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# A Classification of Biases Relating to the Production, Dissemination and Consumption of News

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## **ABSTRACT**

There are many difficulties in studying bias at the production, dissemination, or consumption stages of the news pipeline. These include the difficulty of identifying high quality empirical research, the lack of agreed terminology and definitions, and the overlapping nature of many forms of bias. Much of the empirical research in the domain is disjointed and there are few examples of concerted efforts to address overarching research challenges. This paper details ongoing work to create a classification of biases relating to news. It is divided into three sub-classifications focusing on the production, dissemination, and consumption stages of the news pipeline.

## **CCS CONCEPTS**

• **Human-centered computing** → *HCI theory, concepts and models*; **Interaction design theory, concepts and paradigms**.

## **KEYWORDS**

News; Bias; Classification of Biases

## **ACM Reference Format:**

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## INTRODUCTION

One of the core issues affecting the study of bias at any stage of the news consumption pipeline is the lack of an easily accessible and referenceable classification of biases. The development of this resource will help researchers overcome the many difficulties of studying bias and to develop a systematic research agenda to tackle larger research questions. This paper highlights ongoing work being undertaken to create such a classification. The first two sub-classifications of biases relating to the production and dissemination of news are nearing publication. Another sub-classification of cognitive biases impacting the consumption of news is currently under development. This paper provides an overview of this ongoing work.

## THE MANY DIFFICULTIES OF STUDYING BIAS

### The Lack of Definition

Bias is notoriously hard to study. Many researchers have noted this fact while lamenting the lack of agreed definitions for the term [13, 17, 39]. Given its complexity, it is unlikely that there will ever be a comprehensive definition. In fact, Kline described the search for a comprehensive definition as an *"illusive goal"* [31]. Druckman and Parkin also describe the futility of searching for an objective definition [14]. While Forward stated that *"a workable definition of 'bias' is impossible to obtain"* and instead studied manifest favour and disfavour [19].

Many researchers simply avoided providing a definition of bias. In his review of four seminal works on television news bias from the early 1970s, Williams points out that *"Nowhere in the four studies is bias really defined"* [52]. In his attempt to create a new measure of bias Sachsman avoided the difficulty of defining bias by claiming that *"Loading' is defined as what members of the general population see as loading. Thus loading=slanting=biasing"* [41]. Decades later, Deacon, Golding and Billig still faced the same problem of identifying a suitable definition and point out that many analysts simply avoid using the term [9].

The overarching lesson from the literature is that a comprehensive definition of bias does not currently exist and it may never do so. This underscores the importance of a comprehensive classification containing specific definitions of bias.

### Bias has Become an Automatic Invective

There are also significant difficulties studying bias given the charged nature of the term. Efron noted as far back as 1971 that *"Bias' is a concept which by now has become a loaded code-word — used as automatic invective..."* [15]. Others have pointed out the tendency of politicians and news agencies to strategically allege bias [21, 50]. News consumers have also been known to claim bias when they encounter *"discrepant information which evokes evaluative response"* [48]. Today's politicians and news

consumers are even more likely to allege bias given the increasingly polarized nature of political debate and the increased propensity of certain politicians to hide behind the accusations of *biased media* or *fake news* [32].

### **A Paucity of Empirical Research**

Entman and others have also highlighted the lack of serious empirical research on the subject as another issue [17, 38]. Thus, many known forms of bias are understudied, while others are still unknown. This has resulted in a lack of agreed terminology, agreement over their manifestation and effect, and established definitions. This means that it can be difficult and confusing for those new to the domain to equip themselves with the necessary knowledge to undertake research on the subject.

### **Many Forms of Bias Overlap**

Compounding the difficulty is the fact that many forms of bias overlap and contribute to each other. Thus, patterns of headline, photograph, and coverage bias in a newspaper may be part of an overall campaign of framing or agenda setting bias. This may be instigated by journalists, editors, or it may be organisational. Smith et al. showed that description bias of protesters contributes to agenda setting in US newspapers [42], while Eisinger, Veenstra, and Koehn measured labeling bias of conservative and liberal politicians in US newspapers to identify ideological bias [16].

### **Inconsistent, Imprecise and Overlapping Terminology**

There are also many examples of confusing and overlapping terminology. E.g the meaning, manifestation and effect of *selection bias* is different depending on which point on the news production, dissemination, or consumption pipeline that it occurs at or that it is being investigated at. Supertype descriptions such as *media bias*, *election bias*, and *reporting bias* are also often used by politicians, journalists, consumers, and to a lesser extent researchers. These blurred nebulous descriptions are very subjective and difficult to prove quantitatively.

