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A FAKE NEWS CLASSIFICATION FRAMEWORK: APPLICATION ON IMMIGRATION CASES

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ABSTRACT:
In this study we conduct a systematic literature review with the aim of pointing out the characteristics and types of fake news. We use them to formulate a framework to facilitate classification of fake news instances. Using the classification framework of fake news, we analyse 59 different fake news cases regarding immigration. The research team provided a proof of concept of applicability of the proposed framework for categorising immigration fake news cases. Towards this direction, machine learning algorithms were employed to identify association rules among the classification facets of our framework. The findings of the research study show that a number of these rules can be used in order to design a semi-automated tool that fills-in some of the characteristics of our framework and infers the rest, thus utilising the extracted rules. Benefits stemming from this work include a proposition of an easy to use framework for fake news classification, and derivation of commonly occurring patterns that demonstrate how fake news, as well as their types, interrelate.

KEY WORDS:
disinformation, fake news, false information, immigration, misinformation

Introduction

Internet use has grown greatly over the last twenty years among people all over the world and provides a highly interconnected worldwide platform for everyone to spread information to millions of people in a matter of a few minutes, at little to no cost. While information on the Internet has an incredibly positive effect on people globally in various ways, false information is also created and spread through the web and online social media.

People routinely encounter inaccurate information, from fake news designed to confuse audiences, to communications with inadvertent mistakes and stories made up to entertain readers. The hope is that these inaccuracies can be easily ignored, exerting little influence on the thoughts and actions of people. Unfortunately, being exposed to inaccuracies leads to problematic consequences. After reading incorrect statements, readers exhibit the clear effects of those contents on their decisions and problem-solving. Exposure to erroneous information leads to confusion about what is true, doubt about accurate understandings, and subsequent reliance on falsehoods.[1]

Nowadays, *"fake news represents a serious issue. The structure of social media platforms dramatically differs from previous media technologies. From this perspective, contents can be relayed amongst users with no significant third-party filtering, fact-checking, or editorial judgment"*. At present, it has become possible for any user to reach as many readers as any mass media, increasing this unrestricted propagation of false information.[2]

False information and fake news centred on immigration spikes during periods of increased flows and intense media coverage of migration issues. Common topics include supposed criminal acts carried out by migrants, migrants who take advantage of social benefits and the idea of a 'migrant invasion'. False information even spreads among countries, often changed or adapted to fit a local context or to feed into the rhetoric of various local political groups. The impetus being to associate these groups with violent behaviour and ingratitude for the 'social benefits' they may enjoy. The Internet and social media address the issue of limited foreign-language news sources for immigration in some European countries. However, in many cases, they present a completely new set of issues including the spread of false information, both intentionally and unintentionally.

As fake news about immigration keeps gathering momentum, it is crucial to be able to detect it and counteract. Being able to identify the types of fake news about a specific area of interest might play its part in this process. Presently, there have been several attempts focused on systematic approaches towards this issue using appropriate methodologies and tools.[3]

Literature Review

There are different classifications of false information. It is categorised based on its intent and knowledge content. Depending on intent, false information can be classified as misinformation and disinformation. Both of them have negative influences. Misinformation is spread without the intent to deceive.[4] It is a distortion of an original piece of true information by an actor, due to lack of understanding, attention or even bias. *"Disinformation entails the distribution, assertion, or dissemination of false or mistaken information in an intentional, deliberate, or purposeful effort to mislead, deceive, or confuse."*[5] There is also a mention of another type of false information: "mal-information" is information that is based on reality, used to inflict harm on a person, organisation or country.[6]

1 KUMAR, S., SHAH, N.: False Information on Web and Social Media: A Survey. In *Social Media Analytics: Advances and Applications*. [online]. [2020-02-01]. Available at: <https://arxiv.org/pdf/1804.08559.pdf>.

2 BORELLA, C., ROSSINELLI, D.: Fake News, Immigration, and Opinion Polarization. In *SocioEconomic Challenges*, 2017, Vol. 1, No. 4, p. 59.

