Interdisciplinary lessons learned while researching fake news

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Abstract

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The misleading and propagandistic tendencies in American news reporting have been a part of public discussion from its earliest days as a republic (Innis 2007; Sheppard 2007). “Fake news” is hardly a new phenomenon (McKernon 1925) and it has been applied to a variety of distinct phenomenon ranging from satire to news which one finds disagreeable (Jankowski 2018; Tandoc, Lim, and Ling 2018). However, this problem has become increasingly acute in recent years with the Macquarie Dictionary declaring “fake news” the word of the year in 2016 (Lavoipierre 2017). Fake news was internationally recognized as a problem in 2017, although this latest version had been identified earlier (Pomerantsev and Weiss 2014; Applebaum and Lucas 2016). There are many initiatives to counter this problem and the results have had varying levels of success (Flanagin and Metzger, 2014; Horne and Adali 2017; Sample et al. 2018). The inability to create a complete solution continues to stymie researchers and other vested parties alike. A significant contributor to the problem is the interdisciplinary nature of digital deception. While technology enables the rapid and wide dissemination of digitally deceptive data, the manner in which the data is designed for consumption relies on a mixture of psychology, sociology, political science, economics, linguistics, marketing and in some cases fine arts. The authors for this effort discuss deception’s history, both old and new, from an interdisciplinary viewpoint, then proceed to discuss how various disciplines contribute to aiding in the detection and countering of Fake News narratives. A discussion of various fake news types (printed, staged events, altered photos and deep fakes) ensues with the various technologies being used to identify these, the shortcomings of those technologies and finally the insights offered by the other disciplines that can be incorporated to improve outcomes. A3-point evaluation model that focuses on contextual evaluation, pattern-spread and archival analysis of both the author and publication archives will be introduced. While the model put forth cannot determine fact from fiction, the ability to measure distance from fact across various domains provides a starting point for evaluating the veracity of a new story.

Contribution to the field

Fake news has generated research in various disciplines that offer new insights but a lack of research has been done that examines the interplay between disciplines. The authors represent different disciplines and perspectives on digital deception by discussing topics in their areas of expertise and applying those issues to other disciplines. For example: the relationship between linguistics, sociology, computational linguistics, natural language processing software and data science are discussed. Cybersecurity’s role in digital deception identification and countering. Solutions that are discussed for digital deception are either not scalable or lack accuracy, by allowing outside disciplines to inform the queries the authors suggest improved results are possible.
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Interdisciplinary Lessons Learned While Researching Fake News

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Abstract
The misleading and propagandistic tendencies in American news reporting have been a part of public discussion from its earliest days as a republic (Innis 2007; Sheppard 2007). ‘Fake news’ is hardly new (McKernon 1925) and the term has been applied to a variety of distinct phenomenon ranging from satire to news, which one may find disagreeable (Jankowski 2018; Tandoc, Lim, and Ling 2018). However, the problem has become increasingly acute in recent years with the Macquarie Dictionary declaring ‘fake news’ the word of the year in 2016 (Lavoipierre 2017). The international recognition of fake news as a problem (Pomerantsev and Weiss 2014; Applebaum and Lucas 2016) has led to a number of initiatives to mitigate perceived causes, with varying levels of success (Flanagin and Metzger, 2014; Horne and Adali 2017; Sample et al. 2018). The inability to create a holistic solution continues to stymie researchers and vested parties. A significant contributor to the problem is the interdisciplinary nature of digital deception. While technology enables the rapid and wide dissemination of digitally deceptive data, the design and consumption of data relies on a mixture of psychology, sociology, political science, economics, linguistics, marketing, and fine arts.

The authors of this paper discuss deception’s history, both old and new, from an interdisciplinary viewpoint, then proceed to discuss how various disciplines contribute to aiding in the detection and countering of Fake news narratives. The authors then provide a discussion of various fake news types (printed, staged events, altered photos and deep fakes), followed with the various technologies being used to identify these, an analysis of the shortcomings of these supporting technologies and finally the insights offered by the other disciplines that can be incorporated to improve outcomes. A three-point evaluation model that focuses on contextual data evaluation, pattern-spread and archival analysis of both the author and publication archives is introduced. While the model proposed cannot determine fact from fiction, the ability to measure distance from fact across various domains provides a starting point for evaluating the veracity of a new story.

“If it is not true, it is very well invented” Giordano Bruno

Introduction
Fake news has a long history in America (Innis 2007; McKernon 1925), becoming internationally recognized as a problem in 2016, the year it was declared word of the year by the Macquarie Dictionary (Lavoipierre 2017). The re-emergence of the term ‘fake news’ (Meza 2017) served as an inflection point for academics across various disciplines. Some academics observed the commonalities between ‘fake news’ and propaganda that uses a different delivery mechanism (Younger 2018), while others observed greater sophistication, customization and weaponization (Younger 2018; Verrall and Mason 2019). Those in academia and government who recognized this threat, some as early as 1997 (Szfranski others soon after (Cybenko 2002). Szfranski (1997) suggested that the weaponization of deceptive information would require protection of both combatants and non-combatants alike. While some groups of people are more resilient against deceptive data (Bjola and Papadakis 2020) suggesting a cultural component, significant populations remain vulnerable. The vulnerable also includes journalists, who repeat the stories that align with their own values. Even the journalists’ verification and validation mechanisms are corrupted by algorithms that provide information that aligns with targeted beliefs. Indeed, according to some behavioral scientists, all are vulnerable to the messages that confirm biases (Oswald and Grosjean 2004).

Media spheres like journalism require their journalists to act as watchdogs of information-sharing for its global citizens. Their position in the world holds responsibility to provide independent truth and legitimacy to its audience by providing fact-checking. General verification procedures will be covered to transition into discussion about the importance of interdisciplinary work. Journalists intercept deception by reporting on the truth of our reality, having a general agreed normative approach to fact-checking including combating Fake news narratives even if interpreting false claims are still very much subjective (Graves, 2018; Meña, 2019). Five elements of fact checking provided by Bratich (2020) include: choosing claims to check, contacting the source of the claim, tracing false claims, working with experts, and showing their (journalists) work. Within this frame, journalism has become loaded with uncertainty, mistrust, and manipulation from its user engagement and many other trends, such as politics and emerging technologies, which intersect it (Waisbord, 2018).

Pomerantsev & Weiss (2014) identified five goals of disinformation, of which fake news is a subset, these goals include: paralysis, demoralization, confusion, blackmail and subversion. Disinformation campaigns will seek one or more of these goals, with each of the five goals representing a strategy to use against a targeted group of people. For example, credible news stories that report opposite stories on the same event can, if both are professionally done, confuse a person who is new to the story and environment, rather than simply sway the person to one side or another.

1.1 Fake News, Disinformation, and Manipulation

The use of disinformation and misinformation in news has a long history. Some scholars have focused on misinformation, the inadvertent release of misleading or factually incorrect information, or disinformation, involving the intentional diffusion of factually incorrect claims for political purposes (Bakir and McStay 2018; Bennett and Livingston 2018). From a perspective of information warfare however, claims need not be false to have strategic value in manipulating an audience (Schafer 2018). Well timed, factually correct information can be as effective as a lie, when this occurs the information becomes weaponized. The authors contend that there is a distinction between information and its weaponization as the movement from an information logic to an identity logic within communications.

Information is classically defined as “current data about developments in and the status of” a system at any given time (Downs 1957, 79). An information logic has three components. First, there is a temporal dimension. As information refers to the current status of a system or scene of events, it has a fleeting duration, “information that is repeated is no longer information. It retains its meaning
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Deception is not limited to the political realm. Health/medicine (Spring, 2020), finance (Cybenko et al., 2002), the military and cyber domains are a few other environments where deceptive data or fake news have successfully been deployed. Deception relies on tricking both sensation and perception. In order for information to be perceived the data must first be sensed. Human perception and information processing are still not fully understood (De Faveri & Moreira 2016).

“Persuasion lies at the heart of political communications” (Flanigan & Metzger, 2014, 1). For fake news to be effective, the deception must first be formed and then communicated. The communication process where the sender and the receiver share the same perception of information was defined by Gerbner (1956). Gerbner’s model of communications identifies the role of perception and contextualization in the message creation phase. Successful deception relies on influencing the thinking of the target (De Faveri & Moreira 2016). The target in the case of fake news is the human mind, and journalists are humans, thus, vulnerable to disinformation.

The main target of fake news is the human mind. A key component of the human mind is decision-making, and as a result, there are numerous factors that feed into decision-making which are relevant to the topic. Before the human mind can process information, the data that forms the information must first be sensed, then perceived. Sensing occurs when one or more of the five senses are stimulated. Generally, speaking, sight and sound predominate in sensory stimulation, particularly so in the online world where fake news prevails, sensory deprivation makes possible the ability to control perception. Perception provides the input into decision-making, so a lack of stimuli (sensation data) or manipulated sensation data designed as context triggers the initial unconscious neural response for specific actions (Gazzaniga et al. 2014). Conversely, an un-sensed event is never perceived or a non-event.
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While much focus on decision-making centers on motivation, the authors would be remiss if they did not list additional factors that impact human decision-making. Decisions rely on several factors that in addition to motivation include patience/impatience, risk attitude and ambiguity attitude (Gazzaniga et al. 2014). Different factors suggest that the way decisions are made is diverse. Any single factor or combination of factors that dominate in any decision is most accurate as a post-hoc exercise. Furthermore, all factors discussed in the decision-making process are situationally dependent.

