

RUNdeepML: Reliable and Unreliable News deep Markup Language

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INDEX

1. Introduction.....	3
2. Structure level	3
2.1. <TITLE>	3
2.1.1. Style.....	3
2.1.2. Title-Stance.....	4
2.2. <SUBTITLE>.....	4
2.3. <LEAD>	4
2.4. <BODY>.....	4
2.5. <CONCLUSION>	4
2.6. <QUOTE>.....	4
2.6.1. Author-Stance	5
3. Content level	6
3.1. <WHO>	7
3.1.1. Reliability	7
3.1.2. Lack-Of-Information (if necessary).....	7
3.1.3. Role.....	7
3.2. <WHAT>	7
3.2.1. Reliability	7
3.2.2. Lack-Of-Information (if necessary).....	7
3.2.3. Main-Event	7
3.3. <WHEN>	8
3.3.1. Reliability	8

3.3.2. Lack-Of-Information (if necessary).....	8
3.4. <WHERE>.....	8
3.4.1. Reliability.....	8
3.4.2. Lack-Of-Information (if necessary).....	8
3.5. <WHY>.....	9
3.4.1. Reliability.....	9
3.4.2. Lack-Of-Information (if necessary).....	9
3.6. <HOW>	9
3.4.1. Reliability.....	9
3.4.2. Lack-Of-Information (if necessary).....	9
4. Elements of Interest	9
4.1. <KEY EXPRESSION>.....	10
4.2. <FIGURE>.....	10
4.3. <ORTHOTYPOGRAPHY>	10
4.4. <LACK OF INFORMATION>	11

1. Introduction

RUNdeepML is a fine-grained annotation scheme aimed at classifying the reliability of news by means of linguistic and textual analysis, without depending on external knowledge. The aim of this annotation is to determine whether the individual elements help to predict the overall reliability of a news item and which elements have more impact on that decision. The model trained with this annotation proposal obtained a 0.9792 accuracy score in the training set, and a 0.9166 accuracy score in an independent test set, so experiments show that a fine-grained reliability assessment of all the semantic elements can accurately predict the global reliability of a news item.

This annotation has been created based on 3 hypotheses:

1. Fake news is unreliable news that usually mixes true and false information, so analysing the parts and content elements separately can determine the global reliability of a news items.
2. There are textual and linguistic characteristics allowing to differentiate unreliable news from reliable news without using World Knowledge.
3. A reliability classification can provide useful information to predict the veracity of a news item and can be a support to users, fact-checking agencies, and journalists.

The RUNdeepML scheme presents three levels of annotation: the Structure level (Inverted Pyramid), the Content level (5W1H) and the Elements of Interest level. Each level contains several labels and attributes which are explained below.

2. Structure level

The structure level divides a news item into different parts following the Inverted Pyramid journalistic technique. According to this technique, each structure part contains information with different levels of relevance, placing the most important information at the beginning of the news item and the least relevant at the end. Structure labels are described in order of relevance bellow.

2.1. <TITLE>

The TITLE of the news article provides the main idea of the story. Normally in one sentence, it summarises the basic and essential information about the story and the idea around which the news piece has been created. The main objective of the TITLE is to attract readers.

This label presents two attributes that provide additional information about the title:

2.1.1. Style

This attribute allows to mark the objectivity or subjectivity of the TITLE. An objective title will present information in an accurate and informative way, while a subjective title will provide information in an alarmist, connotative or emotional way.

2.1.2. Title-Stance

This attribute indicates whether the information presented in the BODY is consistent with the information of the TITLE. This consistency is represented by the following values: Agree (information provided is consistent in both parts), Disagree (information provided is inconsistent in one of the parts) or Unrelated (information provided in the TITLE has no relation with the rest of the news item).

2.2. <SUBTITLE>

A SUBTITLE is the second title that explains the TITLE in more detail. It completes the information by presenting the idea in a very summarised way or can provide additional information not mentioned in the TITLE. The SUBTITLE'S purpose is to keep the reader's attention and encourage him/her to read the whole news article.

