

# Communicating Artificial Intelligence through Newspapers: Where is the Real Danger?

*Graduation Thesis*

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## **Abstract:**

This study attempts to explore how newspapers are portraying the impact of Artificial Intelligence, while considering the social and economic contexts where these new developments are unfolding. Thus, the research analyses articles from four English languaged newspapers. First it looks into the sample for the 'voices' or sources that journalists are relying on when writing on this issue and secondly, it analyses the articles more in depth to uncover how the narratives and discourses around the short-term effect and long-term effects of AI are being constructed in the news.

## **1. Introduction**

This research aims to understand how the newspapers are portraying the impact of Artificial Intelligence. In doing so, it will first contextualise the latest developments on Artificial intelligence, giving a broad view on what the technical achievements and possibilities are, but also on the expectations surrounding these developments and the controversy these expectations are creating. In addition, it will proceed further contextualising the role of the media in communicating scientific and technological issues and what factors may mediate this communication.

The paper continues further to the second section where I formulate my research question: *How is AI and its impact being represented in newspapers?* To approach this phenomenon, I will study who are the public figures that the newspapers are giving representation to when writing about the impact of AI and I will also explore what kind of discourses emerge from the articles where these 'voices' are quoted. In the third section of this paper I will describe my research strategy consisting of three steps: a selection of the sample of articles under inquiry, a quantitative research approach for gathering the 'voices' quoted in the sample and a qualitative approach based on text analysis to explore the discourses emerging from the corpus. The fourth section will proceed with the gathering of evidence. Firstly, the sample of articles will be analysed in search of the names that are being referred from a quote and a database with the most quoted 'voices' will be created. The articles where these 'voices' appear will be selected

from the total sample to proceed to the second step of the analysis, where they will undergo a text analysis that will look for the emergent topics around the impact of AI. Finally, in the conclusion section, the emerging discourses on the impact of AI will be discussed in relation with the context introduced in this paper. The possible implications of these discourses having a greater or lesser representation on the news, will also be evaluated in this last section.

### **1.1 AI state of affairs: A controversial revolution**

When analysing the progress and development of the new digital technologies on the last few decades, it is easy to notice that innovation has played a key role. If we understand innovation as the creation of new ideas by recombination of existing ones, we may claim that the digital world has set up the specific conditions for fast development of new ideas [1]. The exponential growth of hardware, predicted by Moore's Law, provides us with cheaper and more powerful processors each year. In addition to this, the availability of a big amount of digitised data, the ease of sharing and gathering it have led to achievements of great impact in the new digital world. The powerful impact of these technological developments has already been compared to those of the Industrial Revolution that shaped a new economic and social organization [2]. In this increasingly fast pace of technological innovation, the field of AI has made important and promising achievements, giving rise to a new wave of AI in the last two decades, where the prospects of achieving Human Level Machine Intelligence seems to be a more graspable dream for the field.

The field of AI is a multidisciplinary one and it was born under the scientific field of cognitive science; in a really broad sense AI could be described as "a cross-disciplinary approach to understanding, modeling, and replicating intelligence and cognitive processes by invoking various computational, mathematical, logical, mechanical, and even biological principles and devices." [3]. Throughout the history of AI, significant work has been done in two different approaches: a theoretical approach and a pragmatic one. The former research strain has been more focused on developing theoretical models to understand consciousness or the limits of computation, while the latter was more focused on implementing the idea of intelligence into systems capable of running on computers.

Within the theory of AI there are two overarching theoretical approaches to replicate intelligence in machines: the symbolic approach and the connectionist approach. While Symbolic AI proposes a model to simulate intelligence that consists of the manipulation of symbols according to a set of rules and implementing intelligent systems as an analogy of a computer program, connectionism supports the idea of taking the brain as a model in order to simulate intelligence in machines therefore modelling the intelligence system as an analogy of the nervous system[4]. While both research strains have coexisted since the dawn of AI, the latter one in combination with big data statistical analysis have started to generate new and efficient learning methods in the last two decades with many repercussions on the development of practical software for computer vision, speech recognition, natural language processing, robot control, among others.

What these connectionist machine learning methods have in common is that they propose a data-driven approach to learning [5]. They create intelligent systems that are able to infer patterns and predictions from the data they have been presented, and this ability makes them learn without the need of being pre-programmed. From about the beginning of the 2000s onwards, with the overcoming of technical limitations, the field has seen a fast increase of applications using these methods, that have been tested and welcomed by many users.

The advantage of this data-driven approach to learning is that it creates methods that succeed at performing in really different domains. Using these methods, the field of AI is developing intelligent systems that are good not only at playing games such as chess or Go [6], but they also succeed at simpler task such as recognising pictures of cats [7]. This ability increases the possibilities of its application in different domains of human activity, supporting the idea that soon machines will be able to perform most human professions as well as humans do, reaching what has been called the Human Level Machine Intelligence.

But considering the history of AI, some may remain quite skeptical to this claim, as it has been a controversial one since the foundations of the field. This is not the first time such a claim has been made within the field, creating big expectations on future achievements that later are far from being fulfilled. AI has also been an ill-defined term accused of endorsing definitions of human intelligence that are rather simplistic in order to fit its implementation in machines, and therefore for some scholars these definitions are a mere reduction of what human intelligence could be [8]. For example, the idea of replicating intelligence as disembodied entity, simplifies the claim that human intelligence is a product of our whole physicality, and that there is no such a thing as mind separate from body. Thus, having a machine making highly accurate statistical predictions out of huge amounts of data seems like an important technical achievement in terms of its possible applications, but it might be a small step to closing the gap between human and machine intelligence.

### **1.2 Artificial intelligence predictions for the future: dystopia or utopia?**

In fact, there is very little research on the likelihood of Human Level Machine intelligence being achieved somewhere in the future. Furthermore, the little research on the topic presents a high degree of uncertainty on the timeframe in which this event could occur, whether this is going to happen in next 30 years or it is not going to happen at all [9]. Since its inception predictions on the future of AI have been surrounded by the idea that development of Artificial Intelligence will grow such as to overcome us, reaching the 'technological singularity'. But still the question remains whether this superintelligence will be achieved if we are still this far from reaching its prior step, Human Level Machine Intelligence. Of course, putting an end to the philosophical debate around artificial intelligence is far outside the scope of this paper, but understanding the controversy surrounding the field may help to understand how the mass media is covering the subject.