Decisions can be broken down into two types; conscious, otherwise known as action-outcome decisions, and unconscious, also referred to as stimulus-response (Gazzaniga et al. 2014; Khanneman 2011; Dijsterhus 2004). Both types of decisions are influenced by biases. De Favari & Moreira (2016) described patterned deviations from fact in perception as biases and heuristics; cognitive shortcuts (McAlaney and Benson 2020). Regardless of the type of decision being made, the biases still influence the outcome. However, the message creation can vary.

De Favari & Moreira (2016) examined deception in the hostile cyber environment and described three groups of biases: personal and cultural, organizational, and cognitive. It was noted that while highly effective, biases are difficult to obtain (Ibid). However, this observation preceded widespread knowledge of the role of social media in fake news targeting and dissemination (Shu et al. 2017 several sources).

The new role of social media in content creation, delivery and dissemination of fake news has changed the landscape in unanticipated ways, requiring a re-examination of the means to identify and ultimately mitigate this type of deception. For this reason, the authors are examining some of the common disciplines involved in fake news, or digital deception within the model describing content, distribution and archives defined by Sample et al. (2018).

1.3 Deception as a Strategy

The assumption and assertion of this paper is the role of fake news to achieve political, social and potentially other forms of influence utilizing deception as a strategy. Deception as strategy has roots in ancient human behavior; observed in early history including Greek mythology (Phaedrus, 2008, p438). In more recent times, Erfurth’s treatise on Surprise (Erfurth, 1943) provide helpful insights. Erfurth observed that almost all decisive military victories have been preceded by surprise, which relies on secrecy and speed. Deception is a form of surprise, providing a means to unbalance an opponent through uncertainty. Handel’s detailed analysis of deception at the strategic and operational levels in World War Two also offer relevant observations. Deception must be believable to the target audience, with sufficient resources and time invested in a coherent narrative to reinforce existing beliefs. “The susceptibility to conditioning is one of the most fundamental human proclivities to be exploited by deception operations” (Handel, 1987, p14). Conditioning greatly precedes the actual event of deception. Conditioning lays the groundwork upon which the deception capitalizes.

Disinformation, a critical form of and enabler of deception, has a history in both warfare and state security functions. The use of disinformation as a form of deception is examined by Whaley (2007, p8), in the historical context that it was originally a World War One term applied by the German General Staff and then adopted by the Russians. Applying Shannon’s communication model, relevant but false information is fed into a communication channel, forming a third transmission category to signal and noise. This third category described by Whaley (Ibid) may be disinformation or misinformation depending on intent. Misinformation is inadvertent, whereas disinformation deliberately seeks to overload, discredit or realign an audience’s information management capabilities. Given the requirement to consider intent, disinformation has little utility without a purpose. Having understood the target and obtaining a means to access information and information networks, then subsequently exploiting those networks to expand access, disinformation provides the means to utilize

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supporting conditioned biases and narratives with the intent to influence perceptions and behaviors (Waltz, 2008, p.4).

The Soviet concept of maskirovka encapsulates the complexity of the problem space surrounding deception. Although the term maskirovka can be defined as camouflage, it extends in Soviet doctrine across a broad array of strategic, operational and tactical measures to obscure intent, maintain security and confuse the adversary (Glantz, 2008, p.2). Whilst there are numerous instances of maskirovka strategies being successfully employed throughout World War Two, which have helped inform modern doctrines and techniques, it is also important to note that failures occurred when maskirovka was employed hastily, was poorly coordinated, enacted by personnel with inadequate training (Ibid, p14), or conducted in a stereotyped or patterned manner (Ibid, p10).

A critical observation of the maskirovka concept is the employment of a variety of techniques at all levels, in a planned and coordinated manner that also sought to embrace complexity with significant focus on aligning tactical outcomes with strategic intent. This appears to be common when compared with today’s use of fake news. The employment of various tactical and operational approaches to achieve a broad strategic intent allows for multiple target audiences to be engaged with sometimes conflicting narratives and thematic episodes. This tactical and operational flexibility could be regarded as dangerous and counter-intuitive from the strategic perspective, however it does appear to provide freedom of maneuver across the information environment and the ability to leverage the complexity of the modern information environment to achieve specific outcomes efficiently, and with speed. The ability to roam widely, engaging with numerous audiences, themes and narratives, at speed, appears to be a force multiplier in the employment of disinformation and fake news through social media and online forums. Moreover, this approach capitalizes on a number of perceived failures by trusted agencies to apply their moral and ethical narratives consistently; meaning that conflicting narratives by fake news agencies can always be excused by way of pointing to inconsistencies by previously trusted establishments who have perceived conflicts of interest, often amplified by the same fake news outlets.

The identification of target variables and the ability to fashion specific messages at an individual level, refined based on personal and cultural data, appears to support the contention that a single, cohesive narrative is not required in the modern world. Fake news agents, marketers and political organizations can target specific individuals based on individual data collected from internet fingerprinting and social media. Target variable data can distinguish at an individual level likely biases, beliefs, and likely actions through personality profiles. The more traditional media, government and military refers to target audiences in a different, less precise manner, based on broad narratives and a focus on broad beliefs and groupings with an assumption that these descriptions will lead to specific group behaviors. It appears from these differences and the rapid evolution of supporting technologies, that disinformation campaigns have a distinct advantage in the modern information environment. In the instance where one can focus on the issues specific to each individual and tailor the message to alter behavior around those issues at a personal and granular level, it appears that the narrative can be delivered in a micro, targeted manner. The alternative appears to be the delivery of grand narratives and themes supported by ‘trusted’ agencies who rely on their self-perception of impartiality, which is quickly a target for fake news agencies and those who are likely to benefit from distrust of alternatives to the fake news narratives. It remains to be seen if the employment of fact checking, controlled narratives and traditional information operations approaches are sufficient for the information environment of the future. Results to date are not particularly positive. Perhaps part of the problem is the inconsistency inherent in modern life – it is not inconceivable to act contrary to one’s beliefs based on more personal, pertinent matters which are fleeting. That is a matter priests, theologians and ethicists have grappled with since the dawn of organized religion. Personality and culture, discussed later within this paper, are factors that are likely to contribute to these outcomes.
The modern context of disinformation as applicable to fake news, extends from the fundamental concepts of deception as a strategy and some of the principles discussed above. Susceptibility to conditioning, bias, narrative and the exploitation of information and social networks are all fundamental to the concept of fake news. These concepts will be discussed in more detail throughout this paper.

2 Background

The weaponization of information is enhanced in the digital world where communities are created not only through borders and national boundaries, but also by shared thoughts that include shared hopes and fears (Bennett 2012). In the information age where decision-making, especially in western style democracies carries great importance, the ability to control sensing and manipulate perception in online communities is extremely valuable.

If war is political, and politics inhibits a variety of attributes of war, modern politics is in many ways invested in the preparation for war, and our existing politics may even stem from and reproduce a set of relationships established through war (Virilio and Lotringer 2008). The existence of nuclear deterrence as a variation of the “stability-instability paradox” may incentivize sub-kinetic forms of warfare, which can be harder to deter precisely because efforts to restore deterrence conventionally can risk nuclear escalation (Gartzke and Lindsay 2019, 14). Clausewitz (1982) termed war as politics by other means. However it is equally possible in the modern context of hybrid war, political warfare, gray-zone conflict, and the like, politics may be a continuation of warfare by other means (Foucault 2003).

Information warfare weaponizes communications in order to effect change in a target audience in terms of their attitudes and behaviors. If content is the currency of propaganda, then timing performs a similar function for information weaponization. The strategic communication of information can be a “source multiplier” shaping one’s understanding of situations as well as shaping “the operational environment” so as to neutralize an adversary as well as advance one’s own strategic objectives (Armistead 2004, 1). While information warfare retains the descriptor “information,” it denotes a field of communication that is transformative more than informative. Information operations achieve these ends by seeking to “influence, disrupt, corrupt, or usurp the decision making of adversaries” while protecting those capacities for one’s own side. As decision making is largely biased, and biases are behavioral in nature, the shaping of attitudes and beliefs is key to success in this environment.

Although information warfare has often been conceptually confined to a space of military warfare, there is growing recognition that it “can take place in any situation across the spectrum of war or peace” (Morgan and Thompson 2018, 10) whereby warfare extends into political life in a non-kinetic, non-physically violent form (Singer and Brooking 2018, sec. Kindle: 325). This new type of warfare has been referred to as hybrid warfare (Comin & Filol 2014) and enacted in numerous countries (Atkinson 2018), where fake news as a weapon of information warfare plays a prominent role (Younger 2018).