3 See: HIMMA-KADAKAS, M.: Alternative Facts and Fake News Entering Journalistic Content Production Cycle. In *Cosmopolitan Civil Societies: An Interdisciplinary Journal*, 2017, Vol. 9, No. 2, p. 25-40; HODSON, J., TRAYNOR, B.: Design Exploration of Fake News: A Transdisciplinary Methodological Approach to Understanding Content Sharing and Trust on Social Media. In KELLENBERGER, P. (ed.): *Proceedings of 2018 IEEE International Professional Communication Conference*. Toronto : Institute of Electrical and Electronics Engineers, 2018, p. 1-5; KOBIELUS, J.: *How AI Can Help Solve the 'Fake News' Problem*. [online]. [2020-03-03]. Available at: <https://www.infoworld.com/article/3266109/how-ai-can-help-solve-the-fake-news-problem.html>.

4 KUMAR, S., SHAH, N.: False Information on Web and Social Media: A Survey. In *Social Media Analytics: Advances and Applications*. [online]. [2020-02-01]. Available at: <https://arxiv.org/pdf/1804.08559.pdf>.

5 FETZER, J.: Disinformation: The Use of False Information. In *Minds and Machines*, 2004, Vol. 14, No. 2, p. 231.

6 See: WARDLE, C., DERAKHSHAN, H.: *Information Disorder: Toward an Interdisciplinary Framework for Research and Policy Making*. Strasbourg : Council of Europe, 2017. [online]. [2020-02-02]. Available at: <https://rm.coe.int/information-disorder-report-november-2017/1680764666?ct=t()>.

Depending on knowledge content, false information is classified as either opinion-based or fact-based. Opinion-based false information expresses individual opinion and describes cases in which there is no absolute grounded truth. Fact-based false information involves information that fabricates single-valued grounded truth information. This type of false information includes fake news, rumours and fabricated hoaxes.[7]

False information on the web can also be found in some other forms. "Fabricated information" implies *"completely fictional stories disconnected entirely from real facts"*. "Propaganda" is *"a special instance of the fabricated stories that aim to harm the interests of a particular party"*. "Conspiracy theories" typically *"refer to stories that try to explain a situation or an event by invoking a conspiracy without proof"*. Usually, such stories are about illegal acts carried out by governments or powerful individuals. Another type of false information is biased or one-sided. It refers to *"stories that are extremely biased towards a person/party/situation/event"*. There are also hoaxes, rumours, clickbait and satire news. "Hoaxes" are *"news stories that contain facts that are either false or inaccurate and presented as legitimate facts"*. *"Rumours refer to stories whose truthfulness is ambiguous or never confirmed"*. "Clickbait" implies *"the deliberate use of misleading headlines and thumbnails of content on the Web"*.[8] "Satire news" in the context of disinformation means *"to ridicule, expose and critique individuals, narratives, or opinions by presenting factual information using humour and exaggeration"*.[9] Other types of false information include manipulation, misappropriation, parody and advertising.

The researchers also deal with the characteristics of fake news. For instance, in the classification by Sukhodolov and Bychkova fake news is categorised in terms of the true and false information ratio, authenticity of time and place details of the event, persons mentioned in the news, the objectives creators and publishers of fake news pursue and the perceived authenticity of the news.[10]

In the literature, "fake news" is depicted as false information that appears as news. It is disseminated deliberately and there is always an intention to mislead people. The way of distribution of this information is narrowed down to social media, although, mainstream media is not completely discarded.[11]

Typically, when referring to fake news, we imply text-based news websites with disinformation. However, quite frequently disinformation appears in visual formats – whether doctored images, fabricated videos, misleading visualisations or memes.[12] For instance, much of the fake news content that circulates on *Facebook* is images. They are not attached to an article, and there is often no way to trace their source. Furthermore, *Facebook*'s algorithm seems to favour images and video over text. Thus, they have the potential to reach more readers than articles.[13]

Research Methodology

The study provides answers to the following research questions:

7 KUMAR, S., SHAH, N.: False Information on Web and Social Media: A Survey. In *Social Media Analytics: Advances and Applications*. [online]. [2020-02-01]. Available at: <https://arxiv.org/pdf/1804.08559.pdf>.