### **Illusory Superiority and Bias Blind Spot**

Another issue impacting the study of bias is the fact that most people - including those who study it - see themselves as being immune to it or above its effects. Many believe with a feeling of epiphras that cognitive biases, the holding of biased opinions or the consumption of biased news is the suffering of others. Ironically, this is a well-known cognitive bias, called the *Illusory Superiority bias*, a common effect of which is that the majority of drivers believe that they are above average in ability [35]. It can also be known as the *Bias Blind Spot* in which the impact of bias in others is recognised, yet its impact or influence in one's own judgement is not recognised [40]. Any study of bias should be undertaken

with the knowledge that everyone connected with the study including the administrator, the test subjects, and the people who composed or collected the test content, have their own cognitive biases.

Each of these issues and many others have contributed to a domain which lacks clarity, definition, and where researchers act in isolation. The inability to resolve these smaller issues means that larger challenges such as the formulation and testing of theory to explain phenomenon such as judgements of bias are currently unattainable.

### **COMPOUNDING THE ISSUES**

Compounding these issues is the lack of an agreed classification of biases that impact the three main stages of the news cycle: production, dissemination and consumption. There benefits to such a classification including: 1) It will delineate and differentiate between the various types of bias. 2) It will include any existing definitions from the literature for each form of bias. 3) It can be used to show the relationships between different forms of bias. 4) It will provide a description of their manifestation and effect. 5) It will also point to the major empirical and theoretical works - where they exist. 6) It will act as the main reference point to identify related work.

Classifications are common in many other areas of science including psychiatric disorders [47], physical impairments [4], phobias [34], and personality traits [7], to name but a few. To the best of the authors knowledge there are no existing classifications of bias relating to the production and dissemination of news. The most similar attempts to create classifications of cognitive biases include Kassirer and Kopelman's classification of clinical cognition errors [26], an ontology of cognitive biases related to intelligence analysis compiled as part of the RECOBIA project ([www.recobia.eu](http://www.recobia.eu)) by Lortal, Capet and Bertone [33], and a taxonomy of cognitive biases relating to information visualisation created by Dimara et al. [12]. Each of these will inform the development of our classification.

### **A CLASSIFICATION OF BIASES RELATING TO NEWS**

The development of two sub-classifications of bias impacting the production and dissemination of news are almost complete. Future efforts will focus on the development of a sub-classification of cognitive biases impacting the consumption of news. The following is a brief overview of the current status of the three sub-classifications and where we plan to focus in future.

#### **Production Biases Sub-Classification**

Bias in the production of news is the most studied of the three main stages of the news production, dissemination, and consumption pipeline. However, there is currently no single resource which researchers can consult to identify and distinguish between the different forms of bias. The closest is the work of Park et al. who provide an abstract overview of the various factors and influences which can impact the production of news [39]. However, it does not go into sufficient detail on each

**The five layers of the sub-classification of production biases are:**

- Global
- Domain
- Organisational
- Editorial
- Journalistic

Organisational Influences on the Production of News	Manifestation / Effect	Publication
Owners	News in favour of the owners' position on a topic or ideology. Examples include corporate regulation, lobbying, appointment of judges, and environmental concerns	(D. W. D'Alessio & Allen, 2007; Gilens & Hertzman, 2000; S. Hughes & Lawson, 2004; Price, 2003)
Political	Reduced or increased coverage of a politician, party, or scandal based on pressure from the government, a political party, or political movement.	(Di Tella & Franceschelli, 2011)
Ideological	Examples include: Left: Socialism, Communism, Marxism, Leninism Right: Fascism, Nazism, anti-immigrant Conservative v Liberal Business / Industry v Environmental / Green Pro-Government v Anti-Government Pro-business / Free Market v Pro Worker / Planned Market Religious Conservative v Social Progressive	(Bakshy et al., 2015; Bovitz, Drackman, & Lupia, 2002; Eisinger, Veenstra, & Koehn, 2007; Iyengar & Hahn, 2009; Turner, 2007)
Preferred Audience	Slanting news in a manner to appeal with their preferred	(Gentzkow & Shapiro, 2010; Gentzkow

**Figure 1: Partial view of the organisational layer of the production biases sub-classification**

of the individual biases to be a useful reference point, nor does it point to the literature on each. Currently, work is nearing completion on a first-of-its-kind sub-classification of biases which impact the production of news. It is split into five layers, see left. The top layer details global influences which can bias the production of news such as government, nationalism or religion. Domain influences include medium/format and tabloid/quality. Organisational include owners, target audience, and advertisers. Editorial includes gatekeeping, coverage and endorsement. Journalistic includes source selection, gender, and labeling.

