage the **Disinformation Campaigns** and have the **Fake News Creator** under their command to feed these campaigns with Fake News. The latter are created to be conform within a **Disinformation**

Campaign. This is represented by the *Is a part of* relationship. Moreover, a Disinformation Campaign can also re-use a Fake News for its own purposes. Indeed, some of them can become viral and some campaigns could grasp the opportunity to re-use them to fulfill their own goals. It is represented by the *Re-uses* relationship. Both Information Warfare and Disinformation Campaign can be characterized by the context in which they are conducted. The Figure 3 illustrate how data are integrated into the different classes of the conceptual model.

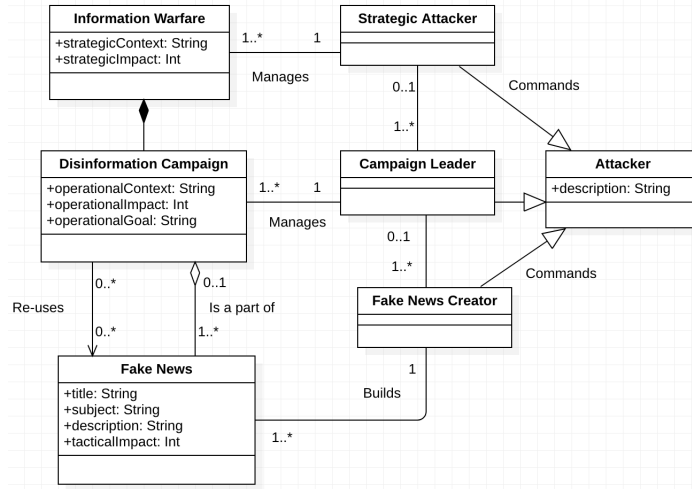


Fig. 2. Fake News Attacker Conceptual Model

#### 4.2 Fact sub-model

This part of the model illustrated in Figure 4 details the facts on which a Fake News relies. Figure 5 shows how data populate it.

Fake News is the key notion. The entire diagram is created around it. *title* of a Fake News consists of its headline and is described by a string. *subject* corresponds to the category of knowledge it refers to. *description* is a textual summary of the key ideas contained in. *tacticalImpact* is an integer evaluating the number of potential readers, expressing the size of the targeted population.

A Fake News relies on at least one Real Fact. Since the context is important to understand the Real Fact itself, it is modeled through the *context* attribute. The *description* attribute provides a textual description of the Real Fact. It is characterized by a value stored in an enumeration: DATA, STATEMENT, or EVENT. A Real Fact can also be illustrated by a Document, which can either be a PICTURE, a FIGURE or a VIDEO.

False Facts contains its own description. It can be specified in three categories: made-up event, deformation of the truth or combination of true events.



<b>Fake news</b>		<b>Attacker</b>	
<i>Title:</i> 200 Stranded Marines Needed a Plane Ride Home, Here's How Donald Trump Responded		Information Warfare	
<i>Subject:</i> US troop withdrawal from Iraq in 1990-1991		<i>Strategic Context:</i> The 2016 US presidential election	
<i>Description:</i> On his website, Sean Hannity related that Trump helped 200 marines to come home.		<i>Strategic Impact:</i> US population, 350 M	
<i>Tactical Impact:</i> 120 M		Disinformation Campaign	
		<i>Operational Context:</i> Trump's campaign during in 2016	
		<i>Operational Impact:</i> Number of voters in the US, 240 M	
		<i>Operational Goal:</i> Bring support to Trump	
		Campaign leader	
		<i>Description:</i> Heads of Republicans	
		Fake News Creator	
		<i>Description:</i> Sean Hannity	

**Fig. 3.** Illustration of the use of the conceptual model Attacker part

False Facts are characterized as either `eventDescription`, `deformationDescription` or `combinationType`. `Reality Distortion` characterizes how strong the distortion is between the False Fact and the Real Fact it is based on. Its intensity can be `LOW`, `MEDIUM` or `HIGH`.

An `Authority` has a `name` and an `expertise field`. The three types of references to an authority discussed above make it possible to divide the concept into two simpler categories: true and false authorities. While the true authority did say or publish what is claimed to have been said or published, the false authority didn't. Thus, a Fake News can call upon an Authority, which can be either a `True Authority`, linked to a `Real Fact`, or a `False Authority`, linked to a `False Fact`. In both cases, the Authority is characterized by a `Credibility` regarding the fact at hand. A `False Authority` also includes a `Boolean` attribute which models whether the Authority is a real entity or not.

### 4.3 Target sub-model

Fake News target specific communities and aim at affecting as many people as possible. To do that, they use cognitive mechanisms. The part of the model illustrated in Figure 6 deals with the target of the Fake News and the process through which it is influenced by the content, while Figure 7 shows a data example instantiation.

