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AUTOMATED JOURNALISM IN BRAZIL:

an analysis of three robots on *Twitter*

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ABSTRACT – Automated journalism is gaining more and more space in newsrooms around the world. In this article, we analyze three case studies that have emerged in recent years in Brazil: [1] the robot Rosie from the Serenata de Amor operation; [2] the robot Rui Barbot from *Jota*; [3] and the robot Fatima from *Aos Fatos*. Methodologically, we conducted semi-structured interviews to think over the role played by professionals in the development of the robots, seeking a broader concept of automated journalism that contemplates the plurality of actors mobilized by these technologies.
Key words: Automated journalism. Data journalism. Algorithms. Transparency. *Twitter*.

JORNALISMO AUTOMATIZADO NO BRASIL:
análise de três robôs no *Twitter*

RESUMO – O jornalismo automatizado tem ganhado cada vez mais espaço nas redações ao redor do mundo. Neste artigo, analisamos três estudos de caso que surgiram nos últimos anos no Brasil: [1] a robô Rosie da Operação Serenata de Amor; [2] o robô Rui Barbot do *Jota*; e [3] a robô Fátima do *Aos Fatos*. Metodologicamente, realizamos entrevistas semiestruturadas com o intuito de refletir sobre o papel desempenhado pelos profissionais no desenvolvimento destes robôs, em busca de um conceito de jornalismo automatizado mais abrangente que contemple a pluralidade de atores mobilizados por estas tecnologias.
Palavras-chave: Jornalismo automatizado. Jornalismo de dados. Algoritmos. Transparência. *Twitter*.

PERIODISMO AUTOMATIZADO EN BRASIL:
análisis de tres robots en *Twitter*

RESUMEN – El periodismo automatizado está ganando cada vez más espacio en las redacciones de todo el mundo. En este artículo, analizamos tres casos de estudio que han surgido en los últimos años en Brasil: [1] el robot Rosie de la Operación Serenata del Amor; [2] el robot Rui Barbot de *Jota*; y [3] el robot Fátima de Aos Fatos. Metodológicamente, realizamos entrevistas semiestructuradas con el objetivo de reflexionar sobre el papel de los profesionales en el desarrollo de estos robots, en busca de un concepto de periodismo automatizado más ancho que contemple la pluralidad de actores movilizados por estas tecnologías.
Palabras clave: Periodismo automatizado. Periodismo de datos. Algoritmos. Transparencia. Twitter.

1 Introduction

The word robot always brings associated the image of humanoid figures and mechanical devices in reference to science fiction novels and films that populate our social imagination. In many of those stories, the role played by these characters is anything but friendly, which feeds a pessimistic and dystopian view that robots should be considered enemies of the human race. In this context, when we talk about robots in journalism, reporters and journalists often take a defensive stance and already associate these technologies as a threat to job security, for example.

However, when we overcome this initial resistance and observe how robots, increasingly multiplying in our society, actually operate, we realize that we are not dealing with humanoid figures or similar objects created in fiction. In practice, we are talking about computers, software, algorithms and databases, common elements that have been part of journalists' routine since the 1990s (Linden, 2017).

In known experiences where Artificial Intelligence is adopted by newsrooms in several countries, we identified the growing use of Natural Language Generation (NLG) software for the production of short notes and news with simple and repetitive data-driven narratives. Inspired by these experiences, the first researches about

automated journalism conceptualize this field as the use of software and algorithms to produce narratives without human intervention after the initial programming stage (Carlson, 2014; Graefe, 2016).

From our point of view, these first definitions of automated journalism seem to spread a limited view that overestimates the work done by programmers. However they make invisible the work performed by other professionals and a complex socio-technical network mobilized in automated initiatives of journalistic tasks. We propose to look at automated journalism as a new ecosystem under formation, where journalists are increasingly part of multidisciplinary teams, working side by side with professionals with complementary skills such as programmers, engineers, data analysts and designers.