Figure 1 shows a partial view of the organisational layer of the sub-classification of production biases. The left column lists the individual influences which can bias news production. At the organisational level these include ownership, political, ideological, preferred audience, and commercial or advertiser. The layering of the sub-classification of production biases enables it to differentiate between e.g. ideological biases at the organisational level or at the journalistic level. The middle column in Figure 1 provides a description of the manifestation and effect of each of the biases. This provides the researcher with an easily digestible top level description and example. The right most column lists the major publications which deal with each form of bias. This enables the classification to act as an initial reference point for researchers to learn more about different types of bias.

Accompanying each layer of the sub-classification shown in Figure 1, is a detailed description of each of the forms of bias. It provides an overview of the main points and findings from the literature. It also lists the main challenges and questions. Currently, work is being undertaken to add a medium dimension to this sub-classification so that users will be able to identify e.g. the main editorial biases - such as coverage, selection, or endorsement / opposition - that impact the production of news, broken down further via radio, television, print, or online news. Other dimensions to view the sub-classification through are also actively being considered. These may include identifying the beneficiary or instigator of the bias [10], or the audience the biased news is targeted at [1].

**Dissemination Biases Sub-Classification**

A detailed sub-classification of the biases that impact the dissemination of news is also near completion. This sub-classification has been broken down into four dimensions, see left, representing the four main mediums of dissemination. Researchers can consult this to better understand the manifestation and effect of each form of bias and to identify the key studies from the literature. A partial view of the biases impacting the dissemination of news in print journalism is shown in Figure 2.

Print journalism is one of the more well studied mediums for dissemination bias. A small proportion of the categories and related studies include: headline and story lede [28, 49], position, placement or prominence [27], coverage [6], photographs [36], cartoons and graphics [11], and labeling and description bias [16]. Bias in the dissemination of news on television has also been relatively well

**The four dimensions of the sub-classification of dissemination biases are:**

- Radio
- Television
- Print
- Online

Type of Print Dissemination Bias	Manifestation / Effect	Publication
Position, Placement, Prominence	Placement of articles in a newspaper or news magazine such as front page, above the fold, or buried deep within the paper. Position or placement bias can also manifest in the placement of facts within a story	(Ahmed et al., 2012; Kenney & Simpson, 1993; Lagun & Lalmas, 2016; Ma et al., 2016)
Layout, Spread	Placement and grouping of articles, photos, headlines to create an initial impression as viewers scan the news or to frame a story before they read it	(Bernstein, 2004; Schindler et al., 2017)
Headline, Lead, Lead Story, Bulletin,	Use of language, tone, focus, respect, endorsement, or condemnation to frame the readers thinking, whether they read the article or not	(Guido H. Stempel, 1961; Kahn & Kenney, 2002, 2002; Kingsbury & Hart, 1933; Kriesberg, 1946; Lott & Hassett, 2014; Merron & Gaddy, 1986; Sachsman, 1970; Stoodley, 1960; Tannenbaum, 1953; van Dijk, 2000)
Coverage, Space	The amount of coverage a topic, issue, political party or individual receives. Closely related to position / placement /	(Brandenburg, 2005, 2006; D. D'Alessio & Allen, 2000; Kingsbury & Hart, 1933;

**Figure 2: Partial view of the print journalism biases in the dissemination of news sub-classification**

studied. Just a few of the categories and studies include: coverage [23], soundbite / imagebite [18], facial expressions [? ], and presentation or visual [30].

In comparison, there are very few studies on bias in the dissemination of news on radio. The few examples include: presenter style [2], vocal characteristics [37], coverage [20], and structure [3]. There are also surprisingly few studies specifically relating to bias in the dissemination of news online, though this is likely to change. The few examples include: comment sections [25], photographs [24], presentation [44–46], and headlines [51].

In future, a *smartphone* dimension may be added to this sub-classification. This would include any studies relating to news apps and notifications. An *algorithms* dimension may also be added due to their increased importance in news consumption and concerns about bias in their recommendations [5, 8, 29]. This will have categories for personalisation, recommender systems, machine learning and deep learning, content distributions systems, and social computing systems.