A `Target` corresponds to the group of people that the Fake News intends to reach and influence. `targetCharacteristics` are their descriptions. They determine what makes them the Target. `targetValues` are ideas about which the readers will be especially sensitive about. An effective Fake News will twist these values to elaborate the `Trigger Idea` and maximize the `Emotional Load`. Fake News are spread through a media which can be either conventional, state-affiliated, alternative, or social. It is represented by `Vector` in the model. It also defines the `Trust` that the Target has in it. The latter is measured with an intensity: low, medium or high.

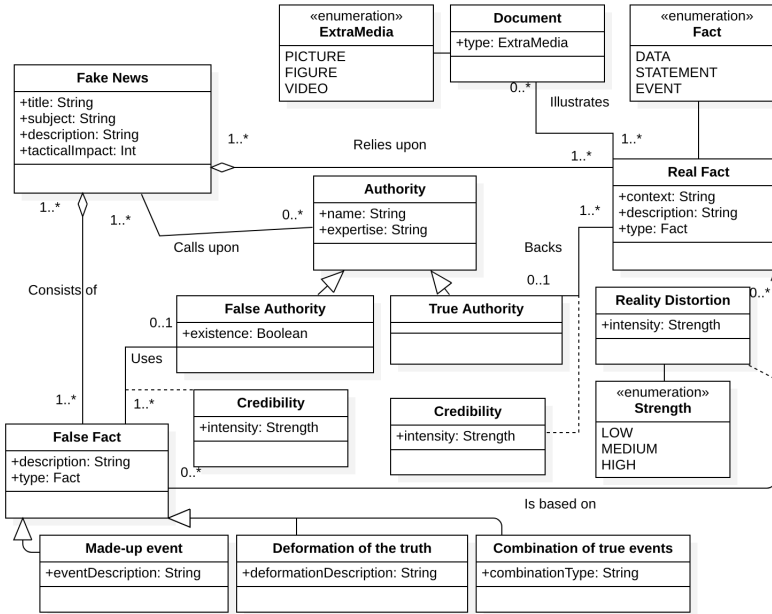


Fig. 4. Fake News Fact Conceptual Model

A Target expresses an Opinion about an opinionSubject. It is described with the opinionDescription and the type classifies the position: pro, anti, or neutral. This opinion depicts the target’s original thinking before being influenced by the Fake News, i.e., changed or strengthened. Note that the manipulation of the Opinion starts with the Disinformation Campaign. The Goal of the Fake News can either be to WEAKEN or STRENGTHEN the opinion expressed by the target. Its action is determined by the Processed Information. Fake News contains Trigger Ideas which represent arguments in favor of the Processed Information. The latter is the mixing effect of an emotion and an information. It represents how the information is assimilated and understood by the target. It is directly responsible for influencing or changing the opinion of the target. Processed Information conveys an implicitConclusion through its Trigger Ideas. Fake News aims to influence opinions and lead the target to come to the desired conclusion. The emotional load enhances the phenomena. The trigger ignites an Emotional Load. Emotional load has a type which can be chosen among the eight standard emotions: JOY, TRUST, FEAR, SURPRISE, SADNESS, ANTICIPATION, ANGER and DISGUST. The intensity of the load is evaluated based on the Plutchik wheel [16].

## 5 Discussion

The focus of our proposal is a Conceptual Model for Fake News. Our next further work includes a n intensive validation process, that we have started to accomplish

Real Fact	
<i>Context:</i> Marines were stranded after fighting in the 1991 Persian Gulf War.	
<i>Description:</i> A Boeing 727 jet which was part of a Trump Shuttle fleet brings Marines to a safe base. M. Trump had a contract with the military because his fleet was not profitable, and this flight home was part of that contract.	
<i>Type:</i> Event	
Document	
<i>Type:</i> Picture	

False Fact 1	
<i>Description:</i> Sean Hannity relates that Mr. Trump found out about the situation of the Marines and sent the airline down to take care of them.	
<i>Type:</i> Event	
Made-up event	
<i>Event Description:</i> - Trump was aware of the situation	
Deformation of the truth	
<i>Deformation Description:</i> - Turn a Boeing 727 jet into a private jet of Trump's	

False Authority	
<i>Existence:</i> True	
<i>Name:</i> Cpl. Ryan Stickney	
<i>Expertise:</i> military	
<i>Credibility:</i> medium	
Reality Distortion	
<i>Intensity:</i> medium	

False Fact 2	
<i>Description:</i> Statement of Cpl. Ryan Stickney: "The way the story was told to us was that Mr. Trump found out about it and sent the airline down to take care of us."	
<i>Type:</i> Statement	
Combination of true events	
<i>Combination Type:</i> - Need of a plane - Boeing 727 from the Trump's fleet	

Fig. 5. Illustration of the use of the conceptual model Fact part

through a preliminary validation phase with ten existing Fake News (see Table 2). Results have been very positive: with the support of the conceptual model, we have been able to characterize all of them in detail, what reinforces Fake News communication and management, our main purpose.