8 ZANNETTOU, S. et al.: The Web of False Information: Rumors, Fake News, Hoaxes, Clickbait, and Various Other Shenanigans. In *Journal of Data and Information Quality*, 2019, Vol. 11, No. 3, p. 2-3.

9 PAMMENT, J. et al.: *Countering Information Influence Activities: The State of the Art*. Lund : Swedish Civil Contingencies Agency, 2018, p. 45. [online]. [2020-01-15]. Available at: <https://www.msb.se/RibData/Filer/pdf/28697.pdf>.

10 SUKHODOLOV, A.P., BYCHKOVA A.M.: Фейковые новости» как феномен современного медиапространства: понятие, виды, назначение, меры противодействия [Fake News as a Modern Media Phenomenon: Definition, Types, Role of Fake News and Ways of Taking Measures Against It]. In Вопросы теории и практики журналистики *(Voprosy teorii I praktiki zhurnalistiki)*, 2017, Vol. 6, No. 2, p. 146-151.

11 See: GELFERT, A.: Fake News: A Definition. In *Informal Logic*, 2018, Vol. 38, No. 1, p. 108; HIMMA-KADAKAS, M.: Alternative Facts and Fake News Entering Journalistic Content Production Cycle. In *Cosmopolitan Civil Societies: An Interdisciplinary Journal*, 2017, Vol. 9, No. 2, p. 26-27; SHU, K. et al.: Fake News Detection on Social Media: A Data Mining Perspective. In *SIGKDD Explorations*, 2017, Vol. 19, No. 1, p. 23.

12 See: WARDLE, C., DERAKHSHAN, H.: *Information Disorder: Toward an Interdisciplinary Framework for Research and Policy Making*. Strasbourg : Council of Europe, 2017. [online]. [2020-02-02]. Available at: <https://rm.coe.int/information-disorder-report-november-2017/1680764666?ct=t()>.

13 RENNER, N.: *Memes Trump Articles on Breitbart's Facebook Page*. [online]. [2020-02-21]. Available at: <https://www.cjr.org/tow_center/memes-trump-articles-on-breitbarts-facebook-page.php>.

RQ1: What could a framework of fake news classification be?
RQ2: How could this framework be used in real fake news cases related to immigration issues?
RQ3: How applicable could such a framework become if association rules among concepts of the framework are identified?

We followed a mixture of top-down and bottom-up approaches in order to respectively (a) formulate the framework of fake news description assets, and (b) apply the proposed framework to real fake news cases related to immigration aspects. As a first step, we performed a systematic literature review in the area of fake news. This task led us to organise definitions, terms and characteristics of fake news within a model, and present it as a framework. It has a tabular form and entails metadata characteristics. To prove its usefulness, we selected fake news cases and applied the framework to them. To further investigate the benefits of the framework we exploited machine learning tools to trace possible association rules among concepts within the framework. This bottom-up approach can promote semi-automatic or even automatic classification of fake news cases. Moreover, it supports the claim that the framework is of value. On the other hand, association rules can formulate guidelines for filling in this framework pattern.

We gathered relevant information about immigration fake news cases from three fact-checking sites: *Factcheck.org*, *Snopes.com* and *Politifact.com*. The research data were collected from April through November, 2018. Our query was "migra" which encompasses all words of interest (immigration, migration, migrants, and emigrants). We filtered out duplicates and results with missing values related to the absence of information and performed data cleaning tasks, following the principles described by Wickham.[14] We identified 59 cases of immigration fake news. We employed machine learning tools to identify association rules among the classification facets of the framework. Then we analysed our data as a "market basket".[15]