**Consumption Biases Sub-Classification**

In future, our efforts will focus on the development of a sub-classification of cognitive biases that impact the consumption of news. Table 1 depicts an initial version of this sub-classification which was assembled while classifying production and dissemination biases. The aim is to continue populating the sub-classification and to further develop the descriptions of their manifestation and effect. This is dependent on an in depth literature review.

Longer term, there is also a significant amount of work to be undertaken in breaking down this sub-classification by adding dimensions to aid researchers identifying relevant work. Options include adding a dimension classifying the various biases by their similarity, causes, or effect. It may also be possible to classify these biases based on the propensity of different personalities or groups to be impacted by them. Potentially this could include sub dimensions such as political ideology etc.

**THE CLASSIFICATION AS A SOURCE OF KNOWLEDGE**

A major benefit of the classification is that the organised overview of the domain it provides acts as a source of knowledge in itself. The following presents a few of the insights its realisation has revealed thus far.

**Insufficient Research into News Bias on Radio and Online**

One of the most obvious facts visible in an overview of this classification is the lack of research investigating bias in radio news in comparison to the preponderance of studies investigating bias in television and print news. There are several reasons for this including the difficulty of accessing radio news content, the un-composed nature and format of radio news shows, and the time, effort and costs of converting spoken radio content into a format that can be easily measured and analysed.

**Table 1: Partial categorisation of cognitive biases which may impact the consumption of news.**

Type of Consumption Bias	Manifestation / Effect	Publications
Confirmation	Seeking information that we agree with or agrees with our position while ignoring news that we disagree with or causes discomfort	(Hernandez & Preston, 2013; Knobloch-Westerwick & Kleinman, 2012; Knobloch-Westerwick, Mothes, Johnson, Westerwick, & Donsbach, 2015)
Saliency	Individuals are more likely to focus on information or details that are more prominent, striking or perceptible and ignore those that are not	(de Vreese, 2004)
Selective Perception	The phenomenon of not noticing and/or more quickly forgetting stimuli that contradicts prior beliefs or causes discomfort	(Bucher & Schumacher, 2006)
Selective Exposure	The tendency to favour information which reinforces or supports the individuals pre-existing views while avoiding contradictory information	(Garrett, 2009; Iyengar & Hahn, 2009; Knobloch-Westerwick & Kleinman, 2012; Knobloch-Westerwick, Sharma, Hansen, & Alter, 2005; Messing & Westwood, 2014, 2014)
Stereotyping	Ascribing an individuals or types of individuals' behaviour as representing the group or background they belong to	(Gorham, 2006; Rodgers & Thorson, 2000; Tyler Eastman, 2001)
Blind Spot	Recognising the impact of biases on others but failing to recognise it on oneself	(Ehrlinger et al., 2005; Pronin et al., 2002)
Bandwagon	The phenomenon whereby individuals will do or agree with something primarily because others are doing it	(M. Baum & Just, 2009; Seely, 2014)
Negativity	The tendency of people to pay more attention and remember for longer bad news	(Grabe & Kamhawi, 2006; Kätsyri, Kinnunen, Kusumoto, Oittinen, & Ravaja, 2016; Trussler & Soroka, 2014)
Accessibility	Information that can be easily retrieved from memory is more likely to affect judgements, opinions, and decisions when processing information.	(Iyengar, 1990)
Hostile Media	The tendency for individuals with strong pre-existing positions or attitudes on an issue to perceive media coverage as biased against their side	(Giner-Sorolla & Chaiken, 1994; Vallone, Ross, & Lepper, 1985)
Anchoring Effect	The tendency to rely on the first piece of information relating to a topic or individual	(Groeling, 2013b; Heath & Gilbert, 1996)
Projection	Overestimating the degree to which other people agree with us and/or that our positions reflect the majority of others	(Christen & Gunther, 2003; Gunther & Chia, 2001)
Status Quo	The acceptance of the current situation or the default choice or resistance to change, even when the current option / choice / position is considered sub optimal	(Groeling, 2013b; Heath & Gilbert, 1996)
Source / Purveyor	The tendency to assume or judge news from a certain source or purveyor as being biased or against one's own position	(Turner, 2007)

Even if researchers did go to this trouble, much of the bias in radio news is related to how something is said, not what is said, thus increasing its subjective nature. There is also a similar lack of studies into bias in news online. This is in part because it is the newest news medium. However, the digital format of the content and the ease of access to it should make studying bias easier than in other mediums and thus resulted in additional studies.