Politics has become a problematic center in Fake news reporting; journalists are criticized for being non-partisan during fact-checking procedures coupled by general misunderstandings that they are responsible for fact-checking future statements from politicians, leading to increased user distrust in mainstream media (Uscinski, 2015). These trends have caused a shift in the traditional hierarchical information sphere regarding how truth is reported. Interdisciplinary work can address some of these issues. Social media has transformed the landscape of information reporting, meaning that solutions to combat Fake news depend on the flexibility of traditional journalistic pathways to produce fact-checking frameworks clear enough to account for such change. Much like cybersecurity issues faced today, the information flow of fake news is unprecedented and at times overwhelming; mounting pressures on journalists to discern truths has allowed for both increased verification and

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vulnerabilities to occur in reporting. For example, fact-checking the credibility of sources is a common task, but there are many examples in mainstream media where this is not done. Many journalists recognize the presence of information disorder (Plotkina et al., 2020). Information excess from virtual space produces a reporting experience that can cause fact-checking to be synonymous with instantaneous discernment of sources to then act, or not act, upon. Generally, journalists do agree that taking the time to do fact-checking thoroughly is more important than being the first to cover a story, but this is not always a tangible result (Schapals, 2018). Journalism, unlike many other spheres, has an advantage in its ability to report on evolving fake news concepts at the rate fake news articles are being produced because of its unique access to information streams.

There is an alternative view that modern information operations occur in a globally competitive environment, influenced by the integrated nature of the world trade and political systems. Future World War is unlikely due the looming threat of nuclear conflict, so instead political objectives are achieved through kinetic and non-kinetic proxy wars. Cyber and information are just some of the domains and environments where we see this competition. Even from a warfighting perspective, in many cases the actual implementation of information operations as a component of military campaigning is focused on managing kinetic events against a narrative and coordinating non-kinetic effects to achieve specified outcomes. Therefore, the concept of information warfare can portray a more integrated and planned approach than is often the case. Governments and societies, even totalitarian regimes, must balance a variety of internal and external forces to shape their strategic objectives and narratives. For the purposes of this paper, however, we will refer to information warfare in the context of ideologically and politically driven fake news, which seeks to manipulate, deceive and change behavioral outcomes through disinformation for long-term strategic advantage.

While some aspects of campaigning fit within an informational economy, others bear a closer resemblance to the strategies and tactics of information warfare. Information by itself simply informs an audience about the current situation, leaving the parameters of decisions unchanged. Information becomes weaponized at the point that it shifts a target audience by either reshaping the environment or the preferences, attitudes and even identities of the target audience in order to produce judgements, decisions and behaviors favorable to the initiator (Marcellino et al. 2017, 9). This can be subtle. For example, rather than changing a person’s desire to vote for a party, it is enough to simply convince someone not to vote on the day of the election. Value sets and beliefs are not always the target. Sometimes it is enough just to influence behavior for a short period to achieve the desired outcome.

The purpose of news is to inform the target audience which differs from the weaponization of information that seeks to deceive or manipulate through transformation of one’s perception of a situation or through transformation of self-identity. The realignment of interests, attitudes, and beliefs through communications creates a “consubstantiality” between persons such that they come to see themselves as the same, at least within a certain set of parameters for acting (Burke 1969, 21).

Underlying the creation of consubstantiality involves shifting identifications with political objects and actors, as well as their understandings of themselves in relation to the political world. Identities are always relational, demarcating what one is and, simultaneously, what one is not (Connolly 2002). Information warfare, therefore, involves the strategic and tactical use of information which operates on the order of identities, shifting the alignments of a target from one set of political identifications to another, with the goal of shaping behavioral outcomes.

The focus on shaping identities and behavior is not limited to warfare between international adversaries. In contrast to the informational terrain of political conflict which has informed models of spatial competition and political opinion formation, political preferences are not prior to campaigning but shaped by political identities which are constructed through campaigning over time. Evidence points to the primacy of a politicized identity over information cues in understanding American political behavior. Political identity is irreducible to differences in issue positions as research shows policy positions even on fundamental issues such as abortion shift in line with partisan identities over
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time (Achen and Bartels 2016; Mason 2018). While personality characteristics of candidates might be one calculation along with policy considerations, the explanation for political behavior predicated on the basis of an identity logic is quite distinct from the informational logic of policy preferences as policy preferences are derivative of partisan identifications rather than the other way around.\(^1\)

An identity logic contrasts along all three dimensions of the informational logic. First, in terms of the target of definition, identities define actors rather than inform as to the state of a situation in which action occurs. Personal identities are composed of “the commitments and identifications which provide the frame or horizon within which I can determine … what is good, or what ought to be done, or what I endorse or oppose” (Taylor 1992, 27). The normative entailments of identities function in communications as an “inducement to action (or an attitude, attitude being an incipient act)” (Burke, 1969: 42).

Second, information and identity logics are temporally distinct. By overlooking the unique timestamps, deep fakes and computer-generated fake news can work in deceiving targeted users. In contrast to the instantaneous and fleeting nature of information, identities temporally integrate an actor providing a sense of continuity over time and space (Miskimmon, O’Loughlin, and Roselle 2014, 5). The repetition of identity claims perpetuates an identity narrative which preserves a sense of ontological security in the face of changing circumstances over time (Giddens 1991, 53–54). On the other hand, identities can be weaponized at the point that ontological security is put in jeopardy through communications which undermine one’s trust in political actors and institutions or one’s standing in the political system.

Third, in contrast to the descriptive nature of information, the moral horizons which define identities provides a language “for objects contain[ing] the emotional overtones which give us the cues as to how to act towards those objects” (Burke 1984, 177). In online communications, “identity can be a shared feeling” as “people recognize themselves in the emotions of others” (Zaharna 2018, 60). The contrast to emotional appeals is descriptions of external objects and events without reference to the experience of those objects and events\(^2\). Emotional appeals can problematize identities as in the case of repeated communications seeking to induce anger or fear and can give rise to anxieties – a tactic used by the Russian social media efforts to move Americans to de-identify with the existing political order (Jensen 2018).

2.1 Fake News: Content Creation, Delivery and Dissemination

Effective content creation relies on several different disciplines from target selection (military, political science, biology, psychology, and sociology) in service of creating memorable content. The content must resonate with the intended target, especially in an information rich society. For this reason, a discussion of linguistics, psychology and sociology is necessary. The delivery must be credible relying on psychology, sociology, linguistics, theater and more recently data science. Dissemination often relies on technology, thereby introducing cybersecurity into the mix.

2.1.1 Linguistics: Analysis of propaganda tools

Linguistics is a discipline that is used in the creation of deceptive data via rhetoric, however typically linguists are not consulted when countering efforts are necessary. Sample et al. (2019) cited the three well-known general attack types (ethos, pathos and logos) as methods associated with supporting fake news and why these methods must be considered in any fake news counteracting solution. Of the three rhetorical groupings, each presents challenges as well as opportunities for

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\(^1\) This is not to say that identity-based logics cannot be subject to spatial modelling (see Glazer, 1995).

\(^2\) This is not to invoke a strong subject-object distinction denoting the object of description need not define the content and sources of subjects.

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automated processing by combining the rules of linguistics and computer science when deploying computational linguistics.

The linguistic analysis of fake news must operate across a range of domains and disciplines, for every act of language is embedded in a context composed of a wide number of different influences and drivers (political, social, cultural, ideological… as well as purely language-based). A study based on the identification of lexical and syntactic patterning as an identification and attribution tool (Dey, Rafi, et al 2018; Conroy et al. 2015) can only be one step in the analysis. Similarly, a rhetorical analysis, detecting both individual figures of speech and appeals to ethos, logos, and pathos (see below) is vital, but can only be a single element in a much broader and deeper examination of the target texts. This paper outlines a multi-disciplinary approach for the identification and countering of fake news in general; we can also see how a blended, multidisciplinary methodology can operate at the linguistic and communicative levels. A helpful overview of one such blended approach is given by Zhou and Zafarani (2018), but in what follows, an outline model for the investigation of fake news is presented, based on analyzing it not as single acts of language, but as a process of targeted communication, consisting of several elements, all of which must be considered to permit a truly informed understanding of how fake news is constructed, and how it functions.

The following analytical schema is based on the seminal model of communication outlined by Shannon (1948), in which any communicative act is viewed as a process consisting of a message transmitted from a sender to a receiver via a channel (this is of course a simplification of the Shannon-Weaver model, but it is a useful starting point). The key thing to note is that while we can study each element in isolation, a truly sophisticated analysis considers how the various components interact and interrelate. For example, consider the issue of the chosen channel of transmission; different social media platforms operate in different ways (Twitter has restrictions of message length, Snapchat and Instagram are image-driven), and appeal to different demographics (Chen 2020). Just as fake news must be carefully crafted to reach and appeal to specific target audiences, so any effective countering-strategy must consider the most appropriate communicative approaches and channels to mitigate against it. It is known that there is a correlation between the age of online users (and their political opinions) and their likelihood to retransmit fake news (Guess, Nagler, and Tucker 2019); work remains to be done on determining not just why this group is likely to fall prey to fake news, but in devising strategies for mitigating against this.