In association rule mining the important metrics to keep track of are support, confidence and lift. "Lift" is a metric that tells us the strength of a relationship. If the lift value approaches 1, then we can think of the relation as non-existing. The greater the value of lift is, the stronger the relationship between characteristics. A rule with a high lift value means that this association occurs more frequently than would be expected (above the median), given the number of transaction (fake news) and product (characteristics) combinations. A high "confidence" level (higher than the median) forms part of the causal analysis for association rules existence. This is where the domain knowledge can verify and testify for or against a detected association. "Support" explains how often a particular item or relation appears in the dataset. Support indicator measures frequency, i.e. how frequently the collection of items occurs together as a percentage of all transactions. Confidence indicator answers the following question: 'How often items in (a set/item) B appear in transactions that contain (an item/set) A only'.[16] The analysis does not give causal explanations; we only find co-occurrences. Using this approach, we could derive commonly occurring patterns that granted us more insights into how fake news, as well as their types, interrelate.

The next step was to formulate and use the classification framework of fake news about immigration cases. Towards our effort of articulating this framework, we identified research articles that deal with fake news characteristics. Our framework is based upon the aforementioned classification of fake news presented by Sukhodolov and Bychkova.[17]

As it is shown in Table 1, we adapted the categories and types from the initial classification of fake news proposed by the above-mentioned authors in order for it to be easier to use and understood by potential stakeholders, and with discrete values appropriate for data mining techniques. The latter means that we form the possible values to be used for these characteristics. This also means that we can actually use these values in a machine learning model.

14 WICKHAM, H.: Tidy Data. In *Journal of Statistical Software*, 2014, Vol. 59, No. 10, p. 16-20.
15 BRIN, S. et al.: Dynamic Itemset Counting and Implication Rules for Market Basket Data. In PECKMAN, J. M., RAM, S., FRANKLIN, M. (eds.): *SIGMOD 1997, Proceedings of the ACM SIGMOD International Conference on Management of Data*. New York : ACM Press, 1997, p. 255.
16 HAHSLER, M. et al.: Introduction to Arules – A Computational Environment for Mining Association Rules and Frequent Item Sets. In *Journal of Statistical Software*, 2005, Vol. 14, No. 15, p. 2-3.
17 SUKHODOLOV, A.P., BYCHKOVA A.M.: Фейковые новости» как феномен современного медиапространства: понятие, виды, назначение, меры противодействия [Fake News as a Modern Media Phenomenon: Definition, Types, Role of Fake News and Ways of Taking Measures Against It]. In Вопросы теории и практики журналистики *(Voprosy teorii I praktiki zhurnalistiki)*, 2017, Vol. 6, No. 2, p. 146-151.

Table 1: Classification framework of fake news based on its characteristics

Characteristic	Characteristic type	Type values (values that can be selected by a user of the framework are underlined)			
C1. Truth information ratio*	Categorical, Multi-Class	Complete lie	Partial lie (when a piece of news contains a lie while all the other information in this piece of news is authentic)	Unproven or true	
C2. Time/place authenticity* (added)	Categorical, Multi-Class	False time and place	False time & true place	False place & true time	True time and place
C3. Perceived authenticity* (removed a value)	Categorical, Binary	Easily distinguished (by readers as fake)	Convincingly written (not easily distinguished by readers as fake)		
C4. Persons (=source) mentioned in the news (added)	Categorical, Multi-class	Fake Identity (web-page / profile)	Peripheral char-acter (a person is presented as the main participant of an event)	Unconfirmed witness	Trusted sources
C5. Primary objective	Categorical, Multi-class & Multi-label	to entertain the audience to gain political advantages (discredit opponents) to provoke a riot or a coup to discriminate against people to manipulate the market to gain economic advantages to increase Internet data traffic (clickbait) to draw audience attention to a particular person, company, project to seize money and property (e.g. fake charities)			
C6. Medium * (added whole class)	Categorical, Multi-class	Social media (*Facebook, Twitter*) Internet Traditional media or public event Other			