### **Many Studies on Bias do not Focus on the Text or Message**

The majority of studies on bias in the dissemination of the news, do not focus on the actual text or the message, but rather on the factors surrounding them. This is due to the highly subjective nature of bias, the fact that judges of text and message have their own personal biases, the fact that many forms of bias are via omission rather than commission [22], and for television and radio, it is often how something is said rather than what is said, i.e. tone or facial expressions. For online and print news, factors such as the pictures, headlines, and related articles accompanying an article would have a similar effect. However, researchers can now take advantage more easily accessible news content online and of new technologies such as machine learning and the ability to crowdsouce large numbers of participants to prepare content or to undertake experiments. This could potentially result in large scale evaluation of Entman's Aggregate News Slant Index formula [17] or the development of other means to measure bias in the text or message.

### **The Lack of Theory**

The classification has revealed a chronic lack of theory relating to how judgements of bias are made. In comparison, the overarching domain of credibility has at least ten cognitive models, theories, frameworks and schematics to explain how judgements of credibility are made online [43]. The formulation and testing of theory is important as it underpins experiments and explain phenomenons.

### **A Range of Gaps in the Literature**

The classification has also exposed many smaller gaps in the literature. 1) Despite an extensive literature review, many forms of bias to not have an explicit lexical definition. 2) In many instances, specific forms of bias which have been studied in print journalism have not been studied online. 3) For print journalism, the 1950s, 1960s and 1970s produced a range of seminal studies on bias. For television, the 1970s and to a lesser degree the 1980s produced many important studies. Unfortunately, the 2000s or 2010s do not seem to have produced the same level of seminal work for online news. 4) A very large proportion of studies on bias in the news focus on American media, particularly on their elections. More research needs to be undertaken in bias in other countries and on non-election topics. These and other gaps in the body of knowledge are opportunities.

### **ONGOING EFFORTS AND FUTURE ENDEAVOURS**

The population and development of the three sub-classifications is ongoing. The first two sub-classifications, production biases and dissemination biases, are nearing publication while the third classification of cognitive biases requires additional work. However, it must be noted that publication does not equal completion. As new biases are discovered and defined and their manifestation and effect understood, the body of literature will also expand. Thus, the classifications will also need to be expanded and revised in the future. Consequently, online publication is being actively considered. This resource could then be made searchable with faceted viewing.

In future, opportunities exist to debate and refine the classifications. This includes the definitions of each form of bias, their manifestation and effect. In many cases, there are no definitions. These are obvious gaps in the literature which if filled, will aid researchers for years to come. There are also opportunities to add concrete examples of each form of bias to the classification. To increase the validity and usefulness of this resource, psychologists, psychiatrists, journalists, editors, HCI experts, news website designers, news app developers, and other interested parties should actively be sought out and consulted.

### **A RESOURCE FOR RESEARCHERS**

This classification will be a resource for researchers interested in studying bias at any stage of the news pipeline. Researchers interested in the detection of a particular cognitive bias will be able to quickly consult it for inspiration and to identify methods and techniques. This will allow them to quickly compare the pros and cons of the various approaches. It can also act as a datum point for literature reviews. The classification will also contain any known research that has been undertaken to prevent or limit the effects of each of the cognitive biases it contains. This will help researchers to quickly identify gaps in the literature. Although this classification is primarily intended as an academic resource it may also be of interest to journalists, editors or cognitive psychologists etc.

### **CONCLUSION**

In order to establish a research agenda to systematically investigate cognitive biases relating to news consumption, it is necessary to first have a deep understanding of the related literature in the domain. This exposes the gaps in the body of knowledge. The development of a common and open classification and sub-classifications of biases that impact each of the three main stages of the news pipeline will prove transformative for research in the domain. This paper provided an overview of two such classifications of biases for the production and dissemination of news which are nearing publication. It also highlighted current progress on the development of a classification of cognitive biases which impact the consumption of news.