In this article, we will describe three robots[1] developed by Brazilian journalistic initiatives that follow a completely different logic from the use of these technologies by international newspapers. Instead of adopting NLG software to produce automated short news published on websites, the Brazilian robots described in this article publish small texts with repetitive structures on *Twitter*. They are the robot Rosie from the Serenata de Amor operation and the robot Rui Barbot from *Jota*, which generate alerts after processing a large amount of open data retrieved from public institutions; and the robot Fátima from *Aos Fatos*, which helps readers to distinguish reliable news from biased content. In the first two case studies, we see the use of this technology associated with initiatives in favor of transparency and accountability. Another interesting feature of these three examples is the adoption of social media networks – *Twitter* and *Facebook* – as a channel to disseminate information and interact with readers.

Based on the analysis of these three Brazilian robots, the aim of this research is to expand the perception of how Artificial Intelligence and algorithms can be adopted by journalistic enterprises as a tool to process large volumes of data – the big data –, a new source of information for stories. We envision an approach of automated journalism and data journalism, seeking in this research a more comprehensive concept that takes into account the complex socio-technical network mobilized by projects of this nature. Methodologically, we choose to conduct semi-structured interviews with professionals involved in the development of these robots as an attempt to make visible the human actors who work to keep these robots running, who are often unseen due to the opacity of these technological objects.

This article is divided into three parts. In the first, we recovered the theoretical discussion around automated journalism and concepts such as transparency and accountability. The second part is dedicated to the cartography of the three Brazilian journalism robots. And the third analyze the three experiences and seeks a more comprehensive understanding on how Artificial Intelligence can be adopted to automate journalistic tasks ethically and responsibly.

2 Automated journalism

Automated production of texts for journalistic purposes is not something new. Since the 1970s, there are weather forecasts written automatically (Glahn, 1970, p.1128), as seen in Figure 1. In recent years, the use of this technology has become popular when adopted by great enterprises with international repercussion such as *Forbes*, *Los Angeles Times*, *Associated Press*, *Le Monde*, *Washington Post*, *Southern Metropolis Daily*, *Deutsche Welle*, *MittMedia*, among others (D'Andréa & DalBen, 2017).

Figure 1 – Example of the first automated weather forecasts.

MAR 17, 1970   TDL EXPERIMENTAL FORECASTS

GOOD MORNING. THE TECHNIQUES DEVELOPMENT LABORATORY BRINGS YOU THE LATEST
FORECAST FOR WASHINGTON, D. C. AND VICINITY. MOSTLY SUNNY THIS MORNING WITH A
FEW MORE CLOUDS THIS AFTERNOON. SOMEWHAT WARMER TODAY, MAXIMUM TEMPERATURE 47
DEGREES. NORTHWESTERLY WINDS OF 5 MPH THIS MORNING BECOMING LIGHT AND VARIABLE
BY AFTERNOON. ONLY 2 PERCENT PROBABILITY OF PRECIPITATION TODAY.

GOOD MORNING. THE TECHNIQUES DEVELOPMENT LABORATORY BRINGS YOU THE LATEST
FORECAST FOR ATLANTA AND VICINITY. PARTLY CLOUDY THIS MORNING BECOMING CLOUDY
THIS AFTERNOON. LITTLE CHANGE IN TEMPERATURE TODAY, HIGH OF 53 DEGREES.
SOUTHEASTERLY WINDS 15 MPH, WITH 15 PERCENT PROBABILITY OF RAIN AND 2 PERCENT
PROBABILITY OF SNOW.

Source: Glahn (1970).

Unlike the humanoid robots we see in science fiction films and novels, these newspapers have adopted Natural Language Generation (NLG) software, a subfield of Artificial Intelligence and computational linguistics, to automatically publish short news

stories with repetitive structures about sports, finance, elections, crimes, earthquakes, traffic, to name a few examples (D'Andréa & DalBen, 2017). All of them follow a pre-determined narrative written by a journalist and are formatted and later published after processing information retrieved from large databases.