In order to conduct an effective analysis of fake news, we need to adopt the tools of corpus linguistics, and establish a robust database (or corpus) of previous fake news campaigns. The examples cited in Tenove et al (2018) and the two reports from the UK Information Commissioner’s Office (2018a and b) provide a helpful starting point. This will permit the creation of a detailed taxonomy of fake news, looking at sender/receiver/channel, and allowing a detailed analysis of types of message and their specific linguistic/rhetorical features. While work has already been done in this field (Digital Shadows 2018; Molina et al 2019), there is a pressing need for a much larger set of corpora, which will permit a fine-grained analysis.

The final area for future research is that of traffic and social network analysis; in order to truly understand how fake news functions, we need to examine the ways in which stories spread across a platform, and how various users, such as trolls, bots and super users, act as prolific spreaders of misinformation. The development of tools for collecting, analyzing, and visualizing message spread over time is a priority. The issue of timescale is vital. For example, we need to consider what factors drive a particular item of fake news to disseminate rapidly across information space, while counter-messages often lag far behind and over a much smaller area. One tool which offers a useful basis for R&D across the entire domain of social media platforms is FireAnt, a piece of open source software devised by Lawrence Anthony and Claire Hardaker (Anthony 2018) and another freely available tool,
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the OSoMe tool developed at Indiana University (OSoMe). OSoMe allows the capturing of data
from Twitter over a set timescale; the data can then be visualized as a social network map, permitting
the identification of key nodes of transmission. This in turn allows a fine-grained analysis of message
spread and the possibility of targeting any countering-strategy towards the most prolific transmitters.
The challenge will be to devise tools which can operate across the whole range of social media
platforms (the image-driven, multimedia-rich domains of Instagram and Snapchat will be particularly
testing).

2.1.1.1 Ethos: Define a person or group

“Persuasion lies at the heart of political communication” (Flanagin & Metzger 2009, 1); thus,
the role of the messenger is highly relevant. For this reason, the messengers are targeted, as
mentioned above. Gu et al., (2017) observed that the cost to discredit a reporter was $50,000.
Flanigan and Metzger (2009) noted the role of credibility in presentation as well as perceptions of
honesty and fairness, even when the message remained constant.
Ethos defines the target or messenger (Cockcroft & Cockcroft 2005, pp. 28 – 54). The
definitions for this activity can be positive or negative. In some cases, popular personalities or
celebrities endorse politicians or politics (Scott 2006) or cures and in other cases negative nicknames
are used to both topics associated with a considerable amount of fake news. In some cases, trusted
reporters are targeted in an effort to damage their credibility. Attacking the messenger can take the
form of discrediting a reporter, a publisher, an editor, or any other entity in the news supply chain.
Fake news will inevitably build on the ideological/cultural/political values of the intended
audience, or it will fail. Not only must it ‘speak the audience’s language’, as it were, but it must
operate within the frame of reference held by that audience. In so doing the “us” against “them”
narrative that is commonly deployed, can take hold adding an emotional tie-in.

When ethos is deployed the good-bad dichotomy prevails, even though most individuals have
both good and bad personality traits suggesting malevolence or benevolence with the target but not
both. The use of ethos appeals to tribal identification and behaviors. Thus, this form of propaganda
can be used with better efficacy on homogeneous groups in societies where fear of new or other
groups predominates over curiosity or hope (Hofstede et al., 2010). In these societies “in groups” are
viewed as having significantly different values than “out groups”.

2.1.1.2 Pathos: Appeal to emotion

This rhetorical grouping is characterized by the appeal to emotions; thus, the emotions of fear
(Montgomery 2017) and hope (Menz, 2009) have a long-documented history of use in the political
arena. Emotions play a critical role in political propaganda. Fear and hope have also been used in as
motivators in military matters.
Of the three approaches, pathos is the most immediately effective, acting as a means of short-
circuiting logic and rational thought, and aiming to evoke an immediate emotional response. This is
due to the emotional nature of decision-making. When appealing to pathos punctuation can be a
valuable tool. Punctuation was shown to act as a marker for propaganda in Israeli political discourse
(Shukrun-Nagar 2009).

2.1.1.3 Logos: Appeal to logic

Any logos-based approach is highly challenging. Human beings are driven primarily by
emotions, and the use of logical reasoning and data-driven persuasion will founder on the lack of
statistical and general mathematical knowledge in the general public. Of course, statistics can be
easily manipulated to customize narratives. In some cases, as noted by Pomerantsev & Weiss (2014)
any narrative can be created, and a supporting reality can be created to support that narrative.
Partial truths and partial lies provide input for propaganda. This type of logic is sometimes
effective in political and scientific arenas. Consider, the anti-vaccination movement that believed that
vaccinations caused autism (Gross 2009). An unexplained rise in the number of autism cases along
with a discredited article from a scientist (Wakefield 1999) with celebrity endorsements (Antrim
2018) sounding credible created a combination of an ethos and logos-based appeal. Many conspiracy
theories contain elements of logos mixed with pathos. The messaging must include terms that
resonate with the target audience, word choices should reflect similar or the same words that the
targeted group would use.

2.1.2 Psychology: Understanding individual behaviors and thoughts

Humans are fundamentally social creatures. Our social worlds are complex and require us to
sift through information to determine what is truthful, and what we need to know to maximize our
survival and personal growth. However, the amount of information that we process is extensive
and, in the digital age, delivered to us at high intensity. As noted previously heuristics are strategies
that we use to take cognitive shortcuts in order to handle this information overload (Tversky &
Kahneman, 1983), and are also known as cognitive biases. On occasion these biases may lead us to
come to the wrong conclusion or to take the wrong action, but ultimately such biases are an adaptive
strategy that help us navigate around our environment. Nevertheless, these biases may be targeted
and exploited by the authors of fake news. For example, the secrecy heuristic may lead people to
believe that any information that is presented from a ‘secret source’ is more reliable (Travers, Van
Boven, & Judd, 2014). This heuristic is exploited in fake news stories that proclaim ‘leaked’
information. The acceptance of fake news can be further increased through the use of images to
accompany the narrative that is being put forward (Newman, Garry, Bernstein, Kantner, & Lindsay,
2012), which again may exploit biases by leading the reader to assume that a visual ‘record’ is further
evidence that a story is truthful. The inclusion of an image to accompany a fake news story also
increases the likelihood that the story will be shared on social media (Fenn, Ramsay, Kantner,
Pezdek, & Abed, 2019). Echo chambers (Boutyline & Willer, 2017) and filter bubbles (Holone,
2016) created through social media platforms may further reinforce these cognitive processes,
through the aforementioned heuristic of confirmation bias (Kahneman & Tversky, 1973). Research
suggests that the acceptance of fake news items can be combatted through the application of
epistemic cognition, which refers to how we gather knowledge about our world and develop our
belief systems.

Our understanding of our social world is also influenced by what we perceive to be the beliefs
and attitudes of our peers. As noted above this can lead to the proliferation of fake news, but the same
social influence can also be a powerful tool in combating fake news. Indeed it has been observed
that viewing critical comments from friends that challenge fake news items on social media is more
effective in prompting people to question the item themselves than a disclaimer from the social
media provider stating that the item appears to be fake (Collinder, 2019).

Emotions are another determinant of the acceptance or rejection of fake news, as predicted
under the feelings-as-information theory (Schwarz, 2012). Falsehoods are 70% more likely to be
retweeted than the truth (Vosoughi, Roy, & Aral, 2018). This could relate to several other forms of
cognitive bias. Survival information bias refers to our tendency to pay attention to information which
relates to the health and wellbeing of ourselves or those we care about (Stubbbersfield, Tehrani and
Flynn, 2015). An example of this is the tales of poison found within Halloween candy that are shared
amongst parents each year, despite there being no record of this ever happening (Snopes, 2020). Such
stories that invoke survival information bias in turn prompt emotional reactions. Similarly, social
information bias refers to our tendency to attend to information that represents some form of
deviation from social values or social norms (Stubbbersfield, Tehrani and Flynn, 2015). An example
of the exploitation of this type of bias is fake news stories which are based on a politician or celebrity
involved in a conspiracy. This again stimulates an emotional response, which as predicted by the
feelings-as-information theory (Schwarz, 2012) may be accepted as truthful. In keeping with theories
of social gossip this information is then shared throughout the individual’s social network, as it has been identified as important by the individual (Mesoudi, Whiten and Dunbar, 2006). Continual re-posting and endorsement of a fake news item throughout a social network may contribute to the phenomenon of illusory truth, the effect exploited by marketers in advertisements for many years in which statements that are repeated are seen as being more truthful (Dechene, Stahl, Hansen, & Wanke, 2010), a phenomenon observed in relation to fake news stories such as those relating to vaccines and autism (Unkelbach, Koch, Silva and Garcia-Marques, 2019).