In other words, as the philosopher Luciano Floridi articulates it, this philosophical debate

about whether or not machines may be considered intelligent is likely to create a kind of distraction from more urgent concerns around the development of AI, and from confronting the short-term challenges that the field could face when building applications for public use that are based on these intelligence systems [10]. These systems are already raising some ethical concerns that are sometimes materialised through the erratic performance of some applications. For example, the image recognition algorithm used by Google Photos, that associated black people with images labelled 'gorilla' shows us the risk of these technologies to encode the bias of their designers [11]. Moreover, the development of an intelligent system that can tell by analysing facial features whether or not the person under analysis is homosexual [12] extends the risk of marginal groups to be persecuted and deprived of their freedom. In this way, it would be simplistic to underestimate the potential power of these developments to alter our relationships of social power and control, not to say that to ignore a technology that has a high impact in our society is being developed under the lead of big corporations instead of being treated as a public good, may be also a risk. The political scientist Kate Crawford goes further elaborating on this line of thought by signaling how the misuse of intelligent systems may favor authoritarian political regimes and how if combined with this recent right-wing and nationalistic drift on European and American politics, these technologies could become a convenient tool for cutting back rights that are embedded in the nature of democratic states. As an example, she shows a system implemented by a company called Faception (*Figure 1*) that claims to be able to predict personality based on facial traits. As she points out, it is quite worrying to observe that the main concept of the system itself relies on a discarded and unethical pseudoscientific discipline, phrenology, that was for a long time the pseudoscientific trope that served to justify slavery and racial superiority [13].

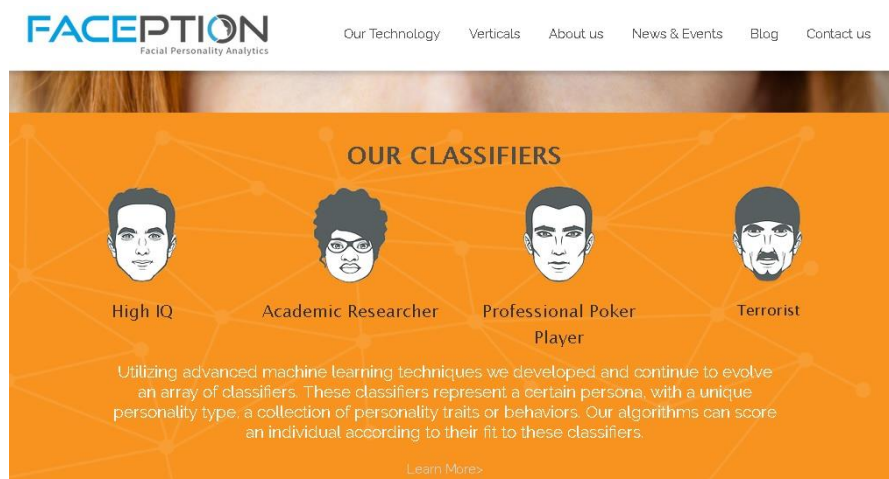


Figure 1: Image of the welcoming page from [Faception](#).

Besides the ethical and political concerns around the development of AI I will add another concern, the fact that all this research in Artificial Intelligence has been done in private environments under the goal and interest of corporations such as Google and Microsoft, among others. In an article published in SSRN, the scientist Yarden Katz formulates an interesting hypothesis. He claims that this growing investment and development in AI,

may hide some other interest than just naive technological progress. Thus, he argues that this new wave of technological innovation labeled Artificial Intelligence is a hype that has been motivated with prospects of being a quite profitable business in Silicon Valley [14]. In addition to this, Joichi Ito, the head of the MIT Media Lab and his team, in *Fighting reductionism: A manifesto*, also support the idea that this development on Artificial Intelligence is being led by economic purposes and the will to perpetuate and extend the current economic and political organization. In the same article, they also compare the 'technological singularity' to a religious cult that Silicon Valley companies idolise.

*The new species of Silicon Valley mega companies—the machines of bits—are developed and run in great part by people who believe in a new religion, Singularity. This new religion is not a fundamental change in the paradigm, but rather the natural evolution of the worship of exponential growth applied to modern computation and science. The asymptote of the exponential growth of computational power is artificial intelligence. [15]*

Furthermore, Luciano Floridi signals at some point in his article that this debate about the impact of AI framed in dualistic terms creates really appealing dystopian narratives for the mass media to write about [10]. In this way, Yarden Katz also pinpoints the mass media as an important actor in the rebranding of AI, one that is constantly paying attention to the discourse that comes from big corporations working in Silicon Valley and giving little support to external or divergent voices that question that main discourse.

### **1.3. The role of the press communicating on technological issues: The political reading of science communication**

It is a common assumption that the communication of 'objective' issues such as those of sciences and technology will be mediated by objectivity. However, some research on this matter has shown that the communication of technological and scientific knowledge by media such as newspapers is a complex one. Some of the main dimensions that may affect news production around these topics may be the economic, political and social context. For example, during the time period from the 1950's to the 1980's a change was noticed in journalistic form related to the increasing privatization of science around the 1980s. In the latter period, the research groups would tend to market the communication of their projects and findings on the newspapers in order to get funding for them [25]. It is also well known that the relations between journalism and science are complex and are affected by different variables such as: myth-making of journalists, constraints, biases, public relations strategies of scientists, corporations, universities, and the governments [26]. In addition to the fluctuation of these variables, the prevalence of science and technology in the press tends to rise when the controversy around a topic creates disagreement within the scientific community. When scientific community is not able to agree on the possible risks or impact of a new scientific or technological breakthrough, this subject may become more salient in newspapers, independently of its overall relevance among the scientific field. That was the case a few years ago with the rise of popularity of emerging technologies such as nanotechnology, biotechnology or transgenic food. Emerging technologies are those new technologies that promise a potential change

capable of dramatically altering the socio-economic domain. These technological and scientific innovations are characterised, among other things, by the uncertainty around their prominent impact and are, therefore, highly vulnerable to speculation [27]. Thus, when framed on the news, subjects such as nanotechnology tend to be reported in a highly positive way in countries as Austria, Switzerland, Germany and the US, but also the report on this technology may be affected by negative public interventions made by celebrities, which may also set up the terms for a controversial debate in the press [28, 29].

Hence, we may label AI as an emerging technology, non-exempt from controversy as I have written in the previous section. Little research has been done on the framework of AI being portrayed in newspapers, but the already mentioned article discussing the rebranding of AI [14] has generate some graphs measuring the rise of publications in newspapers and academic articles containing the terms ‘big data’ and ‘artificial intelligence’. These graphs show an increment of the number of mentions of the term ‘artificial intelligence’ sharply growing from 2012 until 2016. This may be understood as rise of the interests in the field within the academic and the non-academic environment (Figure 2).