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## REFERENCES

- [1] Hunt Allcott and Matthew Gentzkow. 2017. Social media and fake news in the 2016 election. *Journal of Economic Perspectives* 31, 2 (2017), 211–36.
- [2] David Christopher Barker. 2002. *Rushed to Judgment: Talk Radio, Persuasion, and American Political Behavior*. Columbia University Press. Google-Books-ID: wiA5xxwcm0oC.
- [3] Colin Berry, Andreas Scheffler, and Caroline Goldstein. 1993. Effects of text structure on the impact of heard news. *Applied Cognitive Psychology* 7, 5 (Oct 1993), 381–395. <https://doi.org/10.1002/acp.2350070503>
- [4] Jerome E Bickenbach, Somnath Chatterji, E. M Badley, and T. B Üstün. 1999. Models of disablement, universalism and the international classification of impairments, disabilities and handicaps. *Social Science & Medicine* 48, 9 (May 1999), 1173–1187. [https://doi.org/10.1016/S0277-9536\(98\)00441-9](https://doi.org/10.1016/S0277-9536(98)00441-9)
- [5] Engin Bozdog. 2013. Bias in algorithmic filtering and personalization. *Ethics and Information Technology* 15, 3 (Sep 2013), 209–227. <https://doi.org/10.1007/s10676-013-9321-6>
- [6] Heinz Brandenburg. 2005. Political Bias in the Irish Media: A Quantitative Study of Campaign Coverage during the 2002 General Election. *Irish Political Studies* 20, 3 (Sep 2005), 297–322. <https://doi.org/10.1080/07907180500359350>
- [7] Arnold H. Buss and Stephen E. Finn. 1987. Classification of personality traits. *Journal of Personality and Social Psychology* 52, 2 (1987), 432–444. <https://doi.org/10.1037/0022-3514.52.2.432>
- [8] Matt Carlson. 2018. Automating judgment? Algorithmic judgment, news knowledge, and journalistic professionalism. *New Media & Society* 20, 5 (May 2018), 1755–1772. <https://doi.org/10.1177/1461444817706684>
- [9] David Deacon, Peter Golding, and Michael Billig. 2013. *Between Fear and Loathing: National Press Coverage of the 1997 British General Election*. Routledge. Google-Books-ID: yz4uwWltEZ0C.
- [10] Stefano DellaVigna and Ethan Kaplan. 2007. The Fox News effect: Media bias and voting. *The Quarterly Journal of Economics* 122, 3 (2007), 1187–1234.
- [11] Murray Dick. 2015. Just Fancy That. *Journalism Studies* 16, 2 (Mar 2015), 152–174. <https://doi.org/10.1080/1461670X.2013.872415>
- [12] Evanthia Dimara, Steven Franconeri, Catherine Plaisant, Anastasia Bezerianos, and Pierre Dragicevic. 2020. A Task-Based Taxonomy of Cognitive Biases for Information Visualization. *IEEE Transactions on Visualization and Computer Graphics* 26, 2 (Feb 2020), 1413–1432. <https://doi.org/10.1109/TVCG.2018.2872577>
- [13] Howard D. Doll and Bert E. Bradley. 1974. A study of the objectivity of television news reporting of the 1972 presidential campaign. *Central States Speech Journal* 25, 4 (Dec 1974), 254–263. <https://doi.org/10.1080/10510977409367803>
- [14] James N. Druckman and Michael Parkin. 2005. The Impact of Media Bias: How Editorial Slant Affects Voters. *The Journal of Politics* 67, 4 (2005), 1030–1049.
- [15] Edith Efron. 1971. *The News Twisters*. Nash Pub.
- [16] Robert M. Eisinger, Loring R. Veenstra, and John P. Koehn. 2007. What Media Bias? Conservative and Liberal Labeling in Major U.S. Newspapers. *Harvard International Journal of Press/Politics* 12, 1 (Jan 2007), 17–36. <https://doi.org/10.1177/>