One argument made is that people will tend to assume that information they are exposed to is truthful, as they draw upon their experience of the base rate where most of the facts they encounter in their lives are mundane and accurate (Brashier & Marsh, 2020). This assumption may be attributed to an anchoring heuristic where the target believes that because they are honest, that news sources are also honest. This is compounded when the information is received from a trusted source (Flanagin & Metzger 2009).

Differences in cognitive ability appears to be another factor that predicts how easily a fake news story can be countered, with individuals who have low cognitive ability being less likely to change their initial acceptance of fake information when explicitly presented with the correct information (De Keersmaecker & Roets, 2017). This also relates to another cognitive bias known as the anchoring heuristic in which people will tend to keep any subsequent judgements close to their initial judgement, even if that initial judgement is proven to them to be incorrect (Northercaft & Neale, 1987). A Cognitive Reflection Test is used by Pennycook & Rand (2019) to show that susceptibility to fake news is dependent thinking rather than partisan bias. Others support this rationale by citing increased vulnerability because of reduced analytical thinking and less open-mindedness (Bronstein et al., 2019).

2.1.3 Sociology

Cultural values and divisions caused by cultural values are used to define and continue the dialog. In many of the most recent cases, these values are used to stoke divisions and amplify societal polarizations (Azzimonti & Fernandes 2018). Interestingly, many of the divisions within the targeted society are tribal in nature, indicating that certain base values are similar in both groups (i.e. a desire to be treated equally; a desire to freely express one’s views) but that the “in group” versus “out group” dynamic that defines tribes within a society is the targeted societal fissure. This becomes relevant if the base values are the same, the targeted groups can then be manipulated into thinking that the other group is the problem using many of the same techniques. An example of such behaviors may occur when one group within a society seeks equal rights and another group perceives that in order for the first group to gain rights, they must lose or give up some of their own rights.

While, logically this is not the case, the perception remains.

Higher technological capabilities and interactions associate with greater vulnerability to information warfare campaigns (Szfranski 1997). Information systems make it possible to transmit information at much greater speeds and volume than interpretation of the information occurs with a human. Szfanski (1997) identified a strategic and tactical component that identify identification (strategic) and restricting (tactical) disinformation. The authors contend that at the strategic level a fully integrated interdisciplinary response is required to accurately respond at the tactical level.

Orientation differs based on cultural values and heritage (Szfranski 1997). Russia has been particularly active in stoking the immigration crisis in European Union countries (Volodymyr 2016). By speaking to fears of “outsiders” invading countries an increase in nationalism has arisen in host countries. Specifically, Russia has created and supported right-wing narratives that speak to native citizens fears of loss of cultural values and general well-being (Ibid). Culturally speaking, most western democracies exhibit a coexistence of high and low uncertainty avoidance (UAI) values (Hofstede 2010). Hofstede et al. (2010) noted an association between nationalism and high UAI.
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cultural values. According to Hofstede et al. (2010) high UAI values reflect a fear or uneasiness with
the unknown, while low UAI values associate with a curiosity and willingness to learn about the
unknown. The stoking of these and other cultural fissures or differences, in an open society, is easier
with social media due to the wide reach of the communications medium.

Successful campaigns impose false realities on the human targets (Szfranski 1997). Open
societies are vulnerable to alternative viewpoints, the willingness to accept various viewpoints
(Hofstede et al. 2010; Nisbett 2010; Minkov 2013; Sample 2015), while normally a strength and
defense against weaponized information (Szfranski 1997) these cultural norms have been used
against these societies through the promotion of carefully crafted false narratives that are in many
cases quite sophisticated, and in all cases customized to the values of the targeted audience
(Volodymyr 2016; Sample et al., 2018).

2.1.4 Political Science: Influencing policies

Fake news, or the tactical use of manipulative communications in a political context serves to deceive
political actors in relation to their strategic intentions regarding a situation. That may involve efforts
to distort political positions and options so as to move citizens to vote (or refrain from voting) on
grounds that misalign their preferences and actions. It may seek to cloud decision spaces for voters or
political authorities by introducing spurious issues that misdirect attention. It may seek to inflame
relationships between groups in a population by amplifying differences. In this sense, malign fake
news campaigns may be thought of as activities that place additional stress on political systems,
thereby undermining their capacities to govern. On the other hand, a similar fake news campaign
might deceive populations or political authorities in a direction that increases perceptions of trust,
legitimacy, or the performance of the political authorities or the underlying system of governance
(Easton 1975 -- These are the elements of a political system that might be subject to support or stress,
too much stress, Easton noted, could lead to system break down and violence). These latter efforts to
support a political system by celebrating its achievements is a common practice in nondemocratic
countries like the People's Republic of China where government employees are often called upon to
promote the legitimacy of the CCP online and an increasingly strict regime of censorship has
prevented the emergence of critical commentary online (King 2017; Sear, Jensen, and Chen 2018).
Such efforts might artificially inflate the support for a system to serve the interests of an existing elite
and order, at the expense of efforts from the public to change the system. Either situation undermines
democratic participation in a political system through distortions in the capacity to provide feedback
and in its receipt by citizens and/or political authorities.

Political science treatments of ‘fake news’ have focused on two distinct aspects. First, there is a
question of whether foreign actors spreading fake news could have distorted the election results in
2016 in the US. Second, scholars have studied the growing use of the term in recent times within
political contexts, particularly its use as an epithet against journalists and perceived (other) political
opponents. In terms of the interference question, the majority of the research suggests that it has had
little impact on elections for two reasons. First, it is hard to distinguish Russian troll communications
from other online sources, particularly those of the alt-right (Benkler, Faris, and Roberts 2018). This
delineation between Russia and alt-right publications is blurred since Russia Today is a primary
source of news stories for alt-right publications (Dorell 2017) who proceed to pass their articles to
mainstream conservative sites.

Related to this is the fact that domestic sources of news production and the campaigns
themselves had considerably further reach than the Russian efforts, so it is unclear why Russian
trolling would have produced an outsized effect compared to these other sources (Sides, Tesler, and
Vavreck 2018). Further, research shows that there is doubt about the extent to which online
manipulation campaigns have any effects on political campaigning and a general neutral effect as
competing campaigns cancel each other out (Kall and Brookman 2018).
Analysis of information in understanding the effects of fake news or manipulative campaigning has focused on studies of voters and voter behavior which have emphasized the role of campaigns and media outlets in transmitting information to voters who make up their minds (Campbell and Center 1980; Downs 1957; Ferejohn 1990). Information efforts are considered independent of each other such that all information received, whether from a foreign state actor’s manipulation campaign or domestic news sources, are equivalent in their potential effects. Jamieson (2018) notes that this is not necessarily the case, as Russia has appeared to sequence its messaging in relation to information which was not necessarily public at the time, and the sequencing of Russian activity and other actions can have unique and amplifying effects.

Further, although the literature in political science tends to find little evidence of a net effect of campaigning on voter choices, there are a few categories of places where they do find effects that may amplify the effects of targeted foreign interference activities. First, there is evidence that such campaigns have effects where candidates have controversial positions and there is a lot of investment in mobilizing voters supporting those positions (Kalla and Broockman 2018). This is consistent with the normalization effects that a coordinated covert influence campaign can have by making certain positions appear more reasonable through repetition (Kahneman 2011). Second, there is evidence that messages that provide grounds for people to express fear, and to take a limited and discrete action based on that message (e.g. like, retweet, vote once), can help create a persuasive narrative identity narrative for a voter (Jamieson 2018).

Beyond that, there is a literature in political science focused on “misinformation.” Misinformation is often distinguished from disinformation in that the former is factually incorrect (a category overlapping with definitions of fake news) whereas the latter involves the intentional distribution of factually false claims for the purposes of inducing a political effect (Bennett and Livingston 2018; Chadwick, Vaccari, and O’Loughlin 2018; Tucker et al. 2018). In relation to the misinformation literature, there is research into the efficacy of correctives (Nyhan and Reifler 2010, 2015; Vraga and Bode 2017). Some evidence suggests that false information can be corrected, but those effects tend to be limited to cases where an article of belief is not directly connected to one’s belief and identity structure (Garrett, Nisbet, and Lynch 2013).

Finally, there is an area of study in political science regarding the use of the term, ‘fake news’, as a political epithet. Journalists and political opponents have been targeted with this term (Tandoc, Lim, and Ling 2018). Research shows that since the election of Donald Trump, there has been an upswing in the use of the term by politicians as an attack on others in places like Australia, and the use of the term is usually amplified through reporting in mainstream news where it is not contested (Farhall et al. 2019). Propaganda historically has been understood by political scientists to not only provide a favorable narrative for one’s own side but to demoralize the enemy and undermine their will to continue the fight (Lasswell 1927). There are wider corrosive effects on politics that some ascribe to this current era, where the ability to know truths is often put into question, with some suggesting that we live in a “post-truth” political era (Keane 2018). The consequence of undermining trust in political authorities, expertise, and expert systems can have many systemic implications beyond the discrete consequence of swaying an election as it can make a political system on the whole, ungovernable through its polarizing effects (Singer and Brooking 2018). Fake news today may involve a combination of foreign and self-inflicted wounds which erode the will of citizens to participate in democratic political life – precisely the condition Tocqueville feared would give rise to a form of despotism (Tocqueville 2010).