Source: Own processing

Categories in these sort of classification tasks need to cover the whole spectrum of possible values, to be well-separable, to be defined in terms of type (i.e. binary – to choose one of two, multi-class – to choose one of many, or multi-label – to choose many of many). This modification, adaptation and finally formulation of fake news categorisation framework is one of the outcomes and benefits of our work. The characteristics that were modified are distinguished with * sign in Table 1. The following are the changes made to the fake news characteristic classifications:

- **Truth information ratio:** we combined types of fake news regarding partial lie since there is significant overlap between them. Thus, we removed values that could be difficult for an end-user to understand and identify and left only two types of fake news for this category: a complete lie and a partial lie. We added a new value – 'unproven or true' – to handle the cases that cannot be classified with the previous choices. This is a multi-class field.

- **Time/place authenticity:** this is a multi-class value field, which means that based on the information we have about time or/and place for each fake news case we can choose one of all possible combinations. We formulated the possible values in such a way to be easy to be used by both humans in filling in relevant information and machines for identifying associations. The added values are distinguished in Table 1 as underlined and bold.
- **Perceived authenticity:** this is a binary value field. We classify pieces of information as either easily distinguished by users as fake or written so convincingly that the reader cannot distinguish that it is fake. We removed a value in this field when compared with the original proposal to promote ease of use and understanding of this characteristic.
- **Persons mentioned in the news:** this is a multi-class value field; three possible choices here are fake identity profile, peripheral character and unconfirmed witness. We also added another type for 'trusted sources', as a category that is not included in the rest.
- **Primary objective:** a multi-class and multi-label value field. There are eight possible types of objectives.
- **Medium:** This characteristic was not included in the original proposal. It is important as it provides insights when used in the association rule mining.

Moreover, for every fake news case about immigration we indicated its country of origin and the platform that was used for the distribution of fake news.

Results

Using classification of fake news in Table 1, we analysed 59 different immigration fake news cases. A common characteristic amongst the cases was that the sources that were responsible for spreading controversial information were usually from the same country or continent where the questionable fact was recorded.

Only 8% of the cases were classified as unproven by the fact-checkers, most commonly, due to the lack of detailed information. The majority of the cases contained false information, while only a few had unproven statements. A great danger is posed in the partial lie cases, since the reader might be swayed into believing the whole story simply because some parts of it agree with their preconceived opinions. Moreover, the content is written quite convincingly, so that a reader will most probably be misinformed and get a corrupted perception of a subject or even a whole nation.

A common technique, usually used in partially false cases in order to be projected as realistic, is the falsification of two major factors relating to an event – its time and place. We found out that the creators and publishers of fake news falsify information about the time when an event took place more frequently than about the place where an event happened. However, in most cases that we analysed, the time and the place have been stated truthfully, though the case is usually fraudulent with fake or unidentified details. Regarding the medium of spreading fake news, in 38% of the cases it is either traditional media or a public event. However, social media platforms were utilised for this purpose more frequently. To be exact, *Facebook* and *Twitter* were used as the medium in 24% and 19% of the cases respectively.

Most of the users who spread false information are peripheral characters that usually claim the validity of a fact without any proof or evidence. Another major type of such user is an unconfirmed witness, whose claims often lack integrity. We identified that almost a half of the analysed cases had an intention to influence public opinion in order to gain a political advantage. The goal in 29% of all the cases was to discriminate against people that also might correlate with political agenda, since political campaigns usually try to benefit through socialism and the fear of society.

Having all 59 fake news cases encoded according to our framework, we were able to mine rules by examining co-occurrences, using Association Rule Mining with the Apriori algorithm for creating frequent itemsets. The association rule mining was performed following two procedures:

a) Maxlen=1: detecting rules with maximum length (maxlen) of one;
b) Maxlen=none: detecting rules with no maximum length.