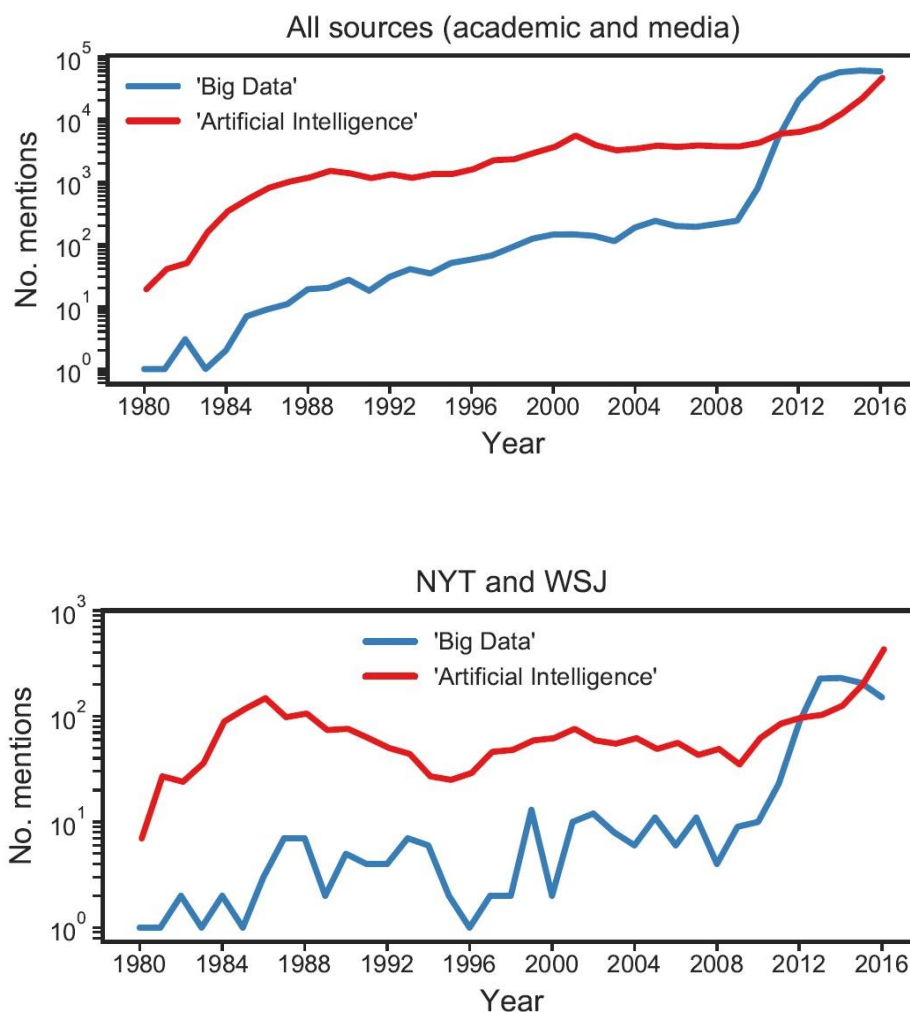


Figure 2: Top: Number of mentions of the terms “Big Data” or “Artificial Intelligence” in academic and media

sources, 1980-2016. Bottom: Number of mentions in *The New York Times* and *The Wall Street Journal*, used as proxies for U.S. mainstream media and business media. Note logarithmic y-axis scale. Source: Factiva. []

## 2. Motivation and definition of the problem

The ideas described in the introduction give a broad view and contextualise my personal interest in doing this research. In the first two sections I attempted to briefly and generally summarise the nature of the latest developments on Artificial Intelligence, the general expectations and excitement generated around them and the controversy that this may cause. In the third section I introduced a review on the communication of technological issues in newspapers and some of the factors that may affect this communication, as well as how these factors may also be affecting the communication of AI in newspapers.

As I mentioned before, as part of the mass media, newspapers tend to adopt subjective positions when writing about controversial topics in the domain of technology. Controversy is understood as the lack of agreement among experts about the forecast or predictions on the recent developments in a specific domain; these predictions are long-term and their likelihood is ambiguous. Controversy is also an intrinsic characteristic of emerging technologies and is really appealing for mass media as a call for audience [29]. Therefore, the portrayal of the impact of Artificial Intelligence as an emerging technology in the newspapers will be affected by the uncertainty of the predictions made on the field.

In this framework of uncertainty surrounding this technology, the coverage of the issue may also be affected by recurrent dependence of the journalist on external ‘voices’ that validate positions within the debate. More specifically, as Dorothy Nelkin mentions in her book *Selling Science*, in communicating expert related knowledge the journalist tends to rely on so-called ‘experts’ or sources, establishing a complicated relation with them, where most of the time an excess of trust in these ‘experts’ leads to a lack of critical judgement on the side of the journalist [26]. I think this may be the case in portraying the impact of Artificial Intelligence in the news as well. Due to the technical complexity of the latest developments of the field and the uncertainty of its predictions around the impact, it seems probable that journalists will need to count on external sources that to a greater or lesser extent allow them to report on the topic and ‘validate’ their claims and arguments.

*“Elon Musk: AI ‘vastly more risky than North Korea’”* [16/11]

*“AI is the biggest risk we face as a civilisation, Elon Musk says”* [17]

*“AI is highly likely to destroy humans Elon Musk warns”* [18]

The headlines above correspond to three different newspapers, all three of them are quoting from the same source talking about the impact of AI. In this case the entrepreneur

Elon Musk is envisioning the future impact of AI as a highly dystopian scenario. We do not know, only by reading this, whether or not the journalists agree or disagree on this claim, but the mere fact that this is being displayed in an article may make us perceive it as a something relevant when talking about the impact of AI. In this way, the theory of agenda-setting asserts that even though the media does not have the power to manipulate what do you think about a topic, it can set what topics are relevant enough to access the public domain.

Thus, I assume newspapers act as a platform for the sources to communicate their own opinion on the impact of AI and at the same time as a filter that will trim what issues are worthy of being communicated. In this framework I have elaborated the following questions to study this phenomenon (*Table 1*).

How is AI and its impact being represented in newspapers?	
<b>Q1</b>	<b>Q2</b>
Who are the sources journalists rely on when writing about the impact of AI?	What are the emerging discourses used in representing AI and its impact?

*Table 1: Top: Main question of this research. Bottom: From left to right the two subquestion derived from the main question.*

The main question *How is AI and its impact being represented in newspapers?* aims to understand how this technological issue is being represented in newspapers, but being such a broad question, I have come up with two sub-questions that attend to understanding the phenomena from a closer point of view. The sub-questions are looking at two different aspects of the communication process in the press, namely the sources and the discourses produced by these sources throughout the articles. Firstly, the sub-question *Who are the sources journalists rely on when writing about the impact of AI?* aims to uncover who is the group of ‘voices’ leading the discourses or being most referenced when writing about AI in newspapers. Secondly, the sub-question *What are the emerging discourses used in representing AI and its impact?* attempts to complement the latter and explore the discourses that emerge from the collaboration between sources and authors in the chosen articles, as well as trying to understand how these discourses relate to the contextual framework described in the first section of this paper.



### 3. Research strategy

In order to tackle the main question and the two sub-questions proposed above, the research strategy will develop as follows. In the first section I will explain the steps followed to determine a stable corpus. In the second section, the sample will be submitted to a close examination and a database that contains all the ‘voices’ quoted in the articles will be elaborated. This latter section will end with a selection of the group of ‘voices’ that have been quoted at least two times in different articles and a final selection of articles that will undergo further analysis in the next section. Finally, the third section will consist of a text analysis of the sample, focused on the emerging topics around the short-term and long-term impact on AI.