2.1.5 Cybersecurity and Military Science

Cybersecurity, a relatively new domain of war (Lynn 2010), was slow to react to the fake news phenomenon in spite of the fact that information systems, particularly social media were widely deployed in the targeting, delivery and dissemination of disinformation. Some of the reluctance to

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engage centered around the censorship versus freedom of speech argument, but another reason for the reluctance was financial. Social media sites such as Facebook have business models that are heavily reliant on advertising money. Interestingly, Taboola has been a common advertiser associated with fake news (Neilsen and Graves 2017).

The argument continued but a change occurred when the role of Facebook and other social media sites became known in the selling of personal information to Cambridge Analytica (Cadwalladr and Graham-Harrison 2018; Risso 2018) where the data was mined for use in political circles. The sharing of personal information crossed the privacy boundary that is one of the core tenant areas of cybersecurity (McCumber 1991). The sale of user personal data (Cadwalladr and Graham-Harrison 2018; Risso 2018) and the customization of disinformation for the targeted users supported Szafranski’s (1997) assertion that civilians as well as military personnel will need protection from disinformation. The drivers for change within the cybersecurity field are not currently strong enough to lead to the development of solutions. Until nation states seek to apply larger scale solutions and adopt policy changes that encourage the security of individual privacy rights, the cybersecurity industry has no incentive as a financially driven business area to address the problem. Indeed, commercial bodies have helped create this situation by repeatedly removing individual rights for privacy on the internet and creating a new norm, accepted by users, that they should trade their data for convenient services. A combination of commercial and legal drivers with strong law enforcement and government agency support has eroded anonymity on the internet. A strong incentive to change existing norms is likely to come from the application of targeted information operations on political, military and critical national security personnel on a scale that forces policy changes. However, without such a driver, until this paradigm changes and there are legal or financial costs associated with the commercialization of user data on the Internet, the main drivers enabling online fake news will continue. Unfortunately, the commercialization and lobbying which has emerged in this area makes it is unlikely that the cybersecurity industry will be able to address this problem in the near term, except as a supporting role to respond to policy change. Efforts to integrate financial payment systems with social media and news outlets is likely to further exacerbate the problem. In the meantime, greater education of users, policy makers and focused attempts to secure users through anonymized and secure applications is probably the best short-term solution available to cyber security practitioners.

Historically, propaganda has been associated with wars for centuries (Sample et al. 2018) and was considered a military and political realm. However, the rise of hybrid warfare, wars without boundaries and the recognition of critical sectors that are outside the traditional scope of the military has resulted in an increased role for cybersecurity, and fake news is a new addition to the ever-increasing growth of cybersecurity responsibilities.

2.1.6 Data Science: Processing large volumes of fake news

The work performed by Cambridge Analytica (Risso 2018) exemplifies the growth of data science in the fake news space. Originally used in marketing, another discipline that processes inputs from psychology, sociology and the arts, the algorithms have been more recently applied to political goals. There are several different types of algorithms ranging from history-based heuristics, through trees and neural networks. Each of these algorithms can be manipulated through their data to either re-enforce preferences or to steer preferences into a new direction. Furthermore, the algorithmic created filter bubbles that re-enforce beliefs are amoral and probabilistic in nature; thus, the stories presented to the user are similar in tone and accuracy.

The ability to manipulate AI outputs, extends beyond fake news propagation and into all aspects of AI and machine learning (ML). The example of Tay (Riley 2016) the Microsoft chatbot that was trained to be helpful, but ultimately became abusive illustrates the ability to manipulate AI, and unintended direction through input manipulation of legitimate data. Weight and data
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The application of AI and ML in the creation, dissemination and countering of fake news represents a growth area in data science, as such, much has yet to be discovered. Deep fakes provide an example of this growth area. While data science can provide fascinating new insights to existing problems, the examples listed above remind us that the power of data science techniques can be used for benign, malevolent or benevolent applications. A key point to remember in data science is the importance of the query being processed. The phrasing of a query sets the algorithm on a weighted path based on the data learned during the ML process. Depending on the data classifications, results can vary to the same query, this action is observable when two people enter the same query into a search engine and receive different results.

Despite the problems that AI and ML introduce, combating fake news and other digital deceptions will be a job for AI/ML. Horne & Adali (2017) have already shown successes in using ML trained hosts to detect fake news. The accuracy will improve as the rules become more complete. Should the rules lack completeness, then fake news detection will be limited to detecting stories that fit a known pattern, signatures in cybersecurity parlance, and signatures have a low to nonexistent detection rate with novel approaches. AI/ML are extremely proficient at detecting patterns, but the patterns must be familiar to the software; hence the need to create rules based on knowledge garnered from other disciplines.

2.1.7 Theater: News as entertainment

“All the world is a stage” (Shakespeare 2009), and fake news has a theatrical aspect. Theater can be thought of as a communal art form where the audience and performer share the roles of subject, spectator and benefactor (Abaka 2014). Similarly, fake news, particularly in an interactive mode of delivery (i.e. talk radio, live interactive TV news shows, and social media), creates the same dynamic.

Theater, like fake news, is also interdisciplinary. The theater consists of eight major disciplines: acting, directing, writing, producing, costumes, set, sound and lighting design (Jones 2004). Each of these disciplines are discussed along with their role in the creation and delivery of fake news in support of seeking a shared, desired intention within the story and the audience.

Theater requires the disciplines working together to create or manipulate the audiences’ thoughts and feelings. Fake news particularly uses propaganda delivered on trusted mediums in personal spaces such as talk radio, TV in the home and social media on cell phones and personal computers. All of these devices are trusted transmission sources for the user. The messaging deploying the use of previously described propaganda techniques are delivered in an environment that the user has already deemed trustworthy.

The story is most effectively told when the disciplines fuse together creating a final product that is greater than the sum of the collective parts. Jones (Hostetter and Hostetter 2011). Actors use voice, facial expression and body movement to convey the message that captures and unites the conscious and unconscious minds through shared presentation and decoding of words and symbols (Hostetter and Hostetter 2011). Similarly, reporters and commentators use their voice, facial expressions and body movement to both consciously and unconsciously deliver a message.

Actors prepare by not only memorizing lines, but by drawing on emotional experiences that audiences can easily understand and find relatable, by using physical movement through expressions and body movement to convey emotions bringing to life the text of pathos. Once the message has been crafted the delivery must seal the emotional hold. The actor pulls from his own memory the emotions he wishes to convey.

Once the message has been successfully delivered and sealed the re-enforcement can be taken care of through secondary actors known as trolls and bots. Trolls, paid personnel used to amplify a
message, can assume the role of unseen actors in support of maintaining the target’s engagement. Bots are the automated counterpart of the troll, performing the same duties through the use of AI.

An actor seeks to tap into the audiences’ emotional memory (Stanislavsky 1989). Sight and sound are entryways into the imagination. Once an actor commands these two senses, they have a pathway into the imagination and can direct and manipulate the mind. Stanislavsky (1989) considered sight and sound the two primary senses and touch, smell and taste secondary senses that can be triggered through the primary senses. Stanislavsky (1989) noted that if an actor can appeal to only one of the senses, the remaining senses will also be available to the actor, all in support of influencing the audience’s emotional memory. One part of the director’s responsibility is to work with the actors to set the tone and intention for the play. The news director works with the news anchor to convey the tone and content of the story. The same news story compared across news stations can vary in length, tone and detail (Sample et al., 2018). In the case of interactive news, much like in the theater, mood and emotions can be extracted from an audience.

Another important role that the theater director plays is in deciding what parts of the story remain and what parts are cut. Similarly, in news media, the director/producer/editor determines which stories, or portions of the selected story are presented to the audience. Recalling the earlier discussion on thinking, an event that is not sensed is not perceived, as with AI/ML, the flow of information is controlled by an entity in support of a specific intention.

The writer relies on words, language, rhythm, pacing and musicality of language to be delivered by a skilled actor or anchor. All are well-crafted and integrated to achieve the intention of the story. The integrated whole is executed to play upon the values and beliefs of their audience. The use of memorable quotes or rhymes creates an indelible memory for the audience and the actor. Word choice for the story writer fits into manipulative linguistic choices, particularly those associated with pathos. Easily remembered phrases associated with fake news are effective methods of delivering a memorable message.

The producer is the person in charge of operations including hiring of directors, actors and other personnel who support the vision. Casting of anchors and reporters sends an enormous conscious and unconscious message to the audience. Attractive speakers benefit from the halo effect while less attractive speakers are perceived as being more untrustworthy (Zebrowitz and Franklin 2014). This finding suggests that a less attractive person would need to compensate for the untrustworthy impression, possibly by using intellect. The producer is responsible for all aspects of the production from vision, through operations and budgeting. In short, the producer is the production CEO possessing the holistic vision.