Among researchers, the adoption of Artificial Intelligence systems for journalistic purposes receives different names, such as robot reporter (Carlson, 2014), algorithmic journalism (Dörr, 2015), machine-written news (Van Dalen, 2012), automated news (Carreira, 2017) and automated journalism (Carlson, 2014; Graefe, 2016), the latter being the preferred term used in this article. Although each research has its specificity, all seek to build a new field of knowledge with information, analysis and reflections, and one of the challenges is to establish a definition of what would be automated journalism.

Carlson (2014) defines it as "algorithmic processes that convert data into narratives news texts with limited to no human intervention beyond the initial programming choices" (Carlson, 2014, p.1), while Graefe (2016) conceptualizes it as "the process of using software or algorithms to automatically generate news stories without human intervention – after the initial programming of the algorithm, of course" (Graefe, 2016, p.14). Proposing a more elaborate definition that considers the complexity of NLG software in the field of computational linguistics, Dörr (2015) recognizes that algorithms are not capable of generating texts without human interference, but argues that

> the direct and active human element during the process of content creation is eliminated in Algorithmic Journalism. This is not to say that human factor is eliminated from content creation altogether, because algorithms are themselves developed by humans. The point is that the individual journalist in NLG is changing to a more indirect role (Napoli 2014) before, during and after text production; as, for example, source selection (input), fact checking, the actual writing (throughput – both depending on coding) and distribution (output) are automated and pre-selected in Algorithmic Journalism. Journalistic work and knowledge now have to comprise skills like programming even more. (Dörr, 2015, p.9).

The three definitions of automated journalism limit human action to the programming phase of the algorithms, a simplified view that makes other human actors involved in the process invisible and does not pay attention to the complexity of developing, implementing, monitoring and maintaining a software of this nature. This technocentric perspective prioritizes in its analysis the final texts published by

media outlets but does not pay attention to the complex network of professionals and technologies mobilized by this innovation. These first definitions overestimate the role played by programmers, placing them in the center of the human dimension behind automated news, which does not notice and value the work performed by other professionals. By disregarding the action of journalists and failing to recognize the plurality of human labor that operates in the manipulation of these technologies and behind the production of these texts, these definitions corroborate the widespread pessimism among many journalists who fear being replaced by robots.

Inspired by the interdisciplinary field of Science and Technology Studies (STS) and by the Actor-Network Theory (TAR), this research proposes to look at automated journalism as a new ecosystem under formation, where journalists are increasingly inserted in multidisciplinary teams, working side by side with professionals whose skills are complementary, such as programmers, engineers, data analysts and designers. The adoption of Artificial Intelligence systems in newsrooms involves a complex socio-technical network including human and non-human actors. Behind automated news, far beyond the programming stage, there is a complex network that involves universities, researchers, startups and entrepreneurs (DalBen, 2018).

3 Data journalism, transparency and accountability

Seeking a conceptual basis that helps us analyze robots in Brazilian journalism, we put together automated journalism and data journalism, two expanding areas that are similar as both use databases as a source for news production. The exponential growth of big data can be seen as an opportunity to expand the coverage of data driven agendas, in a scenario where data journalism tools and automated systems assist in the processing of large volumes of information.

Acting in the manipulation of these tools and in the development of these technologies, we have a team of professionals responsible for defining the journalistic framework given to the news produced from these data. The work involves important ethical decisions that determine how data and technologies will be used, as they can have manipulative purposes like robot profiles that spread false news on *Twitter*, as well as give visibility to subjects of great public interest, such as the case of the three robots we describe.

Who determines the use of an autonomous technology, whether it will be used ethically or maliciously, are the professionals who work on its development. In this scenario, transparency and accountability become important pillars in favor of a responsible use of automated journalism.