#### 3.1 Defining the sample.

The sample used in this study consists of thirty-two articles retrieved using the database Factiva, from four daily newspapers with high average of circulation in their respective countries: The Guardian (UK), The Times (UK), The Wall Street Journal (USA), The New York Times (USA). The time frame will cover three years, from 2015 until 2018 (01/04/2015-01/04/2018).

SAMPLE		
COUNTRY	SOURCES	Nº OF ARTICLES
UK	The Guardian	11
UK	The Times	4
USA	The New York Times	13
USA	The Wall Street Journal	4
	TOTAL	32

Table 2: Description of the sample; the number of articles retrieved from each of the newspapers.

Articles were chosen with the help of a query (Table 3), that used a selection of terms attempting to frame the articles into the topic: “the impact of Artificial Intelligence”. When using the query in Factiva a total of 134 articles were retrieved, from this corpus only thirty-two were selected to form the final sample. The last selection of thirty-two articles, was made by picking up by hand only the articles that deal with the “the impact of Artificial Intelligence” as a main topic.

QUERY		
TERMS		OPERATORS
Artificial intelligence Deep learning Machine learning Learning algorithms Impact Future Probability Chance Possibility Likelihood	Plausibility Consequences Odds Contingency Expectation Prospect Feasibility Forecast Uncertainty	<code>atleastN</code> retrieve the article only if the term after it appears, minimum a number of times, determined by the num. on its right.  <code>wc&gt;n</code> retrieve only the articles with a number of words bigger than the one specified in its right.  <code>and/or</code> Logical operators.
FORMULATION		
<pre>((atleast3 artificial intelligence) and (machine learning or deep learning or learning algorithms) and (impact or future or probability or chance or possibility or likelihood or plausibility or consequences or odds or contingency or expectation or prospect or feasibility or forecast or uncertainty) and wc&gt;800)</pre>		

Table 3: Description of the query used to retrieve the articles of the sample: The terms and the operators and the final formulation of the query used to retrieve the articles of the sample.

The articles finally discarded were 103, some of them were taken out of the sample because they were dealing with the topic of “the future impact of Artificial Intelligence” as a subtopic within a main topic. Some of the main topics of the discarded articles were: “the technological race in developing AI between China and USA”, “reports on specific applications or event around the development of AI”.

### 3.2 Collection of the voices

Firstly, the articles will be analysed in the search for words containing names that are being quoted or used to support a claim or an opinion referring to AI. These names will be organised in a table of experts where several variables will be compiled (*Name, Gender, Age, Businessman/Businesswoman, Researcher, Research field, Institution, the number of the article in which they were quoted*). From this database, a selection will be made of all the names that have been quote at least twice in different articles. Secondly, the articles containing the quotations of this last list of names will be submitted to a further analysis.

### 3.3. Text Analysis: Definition of the theoretical framework and practical approach.

The theoretical approach I will define in the next paragraphs will guide me in order to uncover the discourses surrounding the debate around the impact of AI. This second part of the research aims to answer the second sub-question, *What are the emerging discourses around AI and its impact in the news?* Due to the nature of the question I will

approach the methodology from a qualitative perspective based on text analysis. In the following sections I will describe my theoretical and practical approach to text analysis that will allow me to analyse the corpus of articles.

In the context of text analysis several approaches can be employed that will more or less adequately answer a specific question. The main goal of my approach to text analysis is not only to find and identify how the producers of the articles (journalist and sources) are framing the debate about the impact of Artificial Intelligence but also to reflect on what this means in a broader social context. I will approach newspapers articles as being text that subscribes to this definition: “texts are literary and visual constructs, employing symbolic means, shaped by rules, conventions and traditions intrinsic to the use of language in its widest sense.” [30]. Because of its constructive nature, a text can be surveyed for many meanings. That implies the analysis of a text requires interpretation of possible meaning and a theoretical framework that guides the analysis.

In order to answer the question addressed here, namely *What are the emerging discourses around AI and its impact in the news?* I will approach my analysis from the tradition of Cultural Studies theory that understands text as an artifact where meaning is socially constructed and composed of three dimensions: production, text and context. *Production* aims to understand the authorship of the text, *Text* refers, in this case, to the written material while *Context* appeals to the economic, political and cultural circumstances surrounding the creation of the artifact. In this way, the process of analysing media text might create meanings and provide insight about the political, economic and social dimension of a specific context [31].

In this analysis I will use critical literary methods [32] to carry out an immersive reading of the sample, gathering the emergent topics around the impact of AI and looking for both recurrent and non-recurrent topics while also relating them to the broader social context described in the beginning of this paper.

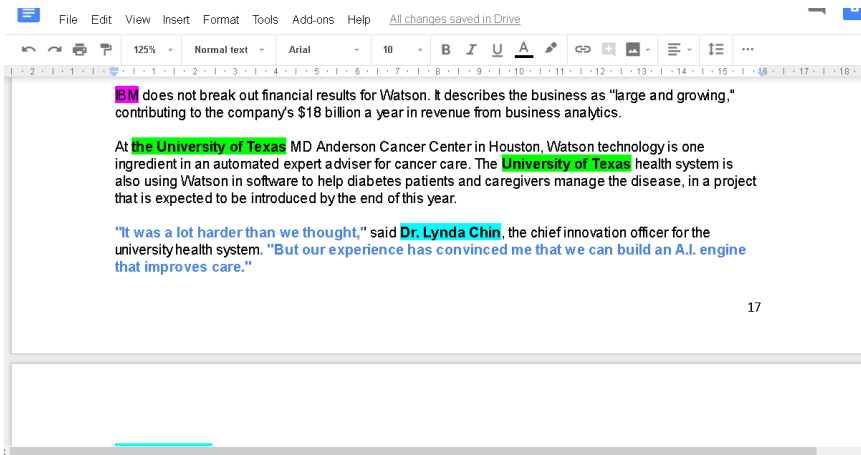
#### **4. Evidence analysis and interpretation**

This section will be dedicated to the gathering of evidence for answering the two sub-questions I have proposed for my research. The section is subdivided in two subsections: *The voices*, one that deals with the gathering of the data concerning public figures quoted in the sample and *The text analysis* that leads to the gathering of evidence from the articles.

##### **4.1. The voices.**

During the gathering of the data, a document of seventy-nine pages was created containing in total the thirty-two articles. This document was read and skimmed in search of names. The names were underlined, together with the quotes, and the institutions or companies they are associated with (*Figure 3*). Because the idea behind this process is to ascertain who has more chance to make their ideas visible in the newspapers, I have

approached the concept of authorship of some of the articles as being as relevant as a 'quote' (Figure 4). That means that both when one of these public figures was quoted in an article as well as when they were an author of one of the articles of the sample, it



counted as a new quotation.

Figure 3: Screenshot of an extract of the text sample with the names underlined in blue, the institutions (in this case universities) underlined in green and the company names underlined in magenta.