Another reading of the maxlen parameter can roughly be asserted as 'how many items one rule can contain'. Therefore, if this maxlen parameter equals one, this means that antecedents and consequents are measured and associated one-to-one. Otherwise, if maxlen parameter equals none, this means that that antecedents and consequents are measured and associated one-by-two, two-by-two, etc. The derived rules were filtered for each of the metrics (i.e. confidence, support, lift) used by the machine learning algorithm we utilised taking only values that were above the respective median values.

Maxlen=1: 8 rules were mined at this stage, sorted by lift (see Table 2). Some of the resulting rules seem more plausible and closer to our preconceived notions while others are either novel or even counter-intuitive. For the former, two such rules stand out, and they start with the assumption that if something was published in traditional media then it is more likely that the time and place are valid (rule 6), which is something we would expect of most newspapers and television. In addition, the primary objective of the publisher is motivated by political advantages (rule 8). Another rule says that if something was motivated by political gain, it is more likely to be categorised as a partial lie (rules 34, 35) and vice-versa. Rule 51 tells us that if a piece of news comes from traditional media, we can expect that the place and time mentioned are valid and not out of context. As we can see, if we go lower and closer to a lift value of 1, then the suggestions are beginning to make less sense. The last two rules say that someone who seeks to discriminate against people will refer to events without taking them out of context. This particular incident should be taken into consideration, though. Even false positives or uninformative statements can indicate a failure in data collection. We believe that this instance showcases a failure of this framework: authenticity of time and/or place may not be a good indicator. Although unexpected relations are often discovered by similar algorithms, this contradiction proves that human input is always necessary when interpreting results so as to filter out 'noise'.

Table 2: Collection of rules, when MaxLen=1

Rule	Antecedents	Consequents	Support	Confidence	Lift
50	Persons: Peripheral Character	Primary Objective: Discriminate against people	0.19	0.58	2.01
51	Primary Objective: Discriminate against people	Persons: Peripheral Character	0.19	0.65	2.01
6	Medium: Traditional media or public event	Authenticity Time & Place True	0.2	0.86	1.81
35	Primary Objective: Political advantage	Truth Ratio: Partial lie	0.36	0.72	1.64
34	Truth Ratio: Partial lie	Primary Objective: Political advantage	0.36	0.81	1.64
8	Medium: Traditional media or public event	Primary Objective: Political advantage	0.19	0.79	1.6
43	Primary Objective: Discriminate against people	Authenticity Time & Place True	0.2	0.71	1.49
29	Primary Objective: Discriminate against people	Truth Ratio: Complete lie	0.19	0.65	1.36

Source: Own processing

Maxlen=none: when dropping the constraint that relations should only examine one item, we again applied filtering, discarding anything below the medians of each basic metric. Cases that satisfy the criterion of having every metric above the median of each were counted as interesting association rules. Thus, we ended up with 52 rules. In Table 3 we present only four of them, the ones with the highest lift. Rule 212 and 213 describe that if something was published in traditional media, and if it is valid in terms of time and place, then the most likely resulting categorisations are for the publisher to have a political motivation and the piece itself to be a complete

lie. The rules following these (i.e. 236, 241) say that if something was politically motivated and authentic in terms of time and place, we should expect to see it in traditional media and it should be convincingly written. If we assume that traditional media are trustworthy, of high quality, and often partisan, this resulting association rules make sense. Another interesting pattern that occurred after examining 52 rules is that we often see the objective being discrimination when the piece of news refers to peripheral characters.

Table 3: Collection of rules, when MaxLen=none

Rule	Antecedents	Consequents	Support	Confidence	Lift
212	Medium: Traditional media or public event, Authenticity Time & Place True	Truth Ratio: Complete lie, Primary Objective: Political advantage	0.12	0.58	4.3
213	Truth Ratio: Complete lie, Primary Objective: Political advantage	Medium: Traditional media or public event, Authenticity Time & Place True	0.12	0.88	4.3
241	Primary Objective: Political advantage, Authenticity Time & Place True	Medium: Traditional media or public event, Degree Authenticity: Convincingly written	0.14	0.73	4.29
236	Medium: Traditional media or public event, Degree Authenticity: Convincingly written	Primary Objective: Political advantage, Authenticity Time & Place True	0.14	0.8	4.29