The term transparency is used to describe instruments and initiatives that provide access to information, mainly from government actions, while still being concerned with the quality of data and how it will be used. For Unesco, public transparency leads to "population empowerment" and "lower transaction costs", which would result in greater "efficiency in the management of public affairs" and "greater human development" (Angélico, 2012 p.29). Transparency and access to public information are also seen as efficient mechanisms to fight corruption, as they allow society to check the functioning of the state machine and allow deviations to be pointed out and judged (Peisakhin & Pinto, 2008, as cited in Angélico, 2012).

In Brazil, transparency is directly linked to the Access to Information Law (LAI), in force since May 2012. It is important to point out that there are both active transparency, when information is proactively available on government websites, and passive transparency, when the information is provided after the registration of a request made by any citizen, which must be answered by the public agency in twenty days, extendable for another ten days upon justification.

In the fight against misinformation, transparency is considered an important element as it encourages journalists, especially those who deal with data, to describe the processes of gathering and analyzing information and how a story was produced. Considered a value by many professionals and included in the code of ethics of some newsrooms, transparency is directly related to credibility, being considered by some to be the "new" journalistic objectivity (Gehrke, 2020).

Although transparency alone cannot restore confidence in news media, it is an important element, recognized by readers, that allows them to check the work of reporters. It has the "potential to transform journalism by making it more exploratory in nature while (…) fostering positive attitudes" (Zamith, 2019, p.17).

In an overlapping relationship with transparency, the term accountability is usually not translated into Portuguese as the term in English preserves a two-dimensional meaning that includes both the ethical responsibility of public bodies and mandate holders to provide information and explain their actions, and the ability to suffer sanctions

and be punished in cases of misconduct and violation of public rights (Angélico, 2012). For the author Ana Maria Campos (1990), the term could only be translated into Portuguese when the government apparatus became more decentralized and transparent, when society is organized and exercises political control of the government and, with that, traditional values would be replaced by emerging social values (Campos, 1990, as cited in Angélico, 2012, p.35).

With public data increasingly available, journalists are challenged to deal with spreadsheets, tables and tools that help in the treatment and visualization of large volumes of data, which also includes the automation of some tasks, mainly related to the investigation. In the case studies described below, two of the robots publish texts on *Twitter* based on open data provided by Brazilian public institutions, which disseminate this information supported by the provisions of the Access to Information Law (LAI). We see in these initiatives a nested relationship between the journalistic investigation and the use of Artificial Intelligence algorithms to autonomous process open data, with the emergence of robots that generate alerts and become another source of information for reporters.

4 Methodology

The methodological choices of this research are intended to give visibility to the professionals involved in the development of the three robots used by Brazilian journalism and demonstrate the need for a broader concept that recognizes the role of humans mobilized by these technologies, in addition to the role of programmers. We conducted three semi-structured interviews in the second half of 2019 with professionals involved in the development of the robots described by this research, being two journalists and a lawyer with experience in data journalism. We chose these professionals because they worked actively on the programming of the robots, as well as carrying out other tasks necessary for their operation. This choice supports the interest of this research to give visibility to the professionals who work behind these technological devices, in order to demystify the idea that there is no human action after the initial programming choices, as conceptualized in the first research on automated journalism.

The script consisted of four questions: (1) how was the team involved in the development of the robot? Were many people needed?

What is the challenge in terms of people management to develop a project like this? (2) Considering equipment and technologies, what was needed to put the robot on the air? What kind of objects and structures did they have to mobilize? (3) After participating in the development of a robot, how do you see the use of technology in journalism? What kind of applications do you think would be useful for the profession? (4) What does Artificial Intelligence mean to you? Are you afraid that technology will end the job of journalists and other professionals?

In addition to the interviews, the research also seeks inspiration in the Cartographic Method (Barros & Kastrup, 2012) and in the Cartography of Controversies, methodology proposed by Bruno Latour and described by Venturini (2010) as a way of "crafting devices to observe and describe social debate especially (...) around technoscientific issues" (Venturini, 2010, p.258). In order to expand the descriptions of the case studies, information was collected from news and social media networks, with the intent to identify human and non-human actors mobilized by these technologies, and statements that present details of how the projects were conceived, developed and implemented. In this stage, we retrieved information from ten news stories, six posts published on Medium, three *Twitter* profiles, a *Facebook* page and a database.