From this analysis a total of 102 names were gathered and thirteen of them were selected for being quoted at least twice in different articles. These thirteen public figures were organised on a scale from the most quoted to the least (table 4). From a total of thirteen sources, eleven of them are male and two of them are female. The number of them that develop their main professional activity in the business domain is five, while eight of them develop it in the research domain inside academic institutions or corporations.

The most quoted sources <sup>1</sup>								
	Name	Nº of quotes	Gender	Businessmen/ Women <sup>2</sup>	Researcher <sup>3</sup>	Research field	Institution/ Company <sup>4</sup>	Articles
1	<a href="#">Elon Musk</a>	9	M	YES	NO		Tesla, SpaceX, Neuralink,	1,2,3,4,7, 10,21,23, 25
2	<a href="#">Stephen Hawking</a>	5	M	NO	YES	Physics	Cambridge University	1,2,3,7,25
3	<a href="#">Bill Gates</a>	4	M	YES	NO		Microsoft	1,3,7,25

<sup>1</sup>These are the most quoted sources (quoted at least twice in different articles) organised in a descending order.

<sup>2</sup>The term refers to those whose main activity resides, currently, in business and have high positions within a company.

<sup>3</sup>The term refers to those that, currently, engage in research as a main activity.

<sup>4</sup>The place where their main activity is developed.

4	<a href="#">Kate Crawford</a>	3	F	NO	YES	Social media, data systems	Microsoft Research	10(author), 17,19
5	<a href="#">David Autor</a>	3	M	NO	YES	Economy	MIT	18,21,25
6	<a href="#">Max Tegmark</a>	2	M	NO	YES	Physics (cosmology)	MIT	3,24(author )
7	<a href="#">Jerry Kaplan</a>	2	M	YES	NO	Artificial Intelligence, Labor market dynamics	Stanford University, Winster, Inc.	8,21(author )
8	<a href="#">Andrew Ng</a>	2	M	YES	NO	Computer science, machine learning,	Baidu	16(interview),31
9	<a href="#">Fei-Fei-Li</a>	2	F	NO	YES	Artificial Intelligence, computer vision	Stanford University	30,32(author)
10	<a href="#">Oren Etzioni</a>	2	M	NO	YES	Computer science, (artificial intelligence, machine reading) machine learning, web search)	Allen Institute for Artificial Intelligence	3,4
11	<a href="#">John Maynard Keynes</a>	2	M	NO	YES	Economy, macroeconomy	King's College Cambridge	5,7
12	<a href="#">Martin Ford</a>	2	M	YES	NO	Futurist, artificial intelligence	Genesis Systems	7,25
13	<a href="#">Alan Winfield</a>	2	M	NO	YES	AI, robot ethics	University of the West of England	14,26

Table 4: Table displaying the information of the most quoted names.

Furthermore, references to these public figures appears in a total of twenty-one articles from the sample of thirty-two. These twenty-one articles will be the sample that will be taken into the next step of the study, the text analysis. These specific articles might be more suitable for the text analysis in order to study the narratives about the impact of AI that are related to ideas that these public figures are sharing in the newspapers, and it will also allow me to identify some possible patterns.

In these twenty-one articles, the most quoted person was the entrepreneur Elon Musk, normally accompanied by the physicist Stephen Hawking or the entrepreneur Bill Gates. The three of them can be considered really well-known public figures, so their claims and comments around the impact of AI could be really salient in the press, not for the value of the claim but due to their status as public figures or even 'celebrities', as other cases

shown before [28,29]. In the fourth position of the list we find the researcher Kate Crawford, a cofounder of the research institute AINow. The research strain followed by this institute is focused on studying the social implications of AI and the short-term effects of AI development. Another voice quoted in the articles is Jerry Kaplan, who defines himself as an entrepreneur, Artificial Intelligent expert and who is also a teacher of Artificial Intelligence ethics at Stanford University.

It is worthwhile to mention that four of the 'voices' on the list (4,6,7,9) are also authors of four of the articles of the sample. Among this group we can find the already mentioned public figures, Kate Crawford and Jerry Kaplan, as well as the physicist and cofounder of The Institute of Future Life, Max Tegmark, and the director of the Stanford Artificial Intelligence Lab (SAIL), Fei Fei Li. These four figures have the opportunity to extensively explain their point of view towards the development of AI, while the rest of the names of the list are referenced only by isolated quotes, most of the cases in direct reported speech within quotation marks and an extension of words that does not go beyond one paragraph.

Finally, and as an aside and curious finding, I may point out the only name on the list that belongs to a deceased person, the economist John Maynard Keynes (1883-1946) that is quoted in two articles. He is named in the articles when talking about the future automation of jobs through the implementation of AI. The predictions he made in the 1930's around the idea that the current economic situation will lead to a prosperity where work hours will reduce to fifteen a week, are being used in the articles as a way to back up the argument of Artificial Intelligence as utopia that will release humanity from labor.

#### **4.2Text analysis: Emergent topics around the short-term and long-term effects of Artificial Intelligence.**

In this section I will gather the emerging topics around the impact of AI from the sample of twenty-one articles. After an immersive reading, several topics emerge around the impact of AI covered in a multifaceted way. The articles were analysed looking at each text individually. The topics were gathered when they were framed around the short-term and long-term effects of AI and its latest developments in different domains. For the sake of organising the analysis, the topics are grouped in short-term and long-term effects. The short-term effects relate to the effects that the actual applications based on AI techniques are producing when included into the social and economic context, and the long-term effects relate to the predictions of the possible consequences this development could pose in an indeterminate future.

##### **4.2.1. Short terms effects**

The short-term effects relate to the impact generated by the application of Artificial Intelligence to different specific domains. In that way it deals with the current development of applications using AI techniques and that relate to the domain of narrow AI. There were two emerging topics: the first one relates to the economic impact of AI, focusing on the excitement of investing in this new market and the possible ethical implications on the development of these systems, and

the second one relates to the undesirable impact that these applications are having in terms of bias and opacity of the process in decision-making systems. The quotes shown in the following sections are written in blue and they have been gathered from the document compiling the twenty-one articles of the sample. Each quote is followed by an identification number and its pertinent page number.

### **Economic impact**

Some of the articles often report on the increasing economic interest in the development of AI in the hands of big companies as well as start-ups, and how the development of AI is transforming the tech industry.

*"We're a team of seven at the moment, largely part-time," Rob Bishop, Magic Pony's co-founder, says, "but we can do powerful things. With developments like Amazon web services, we can run our own supercomputer in the cloud from just a few thin laptops." Magic Pony is about to close a seven-figure round of investment, which may sound fanciful to naysayers. After all, AI has been touted as the next big thing since the days when Atari represented the pinnacle of video games. (Q1, p. 6)*

*Despite IBM's own challenges, Watson's TV victory -- five years ago this month -- has helped fuel interest in A.I. from the public and the rest of the tech industry. Venture capital investors have poured money into A.I. startups, and large corporations like Google, Facebook, Microsoft and Apple have been buying fledgling A.I. companies. That investment reached \$8.5 billion last year, more than three and a half times the level in 2010, according to Quid, a data analysis firm. (Q2, p.16)*

Especially remarkable were the claims and quotations that came from the start-ups working on developing AI that often emphasise the promising power of the technology with expressions like: *"but we can do powerful things. With developments like Amazon web services, we can run our own supercomputer in the cloud from just a few thin laptops."* or *"One of our key projects is to develop a car that can talk to you, like in Knight Rider, (...) That's the level we're targeting."* Such expressions uncover a highly optimistic view on developing AI and a faithful believe on the supposed technological revolution to come.