For lack of space, we will not detail the study, but we refer the reader to this website: <https://people.irisa.fr/Nicolas.Belloir/public/ER2022>. Some relevant conclusions have been obtained. Concerning the attacker part of the model, it is sometimes tricky to formally identify the operational and strategic levels in which a Fake News operates. This is not surprising since one of the pillars of disinformation is to hide the initiators to make it more credible. However, they can often be guessed. Concerning the Facts part of the model, we note that the different types of False Facts appear equitably. We also note that the studied Fake News often play on the difference between correlation and causality, especially when a Fake News is built around several True Facts, which is not surprising. We also find an equal distribution of true and false authorities. Finally, if we look at the Target part, the emotional mechanisms are pretty easily identifiable, as well as the objective of the Fake News. However, if this study shows us that we manage to characterize existing Fake News with our model, the number of studied examples remains limited, and the conclusions we draw

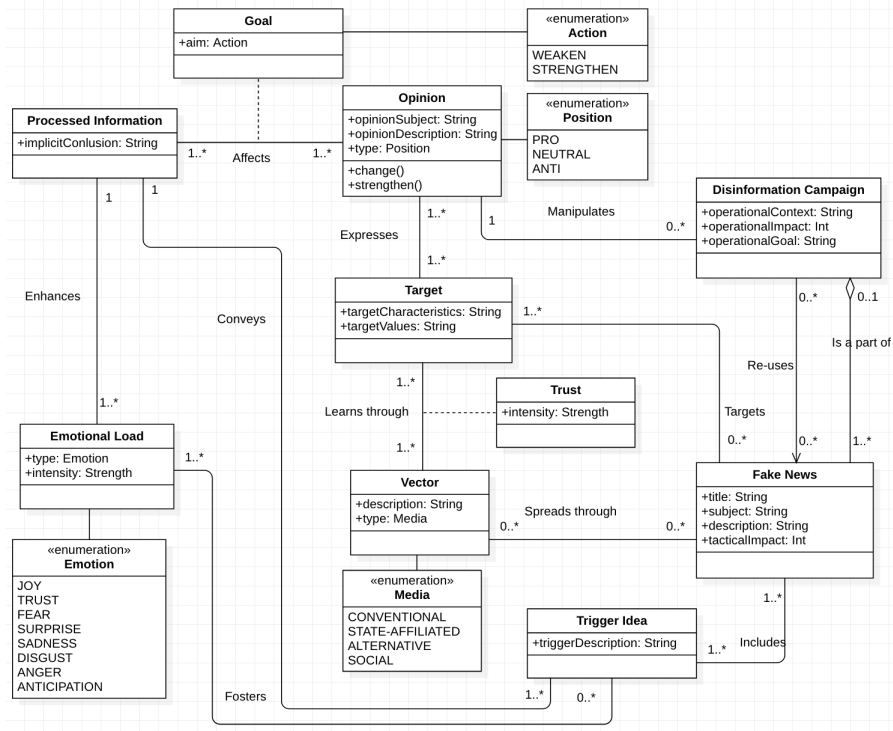


Fig. 6. Fake News Target Conceptual Model

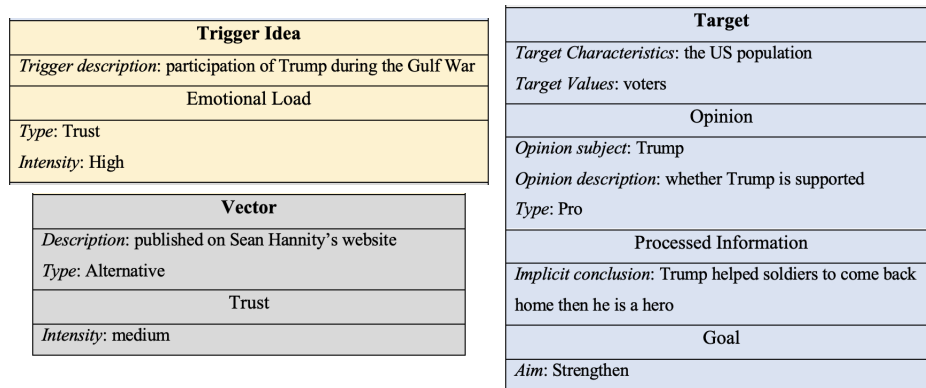


Fig. 7. Illustration of the use of the conceptual model Target part

are to be considered with reserve. A more in-depth study will be necessary to consolidate the results and in the near future.