5 Robots in Brazilian journalism: three case studies

5.1 Serenata de Amor operation

With the name of a famous Brazilian candy in reference to a scandal that occurred in Sweden in the 1990s, when a deputy minister lost her position for using public money for personal expenses, the Serenata de Amor operation (www.serenata.ai) focus on inspecting reimbursements made to federal deputies through the quota for parliamentary activity (CEAP). The original idea is from the data scientist Irio Musskopf and the project was developed in crowdsourcing with a team of eight people and more than 600 volunteers. Free and independent, the collective is not connected to any Non-Governmental Organizations (NGOs) or journalistic enterprises, however it has several data enthusiastic journalists in its team.

The project started in June 2016 and the first stage of development included four months of preparation, three months of a crowdfunding campaign, which raised R$ 80,000, and three months of work. Acting in the project development since the beginning, journalist Pedro Vilanova describes that the biggest challenge was to manage a team geographically separated. "How a group of eight people not located in the same city is going to create this project?" As a solution, they adopted agile method and some metrics, which organized remote work and helped with people management. All the files of the Serenata de Amor operation are open source and available on the internet, which facilitates the collaboration of more than 600 volunteers. "Just as our project demands transparency, we have always been transparent. If you enter today, you would know exactly what was done yesterday, and it has always been that way, since the first day." (Pedro Vilanova, granted interview, 2019, 6 August).

In the first three months, the Serenata's team discovered 3,500 suspected cases of irregular spending by Brazilian federal deputies between 2011 and 2017, and 5,222 tax documents from companies that were no longer active at the time the document was issued, for example. Supported by LAI, the operation carried out a joint effort in January 2017 and opened 587 requests in the Chamber of Deputies questioning 971 refunds made to 216 different deputies. Only 62 of these complaints were answered within the legal term, and 36 generated money refunds (Cabral, 2017).

In the beginning, the Serenata's team had a policy of not disclosing any suspicions, but due to the low response rate of the first notifications and considering that the information was already public, they decided to create a *Twitter* account to give visibility to the project. This was the context in which Rosie (@ RosieDaSerenata) was created in May 2017. The Serenata de Amor operation's robot was named Rosie in honor to the character of Hanna-Barbera's cartoon The Jetsons and alerts through *Twitter* (Figure 2) all suspicious expenses made by the federal deputies it identifies. In every tweet, it asks users to help verify if those expenditures are really illegal.

Figure 2 – @RosieDaSerenata on *Twitter*.

Source: retrieved from https://twitter.com/RosieDaSerenata

Among its posts, Rosie has already found a deputy's refund request that included beers consumed at a restaurant in the United States, and it is forbidden to use public money to pay for alcoholic beverages. For Pedro, technology should always be used with a focus on people: "Who makes the magic happen at Serenata are our followers, people that see what Rosie finds and help to propagate". (Pedro Vilanova, granted interview, 2019, 6 August).

The operation also has a second tool called Jarbas (https://jarbas.serenata.ai/dashboard/), a database or control panel used to view information regarding federal deputies' reimbursements and to identify possible irregularities. In Jarbas, it is possible to filter all payments made by year, name of deputy or company, by state, view only suspicious refunds and check details of any document (Cabral, 2017). As Pedro describes, these two technologies are complementary and while Rosie is the "cleaning robot that analyzes the data and looks for what's dirty there", Jarbas is the "butler who organizes everything and delivers it to Rosie". Without Jarbas, Rosie does not work.

In terms of infrastructure, he explains that the project uses Amazon's cloud computing services and Python language, which are simple devices in computational terms that do not require many investments. "Being in the cloud, our technology can be installed and

executed on almost any computer", he highlights. (Pedro Vilanova, granted interview, 2019, 6 August).