Costumes add a sensual authenticity to the production. Something as seemingly small as hair and make-up can have a significant effect on how the audience perceives the actor in theater or the reporter for news. Consider the appearances of various news hosts and the consistency of appearance on each of the major news stations. Suits for men are the costume with ties being carefully chosen. Women, while not forced to wear suits also have clothing rules that allow for some flexibility of choice (Hillman 2013). Within the range of professional clothing attire, a range exists for various articles of clothing and accessories (Crilli 2018; Moeslein 2019). A clear difference can be observed when viewing before and after pictures of liberal and conservative program hosts.

Set design provides the context or the visual environment. Color can set the emotional tone. For news, a simple calming blue background attracts attention, whilst red color, (Hillyard and Munte 1984) suggests serious fact-based messaging. Red is a universal color alerting people to stop and focus their attention (Kunieciki, Pilarczyk and Wichary 2015). Breaking news alerts appear on a red background. When delivering fake news, the news anchor is typically placed on a set that matches the color scheme and set design of the traditional mainstream media news station where the news anchors are seated but leaning forward. A well thought out set design seamlessly supports the reporter’s performance.
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Audio is the presence or absence of background sounds such as music, voices and other sounds which can also be used to set the mood and manipulate emotions. Dark low-pitched music accompanied with dark lighting and a dark background suggests a sense of foreboding, preparing the audience for bad news.

Lighting is the remaining theatrical discipline. Lights and the shadows cast by lighting allows for creating a perception. Shadows cast over an object suggest something to hide or untrustworthiness. Bright light suggests honesty and integrity. A harsh bright light suggests shining a light on a dark or dirty subject, exposing what was hidden.

All this points to the conscious effort of an entire production team to seek out the desired behavior, thinking and feeling of a target audience. When executed with precision and art, the audience has no real defense against it. Even the best professionals in this field find themselves taken away and moved by the production. The actor must live it, feel it, and experience the depth of human nature supported by all the other disciplines to achieve the goal set by producers, directors, and writers. How better to manipulate people into seeing things from our perspective and changing their point of view.

For years, the delineation between news and entertainment has continued to blur (Edgerly 2017). News reporters, while publicly claiming neutrality can convey messaging through expressions, intonation and movements, all methods of non-verbal communication that actors draw on. Reporters can convey joy, anger disgust, outrage and other emotions without changing the text of the story. The goal of all news reporter, much like an actor, is to keep the audience’s attention.

3 Lessons Learned for Countering Fake News

Since the problem is interdisciplinary in nature, any response that does not consider the various disciplines can only partially succeed at best. As a result, any models developed must bring together Data Science and Cybersecurity, in addition to linguistics, psychology and sociology along with the frameworks defined across these disciplines.

Data science provides insights, however, requires carefully worded questions, and subject knowledge to form the best, most comprehensive queries. Cybersecurity informed solutions tend to be reactive suggesting that queries posed by cybersecurity professionals, may require further abstraction and typically result in limited insights even when new problem sites are discovered. Furthermore, the overall reactive posture can result in software missing new styles and techniques in fake news creation and dissemination.

When combining data science and linguistics computational linguistics offers, some tools available that enable rapid detection of propaganda, for example, natural language processors (NLPs) have shortcomings that may be unfamiliar to data scientists. NLPs used in computational linguistics are able to quickly synthesize large volumes of data presenting common themes through “bag of words” outputs and sentiment analysis. The following sections provide a overview and explanation of each of the challenges with these areas.

3.1 NLP problems

NLPs group common words and emergent patterns in written text. To do so efficiently, several things must happen that can result in misleading outputs for the data scientist. As Data Scientists program the software, there are key considerations including: punctuation removal, case changing, word-stemming and filler word removal.

- Punctuation removal: this is problematic because “!” and “?” and quotation marks are all a part of the sensationalism that elicits emotional responses from the reader (Cohen et al., 2018; Shukrun-Nagar (2009).
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• Case changing: occurs when software evaluates words when the ASCII representation for “News” is different than the one for “news”. To work around this problem, uppercase letters are converted to lowercase, and in most cases no problems result. However, with emotion-driven fake news where words are deliberately written in all uppercase to stimulate the visual sense, this important textual clue is lost by changing these words to all lowercase.

• Word-stemming: results when NLPs convert adverbs to verbs, or convert verb tenses to the root word, so that “quickly” and “quicken” become “quick”. The problem is adverbs are words that are used to elicit an emotional response (pathos), by stemming these words another textual clue is removed.

• Filler word removal: is performed when NLPs remove words such as “the”, “and”, “he” with the goal of avoiding filler words outweighing nouns and verbs. The problem is that the removal of pronouns also results in the removal of “us”, “we”, “they”, “them” important words in the “us” versus “them” narrative which is often deployed in propaganda.

The challenges with NLPs listed above are easily solved when the programmer is aware of their existence. However, typically, and most often, the programmer remains unaware of the challenges and certain limitations of these types of programs. The problem with existing NLP packages remains when they are typically part of a larger software development effort and the examples are not considered. In some instances, developers do not know what they do not know. In many cases, packages can be modified, or pre-processors can be written that quickly address these problems. Much of NLP work aids AI/ML rules, so knowing the correct query to make, falls outside of the expertise of the programmer tasked with writing the software.

3.2 Countering Content

Cybenko et al., (2002) noted the importance of detecting the attack before the narrative can affect the target’s behavior. Of course, this suggestion seems to work posteriori as a method to prevent repeat mistakes. One suggestion was to detect the pre-conditions that exist as a method to inoculate the target (Ibid). Another would be to incorporate rules of propaganda into computational linguistics. The authors propose that three-point model of computational linguistics to address contextualization of data as well as the descriptiveness, pattern-spread analysis to address the temporal aspect and archival reputation analysis that adds temporal, context and descriptive values for additional analysis.

3.2.1 Computational Linguistics – contextualization and descriptive analysis

Fake news, by its very nature, consists of texts. Sometimes multimodal (employing, for example, audiovisual material), but overwhelmingly written compositions, designed to be transmitted (and retransmitted) across electronic/digital media to a carefully selected target audience. As communicative artefacts, they are open to analysis through linguistic tools, and as persuasive communications, they can be related to the body of work that has been done over centuries relating to rhetoric (the art of persuasive communication) in general, and propaganda in particular (see, inter alia, Connelly and Welch 2003, Ellul 1965, Jowett and O’Donnell 1999, Pratkanis and Aronson 1992.)

In spite of the list of problems enumerated above with NLPs, for those engaged in combatting fake news, the ability to employ computer-aided social network analysis offers great potential for mapping (and ideally countering) the spread of misinformation online, by quickly identifying the key vectors of fake news and tracking (in near-real-time) the flow of fake news across the Web (Chetty and Alathur 2018, Hardaker and McGlashan 2016). The use of Computational and Computer-Aided Corpus Linguistics (the identification of key textual features through comparison of a target text with
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A corpus or corpora of reference texts offers a real possibility to create automated tools for the identification of fake news through its linguistic content and its removal from social media without human intervention, and for automated generation of effective counter-texts (Marquardt 2019, Pérez-Rosas, Kleinberg, Lefèvre, and Mihalcea 2018, Pathak and Srihari 2019).

The rules of propaganda are well understood and the ability to modify software to enforce rules is attainable, particularly when ML is combined with statistical tools like group comparisons, correlations to compare text. Many of the lexical expressions found in propaganda are synonyms which can easily translate to neighboring words in ML classifiers (e.g. “step” and “leap”) thus when phrases containing neighboring words are evaluated computationally, they will show that the distance between is statistically insignificant. Compared to traditional phrases used in conversation, where the word distance is statistically different, the ability to analyze and provide decision-making assistance is near real time.

Other areas listed above can be quickly evaluated using simple linguistic tools or even scripts that can strip out and quantify punctuation symbols before they are removed without record. Similarly, the stemming problem can also be addressed as a part of preprocessing while preserving the important metadata. Computational linguistics works alongside data science and can provide much of the inputs needed to feed training data rules.

3.2.2 Pattern Spread – temporal analysis

For fake news to spread, stories must be artificially promoted using trolls and bots (Rosenblatt 2019). The use of these aids leaves digital traces. Vosoughi et al. (2018) illustrated this phenomenon showing the extreme volume of stories that saturate the news cycle. When combined with the credibility of receiving these false narratives from trusted sources and the speed in which these stories spread preemptive inoculation can become problematic.

Suggestions by Cybenko et al. (2002) include information trajectory modeling to counter this tactic. Information trajectory allows for comparisons against historic data and distance measuring from the historic data. This approach can be used to model pattern spread as well as linguistic differences and was proposed by Sample et al. (2018). However, unlike the linguistics component there exists a lack of data for pattern spread of factual narratives and factual narratives will have varying baselines depending on the nature of the story. For example, a natural disaster with many casualties will show a different pattern spread than a special interest story, which differs from a news story surrounding a celebrity. If the fake pattern is the area of focus, the parties responsible will alter the behavior to keep the filters from detecting the pattern. In cybersecurity this is known as “fuzzing”. “Fuzzing” occurs when a character is changed in the signature string, allowing the new malicious data to slip in, undetected by the security filters.