2.3. <LEAD>

The LEAD is the paragraph that develops the main information by answering the six key questions allowing to communicate information in an accurate and objective way (the 5W1H journalistic technique).

2.4. <BODY>

The BODY contains all the information developed in the news article. The BODY presents all the background, facts and arguments of the story in detail. The key questions answered in the LEAD are developed in the BODY by explaining all the elements that are involved in the news piece.

2.5. <CONCLUSION>

The main idea of the story can be summarised in a sentence or in a paragraph but, even if the CONCLUSION is considered part of a well-structured article, it does not always appear. It presents the least important information, as it is only a summary of all the important information that has been developed in the previous parts of the news story.

2.6. <QUOTE>

Even if this label does not belong to the Inverted Pyramid, it can be annotated as a part of the structure level to mark an element or sentence that textually quotes a message or reproduces an already reported idea.

2.6.1. Author-Stance

The QUOTE label only has an attribute called Author-Stance that is used to indicate if the author does not agree with what it is said, if the author agrees with the quote or if the author's stance is not clear. The QUOTE can refer to a true statement that supports the news item or to a fake statement. In this label, the attribute Reliability is not marked.

Examples of the Structure level annotation (Inverted Pyramid)

ENGLISH:

<HEADLINE Style=Subjective Title-Stance=Agree>A glass of hot water with lemon can save your life**</HEADLINE>**

<SUBTITLE>The lemon, besides being an ideal component for our meals, can save our lives since it prevents and cures cancer. **</SUBTITLE>**

<LEAD>The lemon has several properties, but surely you did not know that medical experts have used it for millions of years to cure cancer, as drinking a glass of hot water every day with slices of this citrus fruit kills cancer cells in our body and creates a protective shield that prevents future tumours. **</LEAD>**

<BODY>There are many studies that have shown over the years that the lemon has miraculous properties for our organism. It has been shown that it is up to 100 times more effective than chemotherapy. However, we must know how to prepare it so that this citrus fruit has the desired effects on our body. First of all, you should use hot water with lemon slices and take it fasting every day [...]**</BODY>**

<CONCLUSION>To sum up, lemon is an anti-cancer food that can save your life thanks to its anti-cancer properties. Infusing a slice of lemon in a glass of hot water will help you to prevent and kill this dreadful disease, so do not hesitate to spread this news to everybody. **</CONCLUSION>**

SPANISH:

<HEADLINE Style=Subjective Title-Stance=Agree>*Un vaso de agua caliente con limón puede salvarte la vida***</HEADLINE>**

<SUBTITLE>*El limón, además de ser un componente ideal para nuestras comidas, puede salvarnos la vida, ya que previene y cura el cáncer.***</SUBTITLE>**

<LEAD>*Son muchas las propiedades que tiene el limón, pero seguro que no sabías que desde hacía millones de años expertos médicos lo han utilizado para curar el cáncer, pues tomar un vaso de agua caliente con trozos de este cítrico todos los días mata las células cancerígenas de nuestro cuerpo y crea un escudo protector que previene futuros tumores.***</LEAD>**

<BODY>*Existen muchos estudios que a lo largo de los años han demostrado que el limón tiene propiedades milagrosas para nuestra salud. Se ha llegado a demostrar que hasta es 100 veces más efectivo que la quimioterapia. No obstante, hay que saber cómo prepararlo para que este cítrico tenga los efectos deseados en nuestro cuerpo. En primer lugar, se debe utilizar agua caliente con trocitos de limón y tomarlo en ayunas todos los días [...]***</BODY>**

<CONCLUSION>*En resumen, el limón es un alimento anticáncer que puede salvar tu vida gracias a sus propiedades anticancerígenas. Tomar una infusión de agua caliente con una rodaja de limón te ayudará a prevenir y matar esta dura enfermedad, así que no dudes en difundir esta noticia a todo el mundo.***</CONCLUSION>**

Examples of the QUOTE annotation

ENGLISH:

A false story has circulated on WhatsApp claiming that **<QUOTE Author-Stance=Disagree>a German doctor has been arrested for creating the coronavirus in a laboratory in Berlin.</QUOTE>**

SPANISH:

Ha circulado una noticia falsa por WhatsApp que afirmaba que **<QUOTE Author-Stance=Disagree>un médico alemán había sido detenido por fabricar el coronavirus en un laboratorio de Berlín.</QUOTE>**

3. Content level

The second level focuses on the essential content elements of news. The approach followed in this level is based on the journalistic technique known as 5W1H, which allows the detection of the key elements needed to accurately communicate a story. The 5W1H questions used for this journalistic method are WHAT, WHO, WHERE, WHEN, WHY and HOW. All the content level labels are marked with the attributes Reliability and Lack-Of-Information (if necessary):

- Reliability: attribute allowing to annotate a news item as reliable or unreliable depending on the level of accuracy and objectivity.
- Lack-Of-Information: attribute allowing to mark if scientific evidence or important data is missing. Even if it belongs to the third level (Elements of Interest), it is used with the 5W1H labels.

Besides these two attributes, the WHO label presents the attribute Role and the WHAT label the attribute Main-Event.

The attribute Role is only used with the WHO to indicate the role played by the subject/entity of the event. That role can be indicated with one of these three values: Subject (the WHO causes the event), Target (the WHO receives the effects of the event), or Both (when the WHO performs both functions).

The attribute Main-Event is only used with the WHAT. It allows to mark the main event of the story and it helps to differentiate it with other secondary events. A news item can contain more than one Main-Event.

3.1. <WHO>

In a sentence, the WHO represents the subject or entity involved or acting in an event. It may usually refer to people, organisations or even personified entities (such a country: e.g., *France discovers a vaccine...*)

3.1.1. Reliability

3.1.2. Lack-Of-Information (if necessary)

3.1.3. Role

Examples

ENGLISH:

<WHO Reliability=Unreliable Role=Target Lack-Of-Information=yes>An Italian scientist</WHO>was arrested by force yesterday in Milan for selling an unauthorised vaccine.

SPANISH:

<WHO Reliability=Unreliable Role=Target Lack-Of-Information=yes>Un científico italiano</WHO>fue detenido mediante el uso de la fuerza ayer en Milán por vender una vacuna no autorizada.

3.2. <WHAT>

The WHAT label refers to the circumstances, events or facts of the action performed by the subject.

3.2.1. Reliability

3.2.2. Lack-Of-Information (if necessary)

3.2.3. Main-Event

Examples

ENGLISH:

An Italian scientist <WHAT Reliability=Reliable Main-Event>was arrested</WHAT> by force yesterday in Milan for selling an unauthorised vaccine.

SPANISH:

Un científico italiano <WHAT Reliability=Reliable Main-Event>fue detenido</WHAT> mediante el uso de la fuerza ayer en Milán por vender una vacuna no autorizada.

3.3. <WHEN>

The WHEN label indicates the time or the moment when the events occurred. It is found in temporary expressions (e.g., *on Wednesday, in 2010, last Friday...*)

3.3.1. Reliability

3.3.2. Lack-Of-Information (if necessary)

Examples

ENGLISH:

An Italian scientist was arrested by force <WHEN Reliability=Reliable>yesterday</WHEN> in Milan for selling an unauthorised vaccine.

SPANISH:

Un científico italiano fue detenido mediante el uso de la fuerza <WHEN Reliability=Reliable>ayer</WHEN> en Milán por vender una vacuna no autorizada.

3.4. <WHERE>

This label designates the location where the events occurred. It is found in location expressions, either physical (e.g., *in France, in a laboratory*) or not (e.g., *in Facebook*).

3.4.1. Reliability

3.4.2. Lack-Of-Information (if necessary)

Examples

ENGLISH:

An Italian scientist was arrested by force yesterday <WHERE Reliability=Reliable>in Milan</WHERE> for selling an unauthorised vaccine.

SPANISH:

Un científico italiano fue detenido mediante el uso de la fuerza ayer <WHERE Reliability=Reliable>en Milán</WHERE> por vender una vacuna no autorizada.

3.5. <WHY>

This label refers to the cause of the event. It must not be confused with the purpose.