Source: Own processing

Discussion and Conclusion

To answer the first research question (**RQ1**) we formulated a framework to characterise fake news cases (see Table 1). This framework is based on existing literature and concepts in the wider area of fake news and false information. However, it was adapted in such a way to be simple to use and be incorporated in automated machine learning tools. The research team then examined how this framework could be used in real fake news cases related to immigration issues (**RQ2**). For each fake news case, we stated the source, the country of origin, the fact it was referring to, the true part of what was spread, the false part of what was spread, the true and false information ratio, the date when it was fact-checked, the authenticity of time and place of the reported event and the medium through which it was spread. Moreover, we classified pieces of news presented in each case as either recognisable by users as fake or written so convincingly that the reader cannot distinguish that it is fake, and we categorised them according to their primary objectives.

Using our framework to classify the cases and feeding them into a rule mining algorithm, we were able to extract some rules that have strong support from the data. Using these rules, one could create or augment an automated system for fake news classification that is better suited for recognising fake news in the context of immigration. Having identified the association rules among characteristics of the framework, we proved its applicability (**RQ3**).

Thus, the first benefit of this work is the provision of the framework to characterise fake news. We attested the proposed framework by filling the selected 59 immigration fake news cases in Table 1. Exploratory analysis was performed and we discuss our findings here:

1. We can deduce that the impact of fake news has been more noticeably present in the U.S. media. This is not an unexpected phenomenon, as a major contributing factor to the rise of fake news was the U.S. Presidential Election in 2016 as well as the statements and viewpoint of Donald Trump with respect to immigrants.
2. The most frequent scenario of an unproven case is the one that has an assault as a focal point, where the perpetrator's identity and origin were unknown, and yet, for example, they were accused of being a Muslim extremist.
3. In most cases that we analysed the time and the place were stated truthfully, although the case is usually fraudulent with fake or unidentified details.
4. The majority of immigration fake news is distributed via digital media using websites and social networking platforms (mostly *Facebook* and *Twitter*).
5. Regarding the primary objectives that creators and publishers of immigration fake news pursue, we discovered that almost a half the cases had an intention to influence the public opinion in order to gain a political advantage. Our findings are in accordance with other literature discoveries. False information is also distributed during crises such as terrorist attacks or disasters in order to cause mayhem and spread panic, usually through social media. Politicians usually make false statements about immigration via interviews on TV or their social media accounts.[18]

Moreover, some findings stemming from our association rule mining process are worth discussing:

6. Rule 6 in Table 2 affirms that if a piece of news comes from traditional media, we can expect that the place and time mentioned are valid and not out of context. To an automated tool, this means that the piece, coming from a reputable source, should have a lower probability of being considered fake.
7. Rules 34 and 35 in Table 2 convey that if a piece was published with political motives in mind, then we can infer that it is more likely to be a partial lie. Thus, an automated algorithm should lower its credibility score when dealing with remarks made by politicians.
8. Rule 8 in Table 2 supports that traditional media are likely to propagate information that aims at gaining some political advantage. This was an expected result if we consider that politicians appear very often on said media.
9. Things get somewhat more interesting as we progress to relations between sets of items. Rules 212 and 213 in Table 3 affirm four rules mentioned above. This general trend that emerges – that when traditional media are involved with political matters, we have less truthful statements – is probably the reason why *Facebook* has been moderating political content more closely.
10. Although these pairwise (i.e. maxlen=1) relations are interesting, they are less insightful than relations with multiple antecedents and consequents. These rules show us simple relationships that do not provide much more than a common-sense insight. Still, they can be used in an automated or semi-automated fact-checking mechanism.
11. Rules (212, 213) of Table 3 appear counter-intuitive: if something was published in traditional media, and it is valid in terms of time and place, then the most likely resulting categorisations are for the publisher to have a political motivation and the piece itself to be a complete lie. One plausible explanation for this sort of rule could be that in our dataset there were many statements from Donald Trump, whose false claims have been hotly debated.[19] Another explanation could be that when someone appearing on traditional media lies, they often distort parts of the truth that are not part of the 'true – false' time/place spectrum.