Num.	Fake News title	Description
1	Hillary has six months left	During the 2016 US presidential campaign, numerous rumours about Hillary Clinton’s health were published. These rumours were posted after she fainted during the ceremony for the 9/11 victims in New York.
2	200 Stranded Marines Needed a Plane Ride Home, Here’s How Donald Trump Responded	On his website, Sean Hannity related that Trump helped 200 marines to come home.
3	War Russia-NATO: An analyst from Pentagon foresees how it could end	An online article published in Ukraine claims that Russia could be easily defeated by NATO. The source is linked with Pentagon
4	Youngkin’s false claim that McAuliffe ‘opposes’ election audits	Youngkin twitted a thread against his opponent Terry McAuliffe and claimed that the democrat was against audits.
5	Omar Holding Secret Fundraisers with Islamic groups tied to terror	Ilhan Omar was accused of having links with terrorists’ groups during Minnesota Campaign
6	The Chinese President visits a mosque and asks Muslims to pray for the country to protect it from this disaster of Covid. It’s now they discover Islam virtues!	The Chinese President asks Muslims to pray for the country to be protected against Covid-19
7	When did patient zero begin in US? [...]It might be the US army who brought the epidemic to Wuhan	The spokesperson of the Chinese Ministry of Foreign Affairs Lijian Zhao, insinuated in a tweet that the US Army actually brought Covid-19 to Wuhan. The fact that dead from Covid-19 might have been attributed to influenza is the proof that Covid-19 was in the US before the emergence in China.
8	Norway reclassifies Covid-19: No more dangerous than ordinary flue	The Norwegian Institute of Public Health, or NIPH, declared that Covid-19 had known several mutations and was now less dangerous. It is now no more dangerous than ordinary flue
9	Bill Gates backed polio vaccine disabled 47,000 kids	Bill Gates is accused of poisoning children in India with his polio vaccine
10	Here is what our brothers and sisters live every day all around the world because of the Gospel. Let us pray for our missionaries	Following the fall of Afghanistan, Christians are tortured and packaged in plastic bags until they die

**Table 2.** Fake News used for conceptual model evaluation

We also used the conceptual model to create a Fake News. The advantage of relying on a conceptual model is that it allows associating a process that will enable to control the Fake News generation. Such a formalized process is still a challenge, but our conceptual model is the first step to make it possible because it increases the interpretability of the resulting Fake News.

Indeed, explainability and interpretability is recognized as a major feature for future intelligent systems in AI and Machine Learning research. Known under the name eXplainable Artificial Intelligence (XAI), the aim is to produce intelligent systems that enhance the confidence of users to understand the underlying reasoning and automations [9]. For Fake News context, to our knowledge, works involving explainability feature within Fake News detection methods are still at their beginning [17]. A promising line of work is to follow the XAI-based process proposed by [19] to facilitate building well-justified and explainable models for Fake News generation. The idea is to offer an approach that is understandable, trustable and manageable to humans, as suggested in [9]. The contribution of this paper establishes the foundation of such a process by solving the first,

essential step of getting a shared understanding of what a Fake News is by introducing a precise conceptual model of Fake News. From that sound conceptual basis, the rest of the proposed XAI process can be applied in a reliable way. The explainability with our approach will be conceptually guided by the conceptual model which conforms the core of the contribution: to have an ontologically well-grounded definition of what a Fake News is, which is directly derived from the conceptual model.

## 6 Conclusion

This paper presents a conceptual model of Fake News allowing to identify and specify the relevant entities that conceptually characterize the different dimensions that must be considered in Fake News. We believe that this model will contribute significantly to improving tools for generating/detecting fake news. Under a sound conceptual modeling perspective, we argue that a correct Fake News management process will only be feasible if it is based on a precise conceptual modeling approach, as the one proposed in this paper. We have chosen to focus on the following main aspects: the production chain, the articulation around true and false facts, and the manipulation mechanism used by Fake News and based on emotions. We have confronted this conceptual model to up to ten different fake news in order to evaluate its conformity. The first results are encouraging. A larger study will be conducted in the near future in order to evaluate its scaling up. Moreover, the proposition addresses the first step of the XAI process proposed by [19], that it is crucial to make possible the full XAI-based process. The explainability with our approach is conceptually guided by the conceptual model which conforms the core of the contribution: to have an ontologically well-grounded definition of what a Fake News is, which is directly derived from the conceptual model. The next steps of the process are naturally our future work.

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