- 1081180X06297460
- [17] Robert M. Entman. 2007. Framing Bias: Media in the Distribution of Power. *Journal of Communication* 57, 1 (Mar 2007), 163–173. <https://doi.org/10.1111/j.1460-2466.2006.00336.x> 00688.
- [18] Frank Esser. 2008. Dimensions of Political News Cultures: Sound Bite and Image Bite News in France, Germany, Great Britain, and the United States. *The International Journal of Press/Politics* 13, 4 (Oct 2008), 401–428. <https://doi.org/10.1177/1940161208323691>
- [19] Roy Forward. 1977. Editorial opinion and the Whitlam government. *Politics* 12, 1 (1 5 1977), 136–141. <https://doi.org/10.1080/00323267708401596> [Online; accessed 2018-02-16].
- [20] Christoffer Green-Pedersen, Peter B. Mortensen, and Gunnar Thesen. 2017. The Incumbency Bonus Revisited: Causes and Consequences of Media Dominance. *British Journal of Political Science* 47, 1 (Jan 2017), 131–148. <https://doi.org/10.1017/S0007123415000022>
- [21] Tim Groeling. 2013. Media Bias by the Numbers: Challenges and Opportunities in the Empirical Study of Partisan News. *Annual Review of Political Science* 16, 1 (11 5 2013), 129–151. <https://doi.org/10.1146/annurev-polisci-040811-115123> 00017.
- [22] Tim Groseclose and Jeffrey Milyo. 2005. A Measure of Media Bias. *The Quarterly Journal of Economics* 120, 4 (Nov 2005), 1191–1237. <https://doi.org/10.1162/003355305775097542> 00445.
- [23] Barrie Gunter. 1979. Recall of Brief Television News Items: Effects of Presentation Mode, Picture Content and Serial Position. *Journal of Educational Television* 5, 2 (Jun 1979), 57–61. <https://doi.org/10.1080/0260741790050207>
- [24] Eric Hehman, Elana C. Graber, Lindsay H. Hoffman, and Samuel L. Gaertner. 2012. Warmth and Competence: A Content Analysis of Photographs Depicting American Presidents. *Psychology of Popular Media Culture* 1 (Jan 2012), 46–52.
- [25] J. Brian Houston, Glenn J. Hansen, and Gwendelyn S. Nisbett. 2011. Influence of User Comments on Perceptions of Media Bias and Third-Person Effect in Online News. *Electronic News* 5, 2 (Jun 2011), 79–92. <https://doi.org/10.1177/1931243111407618> 00001.
- [26] Jerome P. Kassirer and Richard I. Kopelman. 1989. Cognitive errors in diagnosis: Instantiation, classification, and consequences. *The American Journal of Medicine* 86, 4 (Apr 1989), 433–441. [https://doi.org/10.1016/0002-9343\(89\)90342-2](https://doi.org/10.1016/0002-9343(89)90342-2)
- [27] Keith Kenney and Chris Simpson. 1993. Was Coverage of the 1988 Presidential Race by Washington’s Two Major Dailies Biased? *Journalism Quarterly* 70, 2 (Jun 1993), 345–355. <https://doi.org/10.1177/107769909307000210>
- [28] Susan Kingsbury and Hornell Hart. 1933. Measuring the Ethics of American Newspapers III. Newspaper Bias on Congressional Controversies. *Journalism Bulletin* 10, 4 (1 12 1933), 323–342. <https://doi.org/10.1177/107769903301000411> [Online; accessed 2018-03-12].
- [29] Keith Kirkpatrick. 2016. Battling algorithmic bias: how do we ensure algorithms treat us fairly? *Commun. ACM* 59, 10 (Sep 2016), 16–17. <https://doi.org/10.1145/2983270>
- [30] Stephen Kline. 1979. Creating Reality: How Television News Distorts Events. *Canadian Journal of Communication* 5, 3 (Jan 1979). <https://doi.org/10.22230/cjc.1979v5n3a208>
- [31] Stephen Kline. 1981. National Perspective and News Bias: a comparison of national news broadcasts. *Canadian Journal of Communication* 7, 4 (1981).
- [32] Juliane A. Lischka. 2019. A Badge of Honor? *Journalism Studies* 20, 2 (Jan 2019), 287–304. <https://doi.org/10.1080/1461670X.2017.1375385>
- [33] Gaëlle Lortal, Philippe Capet, and Alain Bertone. 2014. Ontology building for cognitive bias assessment in intelligence. In *2014 IEEE International Inter-Disciplinary Conference on Cognitive Methods in Situation Awareness and Decision Support (CogSIMA)*. 237–243. <https://doi.org/10.1109/CogSIMA.2014.6816616>
- [34] Isaac M. Marks. 1970. The Classification of Phobic Disorders. *The British Journal of Psychiatry* 116, 533 (Apr 1970), 377–386. <https://doi.org/10.1192/bjp.116.533.377>