When we remodelled the classification of fake news in order to analyse fake news about immigration, we discovered that it was difficult to proceed with carrying out both exploratory and machine learning based analyses since the extra fields we had added were referring to the source of news and not to the case article from the fact-checking website. Thus, we decided to state the source for each case in order to proceed with the analysis. However, not all fact-checking websites provide a link to the original source, so we had to make

18 See: JACOBSON, L.: *No, It's Not Correct That 39% of California Students Are Undocumented*. [online]. [2020-02-16]. Available at: <https://www.politifact.com/truth-o-meter/statements/2018/jul/05/viral-image/no-39-california-students-arent-undocumented/>; VALVERDE, M.: *Diversity Visa Applicants Are Vetted, Despite Contrary Claim from White House Press Secretary*. [online]. [2020-02-17]. Available at: <https://www.politifact.com/truth-o-meter/statements/2017/nov/02/sarah-huckabee-sanders/white-house-press-secretary-claims-diversity-visa-/>; VALVERDE, M.: *Donald Trump's False Claim about the Cost of Illegal Immigration*. [online]. [2020-02-16]. Available at: <https://www.politifact.com/truth-o-meter/statements/2018/dec/05/donald-trump/donald-trumps-false-claim-about-cost-illegal-immig/>.

19 OJEDA, R. H., WYNN, M., CHEN, Z.: *Donald Trump's False Narrative on Mexican Migration and Trade: A Geopolitical Economic Analysis*. Los Angeles : UCLA North American Integration and Development Center, Institute for Research on Labor and Employment, 2016, p. 3-36. [online]. [2020-02-05]. Available at: <www.naid.ucla.edu/uploads/4/2/1/9/4219226/trumptrade_execsum_v16.pdf>.

an individual search for each fake news case that had no mention of the source of information. The difficulty was that not all the sources were articles, but they also appeared as memes in social media channels. There were some fake news cases for which, even after reverse-searching an image, it was still impossible to find the original source of the news. For future studies, we suggest checking out more fact-checking websites, preferably established in different countries and even continents, and examine more than 59 cases.

We analysed fake news cases regarding immigration and pointed out how these cases correlated with some characteristics of fake news. We identified commonly used characteristics of immigration fake news. However, in this study we did not have the goal to analyse all fake news areas. Thus, we cannot state that our findings and framework are applicable in other areas of fake news. Therefore, a direction for a future research could be to investigate other areas of fake news as well.

We believe that this initial attempt to identify rules among characteristics to classify fake news is interesting and deserves further investigation. Moreover, other machine learning algorithms and even statistical methods could be used to compare results and leverage insights into actionable guidelines. One particular example could involve machine learning systems that learn to classify texts of interest in accordance with our framework and leveraging association rule mining type analysis to further augment previously existing automated decision mechanisms.

As for the usefulness and applicability of this study, its results could be utilised as a basis for creating a new tool that specialises in fact-checking news on the topic of immigration. It could be a web-based service or a browser extension. On the other hand, this study could also be used as a foundation of an educational programme aimed at immigrants first, but also anyone who is interested in the matter. As only when people start paying attention to specific characteristics of news and their correlation, will they be more prepared and more able to face the 'fake news world'.

In this work, we researched different definitions, types and classifications of fake news. Based on this information, we presented an integrated model to be used as a framework for classifying fake news. Although based on the literature, it was carefully enhanced in order to be better suited for data mining techniques. We used the proposed framework to analyse fake news about immigration and identify the relations between different characteristics of immigration fake news. We believe that immigration and fake news in general is a topic that needs to be more deeply researched since fake news about immigration keeps gathering momentum and affecting all aspects of people's lives.

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