Frequently the future impact of AI is compared to that of others historical and social changes lead by technology, for example the development of electrification that changed the industry field and the organization of society. In some cases, this wave of optimism around the possibilities of technology is used as a way of backing up the investments on the development of AI, envisioning the development of AI as having a clear economic goal. In the lines below, there is an example that portrays the possibility of AI to be applied to different domains as an opportunity for the economic expansion of Baidu.

*In addition to strengthening our core business, AI is creating a lot of new opportunities. Just as about 100 years ago electrification changed every*

*single major industry, I think we're in the phase where AI will change pretty much every major industry.*

*So, part of my work at Baidu is to systematically explore new verticals. We have built up an autonomous driving unit. We have a conversational computer, similar to Amazon's Alexa and Google Home. And we're systematically pursuing new industries where we think we can build an AI team to create and capture value. (Q3, p.23)*

### **Opacity and accountability of the systems**

Another topic tackling the short-term effects of artificial intelligence is related to the possible ethical and political impact of these existing applications using mainly deep learning techniques. The articles under analysis shortly mention problems such as the opacity surrounding the functioning of the intelligent systems and therefore the risk that this may imply when applications using these systems are launched into the public sphere. Notably, few articles are dealing with topics such as the political implications of AI and only some of them expose how AI in combination with big data may create events that alter power relationship at a societal level exacerbating inequality.

*The promise is more efficient loan underwriting and pricing, saving consumers billions of dollars. But the new A.I. lending essentially amounts to a digital black box that pores over mountains of data. "A decision is made about you, and you have no idea why it was done," said Rajeev Date, a former deputy director of the Consumer Financial Protection Bureau. "That is disquieting." (Q4, p. 10)*

*But for the near term, it's those unseen algorithms -- far more than robots -- that deserve a watchful human eye. The stakes, some experts say, extend far beyond mere technology. "We need to make sure that the data and algorithms are continuously reviewed and vetted by a broad class of people," said Alex Pentland, a computational social scientist at the M.I.T. Media Lab. "Think of representative democracy, forging algorithms rather than laws." (Q5, p.11)*

The extracts from the articles above (Q4, Q5) briefly mention the role of data being used in the design of a system and suggests this data should be thoroughly evaluated before being used, while also mentioning the inclusion of a democratic approach to the design of these systems. Although these quotes may introduce the short-term implications of AI systems, they remain quite abstract and superficial on identifying and defining what are the risks posed by these systems. Therefore, the quotes below show a sharper approach to describe the nature of the problems caused by these systems. These problems comprise: the inherent bias of these systems that are also trained on biased data (Q6), and the lack of transparency of the decision-making systems (Q7).

*This is fundamentally a data problem. Algorithms learn by being fed certain images, often chosen by engineers, and the system builds a model of the world based on those images. If a system is trained on photos of people who are overwhelmingly white, it will have a harder time recognizing non-white faces.*



*A very serious example was revealed in an investigation published last month by ProPublica. It found that widely used software that assessed the risk of recidivism in criminals was twice as likely to mistakenly flag black defendants as being at a higher risk of committing future crimes. It was also twice as likely to incorrectly flag white defendants as low risk. (Q6, p. 19)*

*But even if a AI watchdog were set up, it may find it hard to police algorithms. "It's not entirely clear how to properly equip a watchdog to do the job, simply because we are often talking about very complex systems that are unpredictable, change over time and are difficult to understand, even for the teams developing them," Mittelstadt said. He adds that forcing companies to ensure their AIs can explain themselves could trigger protests, because some modern AI methods, such as deep learning, are "fundamentally inscrutable." (Q7, p.21)*

Apart from describing the problems posed by the systems, the articles dealing with these topics also explicitly point out that the responsibility of the performance of the systems is on their human developers. This might be an overlooked detail but it seems crucial for understanding the development of technology as depending on human agency. Thus, the improvements and goals of these intelligent systems are not self-driven by the force of technology, but by the decisions of the human actors behind their creation. This approach to technology allows human agency to be an active part of the technological development and also to consider context and social fabric as the end goals of technological development. In this way, the responsibility and control of the impact, shift from the non-human actor to the human actor.

#### **4.2. 2. Long-term effects**

In the case of long-term effects, the whole debate is about future predictions more or less validated by the voices of experts or backgrounded by reports and articles made by institutions working in risk predictions. As it was expected, the long-term effects are besieged by controversy and uncertainty. Thus, the possible future effects are based on the present development of AI, and they are projections of these developments into the future.

In this framework, several topics emerge around the same general assumption that the actual development of AI will lead to a future where machines will have at least the same capabilities than humans have. This idea is framed in terms of positive and negative effects and uses both utopian and dystopian expressions rooted in science fiction depictions such as '*Humanity is about to face perhaps its greatest challenge ever*', '*What can humans do when machines can do almost everything?*', '*The rise of robots*' or '*Machines will be able to outperform humans at almost any task.*' These sentences gathered from the articles are recurrent tropes and depictions used when talking about the future effects of Artificial Intelligence.

In the analysis of the articles there were two prominent topics: *AI as a threat*, where the future effects of AI are detrimental and *AI as a promising solution* to humanity's most concerning problems.

### **AI as a threat**

During the analysis of the articles, 'AI development being a threat to humanity' was a recurrent topic and it was framed into warning claims validated by a quoted voice or a source. (Q8)

*The prospect has unleashed a wave of anxiety. "I think the development of full artificial intelligence could spell the end of the human race," astrophysicist Stephen Hawking told the BBC. Tesla founder Elon Musk called AI "our biggest existential threat." Former Microsoft Chief Executive Bill Gates has voiced his agreement. (Q8, p.1)*

*Ever heard of the 'singularity'? That is the term that futurists use to describe a potentially cataclysmic point at which machine intelligence catches up to human intelligence, and likely blows right past it. They may rule us. They may kill us. No wonder Mr. Musk says that A.I. "is potentially more dangerous than nukes." (Q9, p.43)*

However, every time these warnings were addressed in the articles they were refuted by the writer of the article for not being accurate to the real possibilities and limitations that the developments of AI offer (Q10). These apocalyptic claims by Elon Musk were used in the opening of several articles as an introduction.