3.4.1. Reliability

3.4.2. Lack-Of-Information (if necessary)

Examples

ENGLISH:

An Italian scientist was arrested by force yesterday in Milan <WHY Reliability=Reliable>**for selling an unauthorised vaccine.**</WHY>

SPANISH:

Un científico italiano fue detenido mediante el uso de la fuerza ayer en Milán <WHY Reliability=Reliable>por vender una vacuna no autorizada.</WHY>

3.6. <HOW>

This label refers to the way events have developed, the manner or the method in which a given action has been carried out.

3.4.1. Reliability

3.4.2. Lack-Of-Information (if necessary)

Examples

ENGLISH:

An Italian scientist was arrested <HOW Reliability=Reliable>**by force**</HOW> yesterday in Milan for selling an unauthorised vaccine.

SPANISH:

Un científico italiano fue detenido <HOW Reliability=Reliable>mediante el uso de la fuerza</HOW> ayer en Milán por vender una vacuna no autorizada.

4. Elements of Interest

This level allows to mark textual information that could be interesting to differentiate unreliable news from reliable news.

4.1. <KEY EXPRESSION>

Phraseology that urges readers to share the information or that expresses emotions such as fear, contempt, alarm, hope or economic and ideological purposes.

Examples

ENGLISH:

<Key-Expression>SHARE THIS INFORMATION</Key-Expression>

<Key-Expression>THIS CAN SAVE YOUR LIFE</Key-Expression>

<Key-Expression>THE LEMON PREVENTS AND CURES CANCER</Key-Expression>

SPANISH:

<Key-Expression>COMPARTE ESTA INFORMACIÓN</Key-Expression>

<Key-Expression>ESTO PUEDE SALVAR TU VIDA</Key-Expression>

<Key-Expression>EL LIMÓN PREVIENE Y CURA EL CÁNCER</Key-Expression>

4.2. <FIGURE>

Label allowing to mark figures in the text, as it is a characteristic that can be verified by fact-checking techniques.

Examples

<Figure>8</Figure>

<Figure>1200</Figure>

<Figure>560</Figure>

4.3. <ORTHOTYPOGRAPHY>

This label is used to mark grammatical, spelling or formatting mistakes that can be found in the text. Some examples of orthotypography are: whole sentences in capital letters, suspension points in the middle of the text or incomplete, double spaces, many exclamation marks, grammatical errors, spelling mistakes, lack of cohesion, etc.

Examples

ENGLISH:

<Orthotypography>This will completely change your life</Orthotypography>

<Orthotypography>LEMON IS AN ANTI-CANCER FOOD...that can save your life thanks to...its anti-cancer properties!!!!!!</Orthotypography>

<Orthotypography>IF YOU DON'T SHARE THIS INFORMATION, YOU WILL HAVE 5 YEARS OF BAD LUCK</Orthotypography>

SPANISH:

<Orthotypography>Esto cambiará completamente tu vida</Orthotypography>

<Orthotypography>EL LIMÓN ES UN ALIMENTO ANTICÁNCER...que puede salvar tu vida gracias a...sus propiedades anticancerígenas!!!!!!</Orthotypography>

<Orthotypography>SI NO COMPARTES ESTA INFORMACIÓN, TENDRÁS 5 AÑOS DE MALA SUERTE</Orthotypography>

4.4. <LACK OF INFORMATION>

This attribute, as explained in the Content level, is used with the 5W1H labels but belongs to the Elements of Interest level. It is used when scientific evidence or important data is missing.

Examples

ENGLISH:

<Lack-Of-Information=Yes> There are many studies that have shown over the years that the lemon has miraculous properties for our organism</Lack-Of-Information>

<Lack-Of-Information=Yes>It has been shown that it is up to 100 times more effective than chemotherapy</Lack-Of-Information>

SPANISH:

<Lack-Of-Information=Yes> Existen muchos estudios que a lo largo de los años han demostrado que el limón tiene propiedades milagrosas para nuestra salud</Lack-Of-Information>

<Lack-Of-Information=Yes>Se ha llegado a demostrar que hasta es 100 veces más efectivo que la quimioterapia </Lack-Of-Information>