3.2.3 Metadata Analysis of Archival Information – time, content, context and reputations

Data science has been used and suggested for solutions to digital deception. This shows the enduring value of messenger credibility as discussed by Flanagin & Metzger (2009). Reputations can be discredited for an affordable cost and reporters are human, so mistakes will happen. A gullible reporter who is repeatedly fooled may not have a very long career in their chosen field, but a reporter who consistently reports the facts, with or without theatrics, will have a pattern that is worthy of being considered credible. Currently, this process is performed by humans when they evaluate the credibility of a source, and as previously discussed, the human decision-making process in this area is flawed and under attack.

Data science can go beyond sentiment analysis and some of the other techniques discussed earlier in this paper. Every proposed countering technique will generate metadata about the collected data. This data is prime for fresh insights. Some of the metadata fields of interest may include but are

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not limited to reporter information, publisher information, time information, context content and linguistic characteristics. A brief discussion follows.

- Reporter information: Reporter bias scores, average story word count, average linguistic characteristics associated with the reporter including % nouns, verbs, adjectives and adverbs, publisher associations, credibility score and sources used.
- Publisher information: Publication bias scores, average story word count, average linguistic characteristics, reporters used, credibility score, average story lifecycle, average time to report and sources used.
- Time information: given fake news typically has shorter lifecycles following deception discovery i.e. not everyone wishes to propagate it further; time distance from original source, lifecycle and early source trajectory are the key metadata fields of interest relating to time.

This archive of metadata with the small sample set of fields provides a starting point and is by no means exhaustive. This starting point allows for groupings to answer known questions and unstructured analysis groupings to inspire new lines of thought and question. Furthermore, by collecting and processing metadata the actual use space is smaller, resulting in a smaller and more efficient archive, containing links to larger more complete archives.

3.2.4 The Role of Artificial Intelligence & Machine Learning

Horne & Adali (2017) were successful using ML software and satire as training data to demonstrate software could successfully detect fake news in the form of satire. While the findings were encouraging, the study looked for a specific type of fake news, satire.

AI is highly dependent upon the classification schemes attained through machine learning and both AI and ML are highly dependent upon the accuracy and veracity of the training data used. The fact that in cybersecurity, the poisoning of training data is an area of research should serve as a cautionary point. When rules are done well, AI and ML can easily outperform humans on many tasks; however, questions remain open on AI biases that may be intentionally or unintentionally inserted by the programmer (Bellonin 2019). Biases have been observed in facial recognition software (Nagpal et al. 2019) resulting in unanticipated outputs. The importance of balancing the training data requirements result in having to balance inadequate data that yields false results or over fitting provides accurate findings but with little to no abstraction. Striking this necessary balance requires an understanding of rules that lie outside the discipline of data science and cybersecurity, the two disciplines in the enforcement arena, and into the behavioral sciences space.

4 Examples using the model

The three-point model relies on evaluating use of linguistic features, pattern spread and archival reputation analysis. Included are some examples of the evaluations. On February 16, 2020, when the COVID-19 pandemic was in the early stages, Dr. Anthony Fauci was interviewed on by CBS news on the show Face the Nation. A transcript of the show (cbsnews.com) can be found in the public domain. Dr. Fauci’s remarks about the virus were approximately 646 words, containing no special punctuation and the ratio of adverbs to text was 1:215. A few days later, on February 25, 2020 Rush Limbaugh also shared thoughts on the same subject, the virus, during his talk show. Mr. Limbaugh’s text was also made publicly available (mediamatters.org). Mr. Limbaugh’s word count was 756 words, containing six special punctuation instances, five “?” and one “!”, along with an adverb to text ration of 1:126. Additionally, Mr. Limbaugh’s text invokes rhetorical devices discussed earlier such as plain folk talk. Thus, based on these few characteristics, Limbaugh’s words deviate from ground truth farther than Fauci’s. This is not to say that Dr. Fauci’s remarks are considered ground truth, but that Dr. Fauci’s words are measurably more trustworthy than Mr. Limbaugh’s. Limbaugh’s text suggests more than one standard deviation off ground truth and Fauci’s remarks would be considered under ½ standard deviation from ground truth.
This brings us to the pattern spread. Th OSoMe tool (osome.iuni.iu.edu) allows for rapid tracking and visualization of hashtags and other social media features. When the Fauci and Limbaugh hashtags are compared in Figure 1, Limbaugh outperforms Fauci. Rush Limbaugh had been awarded the medal of Freedom in early February (notice the peak in the Limbaugh hashtag, followed by a drop that remains higher than Fauci’s even when Fauci’s interview aired. Even more interesting, is the delta between Limbaugh and Fauci on February 16, the date that the Fauci interview aired. The pattern spread appears to show the fact-based narrative underperforming. Only in March, once the pandemic had taken hold did Fauci surpass Limbaugh. Limbaugh had a full month (possibly longer) to deliver his version of the message to a larger audience.

Figure 2: Hashtags from the mask debate.
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This same phenomenon can be observed again with the face mask debate where “#nomask” drowns out “stopthespread”, illustrated in Figure 2. Then more recently, this pattern is observed again with the “#movetheelec” hashtag when compared to the real news of the sharp decline in GDP in the US, as seen in Figure 3. The underperforming hashtags typically distribute longer, and the peaks tend to be shorter than their counterparts associated with fake narratives. Thus, the fake hashtags would result in the deviation value increasing. In the case of the #nomask hashtag this pattern of a steep, dramatic peak with small tails was observed with election data in 2016 (Sample et al., 2016).

False or misleading narratives are also used to distract from factual news stories. This example was recently observed when President Trump suggested delaying the November election as the GDP quarterly data was released. In this case, the large drop in the US GDP would normally be the leading news item as this drop would be associated with a significant economic recession. However, Figure 3 illustrates the Twitter feed of tweets for ‘delay the election’ drowns out the GDP data tweets on July 30-31, 2020.

Figure 3: Twitter feeds for GDP drop and Delay the Election

Pattern spread data can be valued by measurement from known good news stories pattern spread. The final model point of reputation analysis can be thought of as a consideration of the source. In the Fauci-Limbaugh example, the source of the Fauci interview is widely considered reputable. In this simple example, Dr. Fauci has a history of speaking accurately, particularly when discussing medical matters, thus, his overall accuracy value would be considerably better than that of Mr. Limbaugh. This reputation analysis could be further enhanced by examining the sources that picked up both speeches for publication and those sources could also be evaluated. A final scoring metric could come from fact checking organization, where a point is also given for debunking a story narrative.
The overall analysis when the three-point model is applied the closer to zero, the total score (linguistic, pattern spread and reputation values) lands the more factually accurate the story.

5 Summary

Szfranski (1997) argued that information warfare attacks would be enacted against both information systems and belief systems and that leaders and their supporting non-combatants would both be targeted. This is currently the case with fake news. Szfranski (1997) thought that open societies, such as western democracies would have better defenses than their autocratic counterparts, but the results on this front are decidedly mixed. The current iteration of fake news or propaganda operates in a jujitsu fashion, where a target’s strengths are used against itself, something that was not anticipated with the rise of digital propaganda.

There are many different reasons for the widespread success of fake news. Key factors include the refined targeting techniques, the breadth of the Internet reach, the trust of social media platforms, the financial incentives for data management companies to sell information, and the use of open values systems found in open societies against those societies. Some open societies (i.e. Finland, Estonia, Latvia) have demonstrated resilience to fake news (Atkinson 2018) suggesting a possible common set of values that have not been investigated. However, implementing defenses or countering tactics at speed requires an interdisciplinary approach. Meeting this challenge requires deep interactions that reflect a true exchange of ideas and implementation of models outside the traditional disciplines that support a fused response to this new generation of espionage (Younger 2018).

Interdisciplinary work can help provide a more unified front to a currently fragmented, open-ended institution (Waisbord, 2018). Cybersecurity can aid in explaining how social bots spread misinformation, this can help journalists understand how misinformation spreads online and address increasing frustrations controlling Fake news propagation (Schapals, 2018). Psychology sheds light on the phenomena of fake news amplification by means of echo chambers and confirmation bias to provide more conscious perspectives of how news, whether fake or not, is consumed in different cultures and groups. Akin to other areas, for Journalism to adapt to change cultivated by the internet, a discussion should be initiated that recognizes the integration of multi-dimensional solutions. Journalists are responsible for the integrity and truth of their own reports but also recognize existing understandings of fake news spread is foggy (Mhamdi, 2016). Interdisciplinary approaches should acquit Journalists from being solely responsible for policing fake news in today’s contemporary digital environment and emphasize collaboration to account for other trends responsible for fake news proliferation in our information streams.

6 References


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OSoMe website. Website: https://osome.iuni.iu.edu/tools/trends/#


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CS – Lead author, contributed to all sections, primary authorship on sociology, cybersecurity, data science, sections 3 and 4.

MJ – Contributed to sections 1 & 2, primary authorship political science

KS – Contributed to sections 1& 2 primary authorship linguistics

JM and AB – Primary authors psychology

SF – Primary author theatre arts
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