*In October, Elon Musk called artificial intelligence "our greatest existential threat," and equated making machines that think with "summoning the demon." In December, Stephen Hawking said "full artificial intelligence could spell the end of the human race." And this year, Bill Gates said he was "concerned about super intelligence," which he appeared to think was just a few decades away.*

*But if the human race is at peril from killer robots, the problem is probably not artificial intelligence. It is more likely to be artificial stupidity. The difference between those two ideas says much about how we think about computers. (Q10, p. 7-8)*

Another version of the same topic, 'AI development being a threat to humanity,' was framed into alarming claims about the future effects of AI on the automation of jobs. These claims were also supported by a source or public figure. This version differs from the previous one in the fact that it is not questioned or refuted, it is just assumed and reported (Q11).

*"We are facing a paradigm shift which will change the way we live and work," the authors say. "The pace of disruptive technological innovation has gone from linear to parabolic in recent years. Penetration of robots and artificial intelligence has hit every industry sector, and has become an integral part of our daily lives." (Q11, p.12)*

*Over the weekend, I wrote about Andrew Yang, a former tech executive who has decided to run for president in 2020 as a Democrat on a "beware the robots" platform. He thinks that with innovations like self-*

*driving cars and grocery stores without cashiers just around the corner, we're about to move into a frightening new era of mass unemployment and social unrest.*

*So he's proposing a universal basic income plan called the "Freedom Dividend," which would give every American adult \$1,000 a month to guarantee them a minimum standard of living while they retrain themselves for new kinds of work. (Q12, p.51)*

The quotations above (Q11, Q12) are an extract from two of the articles that have as a main topic the possible effects of AI on the job market. The articles that were dealing mainly with this topic offer none or few criticisms to the claims supporting a dystopian view on the future of work. This dystopian view was framed around the following undesirable effects: unemployment of both highly skilled and low skilled workers, growing economic inequality, and one article even addressed the idea that the unemployment generated by the automation of jobs will drive humanity to an existential crisis (Q13).

*"I do not find this a promising future, as I do not find the prospect of leisure-only life appealing," he [Moshe Vardi] said. "I believe that work is essential to human wellbeing."*

*"Humanity is about to face perhaps its greatest challenge ever, which is finding meaning in life after the end of 'in the sweat of thy face shalt thou eat bread,'" he said. "We need to rise to the occasion and meet this challenge." (Q13, p.15)*

Noticeably, few times these apocalyptic discourses were refuted by the journalist or their sources and judged as being exaggerated compared to the current developments on AI.

*"These doomsday scenarios confuse the science with remote philosophical problems about the mind and consciousness," Oren Etzioni, chief executive of the Allen Institute for Artificial Intelligence, a nonprofit that explores artificial intelligence, said. "If more people learned how to write software, they'd see how literal-minded these overgrown pencils we call computers actually are." (Q14, p.8)*

### **AI as a promising solution**

The forecast of effects on automation were covered in a more positive or utopian view of the future, where the rise of automation will lead to extremely reduced working hours and more time to dedicate to leisure activities (Q15). This claim was actively supported by references to the economist John Maynard Keynes, the producer of this utopian view, and it was quoted in two articles dealing with the topic of automation and job loss. Another positive effect of automation was the economic gains that full automation could bring to business.

*"Andrew Simms, of thinktank the New Weather Institute, said the rise of new technologies could be an opportunity to realise the aspirations of the*

*economist John Maynard Keynes, who predicted in 1930 that within a century, technology would have enabled the working week to be reduced to 15 hours with the rest of the time devoted to leisure.” (Q15, p.13)*

In the same utopian vein, the development of AI is foreseen as having beneficial and highly beneficial effects (Q16). These utopian view on Artificial intelligence that assume development of AI will lead societal change, is surrounded by a cloak of business positivity in some cases. (Q17, Q18)

*“I think future generations are going to look back on the A.I. revolution and compare its impact to the steam engine or electricity,” said Erik Brynjolfsson, director of the Initiative on the Digital Economy at Massachusetts Institute of Technology’s Sloan School of Management. “But, of course, it is going to take decades for this technology to really come to fruition.” (Q16, p.17)*

*“At Enlitic, a start-up in San Francisco, Jeremy Howard, the founder and chief executive, believes that A.I. can transform the huge industry of health care, saving lives and money -- an ambition similar to IBM’s. “But that’s a 25-year project,” he said.” (Q17, p.17)*

*“AI is powering the fastest-growing areas in the global economy,” says Chris Ford, co-manager of the Smith & Willinessamson AI fund that launched this summer. “ Investors have been conditioned to view technology through the prism of the past two tech cycles, which have been characterised by heavy involvement of the US. Going farther back, to the 1960s, technology was characterised by Japanese companies. Our belief is this will be a truly international phenomenon,” (Q18, p.37)*

In general terms there was a high contrast in the way the short-term and long-term effects of Artificial Intelligence were framed in the articles. While the short-term effects were seldom covered within the sample, the long-terms effects were found to a greater or lesser extent in most of the corpus, especially long-terms effects of automation. Also, there was little reference made to the immediate negative effects that applications based on Artificial Intelligence systems are creating at the moment, such as biased databases or opacity and accountability in the processes of decision-making systems. In addition, when these topics were covered in the articles few of them were approached in depth or with the intention of clarifying what are the immediate impact these systems could have on society.

The coverage of long-term effects was characterised by a high degree of speculation around the future of the developments and they were often framed into dystopian and utopian claims. One characteristic that is worth mentioning is that the way journalist integrates these speculative and exaggerated claims changes among the articles of the corpus. When claims made by Elon Musk in apocalyptic terms were quoted in the newspapers they were always refuted by the journalist as being non-aligned with the reality of the developments and identified as not being ‘the real threat’. But in the case of the claims made about automation, several times the topic was framed as being ‘the real threat’ posed by Artificial Intelligence. In this way journalists were validating or refuting claims based on future uncertain predictions, with the difference that in the case of automation, the journalists were backing up their arguments by referring to ‘facts’ extrapolated from reports on the topic. It is worth to mention that the topic related to

automation and the future loss of jobs, was a quite salient one among the whole sample.

The quoting of voices was a recurrent strategy among the entire corpus with the aim of validating claims and ideas; only when the journalists were writing in a descriptive style and they have no need to validate an argument, was the use of quotes less salient.

## **5. Conclusion**

The intrinsic interest of this research was to attempt to understand how the impact of AI was being portrayed in newspapers and to unveil the focus of newspapers when talking about the effects of new developments in the field of Artificial Intelligence, as well as to see how these discourses interact in creating different meanings. The importance of this resides in understanding what kind of issues are brought into the public arena by the newspapers. I will proceed in the following paragraphs to discuss the findings regarding the different contextual dimensions described at the beginning of this paper.

The main focus of the articles was on the short-term effects that AI produces on business and the long-term effects of AI on automation. Besides, a relevant part of the sample is also trying to demystify or refute the idea of AI as a threat.

On the one hand, the highlight of the impact in a short-term span on business could be in some way related to the idea that the goal of this rise of AI is to open possibilities for a new market, and for finding new niches to invest in [14]. The salience of this topic also underlies the broad idea that the development on AI is merely fuelled by economic purposes.