- [35] Iain A. McCormick, Frank H. Walkey, and Dianne E. Green. 1986. Comparative perceptions of driver ability— A confirmation and expansion. *Accident Analysis & Prevention* 18, 3 (Jun 1986), 205–208. [https://doi.org/10.1016/0001-4575\(86\)90004-7](https://doi.org/10.1016/0001-4575(86)90004-7)
- [36] Sandra E. Moriarty and Mark N. Popovich. 1991. Newsmagazine Visuals and the 1988 Presidential Election. *Journalism Quarterly* 68, 3 (Sep 1991), 371–380. <https://doi.org/10.1177/107769909106800307>
- [37] Peter Moss. 1988. Words, Words, Words: Radio News Discourses and How They Work. *European Journal of Communication* 3, 2 (Jun 1988), 207–230. <https://doi.org/10.1177/0267323188003002006>
- [38] David Niven. 1999. Partisan Bias in the Media? A New Test. *Social Science Quarterly* 80, 4 (1999), 847–857. <http://www.jstor.org/stable/42864409>
- [39] Souneil Park, Seungwoo Kang, Sangyoung Chung, and Junehwa Song. 2009. NewsCube: delivering multiple aspects of news to mitigate media bias. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 443–452. <https://doi.org/10.1145/1518701.1518772> 00036.
- [40] Emily Pronin, Daniel Y. Lin, and Lee Ross. 2002. The Bias Blind Spot: Perceptions of Bias in Self Versus Others. *Personality and Social Psychology Bulletin* 28, 3 (Mar 2002), 369–381. <https://doi.org/10.1177/0146167202286008>
- [41] David B. Sachsman. 1970. A Test of ‘Loading’: New Measure of Bias. *Journalism Quarterly* 47, 4 (12 1970), 759–762. <https://doi.org/10.1177/107769907004700415> [Online; accessed 2018-03-12].
- [42] Jackie Smith, John D. McCarthy, Clark McPhail, and Boguslaw Augustyn. 2001. From Protest to Agenda Building: Description Bias in Media Coverage of Protest Events in Washington, D.C. *Social Forces* 79, 4 (Jun 2001), 1397–1423. <https://doi.org/10.1353/sof.2001.0053>
- [43] Brendan Spillane, Isla Hoe, Mike Brady, Vincent Wade, and Séamus Lawless. 2020. Tabloidization versus Credibility: Short Term Gain for Long Term Pain. In *CHI Conference on Human Factors in Computing Systems (CHI '20), April 25–30, 2020, Honolulu, HI, USA*. ACM. <https://doi.org/10.1145/3313831.3376388>
- [44] Brendan Spillane, Séamus Lawless, and Vincent Wade. 2017. Perception of Bias: The Impact of User Characteristics, Website Design and Technical Features. *Proceedings of the International Conference on Web Intelligence*, 227–236. <https://doi.org/10.1145/3106426.3106474> [Online; accessed 2017-09-18].
- [45] Brendan Spillane, Séamus Lawless, and Vincent Wade. 2018. Increasing and Decreasing Perceived Bias by Distorting the Quality of News Website Design. *Proceedings of the 32nd BHCI Group Annual Conference on People and Computers*, 13.
- [46] Brendan Spillane, Séamus Lawless, and Vincent Wade. 2020. The Impact of Increasing and Decreasing the Professionalism of News Webpage Aesthetics on the Perception of Bias in News Articles. In *Proceedings of the 22nd International Conference On Human-Computer Interaction (Lecture Notes in Computer Science)*. Springer.
- [47] Robert L. Spitzer and Michael B. First. 2005. Classification of Psychiatric Disorders. *JAMA* 294, 15 (Oct 2005), 1898–1900. <https://doi.org/10.1001/jama.294.15.1898>
- [48] Robert L. Stevenson and Mark T. Greene. 1980. A Reconsideration of Bias in the News. *Journalism Quarterly* 57, 1 (Mar 1980), 115–121. <https://doi.org/10.1177/107769908005700117>
- [49] Percy H. Tannenbaum. 1953. The Effect of Headlines on the Interpretation of News Stories. *Journalism Bulletin* 30, 2 (Mar 1953), 189–197. <https://doi.org/10.1177/107769905303000206>
- [50] Jim VandeHei and Mike Allen. 2012. To GOP, blatant bias in vetting. *POLITICO* (May 2012). <https://www.politico.com/news/stories/0512/76898.html>
- [51] Jeffrey N. Weatherly, Thomas V. Petros, Kimberly M. Christopherson, and Erin N. Haugen. 2007. Perceptions of Political Bias in the Headlines of Two Major News Organizations. *Harvard International Journal of Press/Politics* 12, 2 (Apr 2007), 91–104. <https://doi.org/10.1177/1081180X07299804>
- [52] Alden Williams. 1975. Unbiased Study of Television News Bias. *Journal of Communication* 25, 4 (Dec 1975), 190–199. <https://doi.org/10.1111/j.1460-2466.1975.tb00656.x>