On the other hand, the focus on the long-term effects or future projections was on dystopian discourses about the future of work, three of the articles mentioning this issue as being 'the real threat' posed by Artificial intelligence. This topic was framed by the articles in a quite sensationalistic way, reinforcing the idea that media tends to portray controversial topics because they create great narratives for readers. One peculiarity of the emerging topics on the long-term effects was that journalists were producing contradictory discourses that were sometimes denying and other times supporting apocalyptic claims that were based on the same presupposition, that AI will reach Human Level Machine Intelligence in a close future. For example, journalists were denying the apocalyptic claims about the end of humanity made by Elon Musk, while they supported exaggerated claims on the automation and the future of jobs. In both cases, the underlying assumption of the claims is to presuppose that the current development of Artificial Intelligence will reach the level of human intelligence. Why is it that this presupposition is non-questioned for the case of AI and full automation, but rejected in the apocalyptic claims of Elon Musk? One reason may be that the idea of reaching full automation is supported in the articles by the reports of institutions such as the Investment Bank of America Merrill Lynch. Such institutions function, in the internal processes of the press, as primary validators of scientific and technological issues [33]. Both the denial and acceptance of the apocalyptic discourse create a contradiction about

what the possibilities of these current developments are and evidence how the internal processes of the media work. Also, the constant quoting of 'voices' reveals the dynamics of journalism when reporting on controversial topics, being constantly reliant on external sources to create and validate different claims, without any work on understanding and evaluation of the problem by themselves.

What seems to be less salient on the coverage, is the risk that these new applications could pose when inserted into specific social and political contexts. In a report released in 2017 by the AINow Institute [19] concerning the development of AI, the authors went far beyond automation when addressing the impact of AI. They organize the immediate impact of AI in several topics: bias and inclusion, rights and liberties, ethics and governance. This report was specifically addressing social implications and immediate effects of the current developments on AI, and each of these concerns is underlining the idea that the development of AI systems is not happening alienated from its social, political and economic context, and that the possibility of ignoring this context could bring undesirable effects for the receivers of these technological developments. Thus, the result of this analysis seems in some way to uncover the little attention that was dedicated to this immediate impact in the articles under analysis.

Coming back to the question in the title: Where is the real danger? I argue that the real danger in the actual portrayal of AI in newspapers is that it drives the attention to the apocalyptic and controversial debate about the long-term future impact of AI, spreading irrational fear or making good entertainment, while ignoring the short-term impact of the AI systems that are being developed into applications and launched into the public sphere.

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## Appendix

### Index of Articles

#### LEGEND

**WSJ:** The Wall Street Journal

**Bold:** Sample of articles that undergoes the text analysis

**NYT:** The New York Times

**T:** The Times

**G:** The Guardian

#### WORDS

AVERAGE	1358
MEDIAN	1168
MIN	822
MAX	2803

Nº	HEADLINE	SOURCE	Nº OF WORDS	DATE	AUTHOR
1	<b>Big Issues in Technology (A Special Report) --- Does Artificial Intelligence Pose a Threat?</b>	WSJ	2177	11-MAY-2015	Ted Greenwald
2	<b>March of the machines takes its first baby steps into the future</b>	T	1130	15-JUN-2015	David Waller
3	<b>The Real Threat Computers Pose: Artificial Stupidity, Not Intelligence</b>	NYT	918	13-JUL-2015	Quentin Hardy
4	<b>Don't Fear the Robots</b>	NYT	1220	25-OCT-2015	Steve Lohr
5	<b>Robot revolution: rise of 'thinking' machines could exacerbate inequality</b>	G	1318	09-NOV-2015	Heather Stewart
6	Blurring a Line Between Driver and Computer	NYT	831	11-FEB-2016	John Markoff
7	<b>Would you bet against sex robots? AI 'could leave half of world unemployed'</b>	G	1074	15-FEB-2016	Alan Yuhas
8	<b>Fulfilling Watson's Promise</b>	NYT	1279	29-FEB-2016	Steve Lohr
9	Can machines come up with more creative solutions to our problems than we can?	G	2653	30-MAR-2016	Alexandra Spring
10	<b>A.I.'s White Guy Problem</b>	NYT	959	26-JUN-2016	Kate Crawford
11	As Artificial Intelligence Evolves, So Does Its Criminal Potential	NYT	1007	24-OCT-2016	John Markoff
12	Will a robot take over your job?	T	1429	10-DEC-2016	Mark Bridge
13	Could online tutors and artificial intelligence be the future of teaching?	G	1098	26-DEC-2016	Hannah Devlin
14	<b>AI watchdog needed to regulate automated decision-making, say experts</b>	G	1574	27-JAN-2017	Ian Sample
15	How AI could boost your bottom line	G	1060	06-MAR-2017	Mark Williams

16	CIO Network (A Special Report) --- How AI Will Change Everything: Andrew Ng and Neil Jacobstein say this time, the hype is real	WSJ	1390	07-MAR-2017	Scott Austin
17	Artificial intelligence is ripe for abuse, tech executive warns: 'a fascist's dream'	G	917	13-MAR-2017	Olivia Solon
18	Evidence That Robots Are Winning the Race for American Jobs	NYT	1136	29-MAR-2017	Claire Cain Miller
19	Jürgen Schmidhuber on the robot future?: 'They will pay as much attention to us as we do to ants'	G	2651	18-APR-2017	Philip Oltermann
20	Bad Intelligence Behind the Wheel	WSJ	822	24-APR-2017	Andy Kessler
21	REVIEW --- Don't Fear the Robots -- - Smart machines will replace some jobs, but they will create many more	WSJ	1226	22-JUL-2017	Jerry Kaplan
22	Ready for robot lawyers? How students can prepare for the future of law	G	1097	31-JUL-2017	Rachel Hall
23	The robots are coming ... to the rescue	T	1326	02-DEC-2017	Annabelle Williams
24	AI is going to change working life forever	T	2164	02-DEC-2017	Max Tegmark
25	Robot-Proofing Your Child's Future	NYT	2087	14-DEC-2017	Alex Williams
26	The legal and ethical minefield of AI: 'Tech has the power to do harm as well as good'	G	1131	05-JAN-2018	Joanna Goodman
27	Leave Artificial Intelligence Alone	NYT	917	05-JAN-2018	Andrew Burt
28	'I Can Execute That Transaction, Dave'	NYT	1344	14-JAN-2018	Conrad de Aenlle
29	On Campus, Computer Science Departments Find a Blind Spot: Ethics	NYT	1201	13-FEB-2018	Natasha Singer
30	How Artificial Intelligence Is Edging Its Way Into Our Lives	NYT	2803	14-FEB-2018	The New York Times (Cade Metz, Raymond Zhong, Kevin Roose, Nellie Bowles, Pui- Wing Tam, Joseph Plambeck)
31	Don't worry about AI going bad - the minds behind it are the danger	G	893	25-FEB-2018	John Naughton
32	How to Make A.I. Human-Friendly	NYT	1111	08-MAR-2018	Fei-Fei Li