Figure 3 – Some results of the Serenata de Amor operation.

Speaking of numbers (Figure 3), "altogether, 134 federal deputies canceled meal refunds, effectively returning R$ 50,569.18 to the Chamber of Deputies" (Musskopf, 2018). From this amount, 78% of the suspicions became public through *Twitter,* which demonstrates the importance of social media networks for the project's success. The total amount may not seem a lot comparing to the big corruption schemes investigated by Brazilian Federal Police, which adopt the top-botton approach focus on cases with potential to return large volumes of money to public coffers. However, the Serenata de Amor operation prioritizes the opposite, a botton-up approach that emphasizes "small attitudes, with little damage to property, understanding that the diversion of millions is made by someone who started to misappropriate little money, often not considering this inappropriate or illegal" (Musskopf, 2018).

Active since 2017 through voluntary services and resources raised by crowdfunding, the initiative has already been praised by

the Open Data team of the Chamber of Deputies, who recognized the "social value" of the project and the help to "improve the service" of the Chamber itself. "Surveillance and popular participation are fundamental for the protection and enhancement of the House as an institution of democracy", said an e-mail sent by the Chamber (Musskopf, 2017).
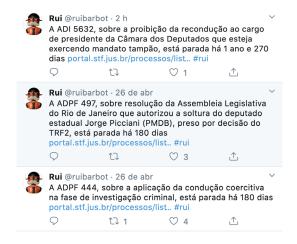
Since August 2018, the project became part of Open Knowledge Brasil, an international organization that works for transparency and access to open data. The aim of this partnership is to internationalize and inspire similar initiatives in other countries (Cabral & Musskopf, 2018). Pedro explains that people involved in the operation ended up becoming activists for open data and free information, which opened opportunities to actively participate in discussions about open government in the Chamber and in courts. "Our project is an example of how we can contribute to build a society around open data, technology, data journalism, in short." (Pedro Vilanova, granted interview, 2019, 6 August).

The current efforts of the project are focused on communication actions in order to reach the maximum number of people. He points out that "maintaining an active and open community for new members, connecting people from different areas of knowledge, is essential to improve the project and increasingly bring clear information to the citizens as a way to promote participation in public resources management" (Vilanova, 2019).

5.2 Rui Barbot

In the "Oração dos Moços", Rui Barbosa states that delayed justice "is not justice, but qualified and manifest injustice. Because the illegal delay in the hands of the judge is contrary to the written right of the parties, and thus damages them in patrimony, honor and freedom" (Recondo, 2018). In a tribute to this famous Brazilian jurist who worked in the early 20th century, the news website *Jota* (www.jota.info), specialized in the coverage of the Judiciary, created the robot Rui Barbot with the aim to monitor the lawsuits on trial at the Federal Supreme Court (STF).

Figura 4 – @ruibarbot on *Twitter*.

Source: retrieved from https://twitter.com/ruibarbot

Launched in March 2018, @ruibarbot publishes a *tweet* every time it detects that a legal cause is stopped for more than 180 days (Figure 4). Initially, the system was programmed to monitor about 289 lawsuits previously established by Jota's team, based on the potential impact of the decision to the society. Gradually, new cases were and are added to the list (Duarte, 2018).

Responsible for the robot's development team, Guilherme Duarte – who is a lawyer, but has experience in data journalism and worked in the newspaper *O Estado de S. Paulo* during the Panama Papers investigations – explains that the work started with the definition, along with reporters from *Jota*, from which STF lawsuits would be monitored by Rui. After analyzing these cases, the team determined which updates would be categorized as procedural changes and which would not. "Because, many times, a lawyer adds a power of attorney to the lawsuit and that is not identified as a procedural movement", he explains. (Guilherme Duarte, granted interview, 2019, 9 July).

Once the criteria were defined, the robot's development team created a script on a Google spreadsheet that every day visits the STF's website and checks if the listed lawsuits had any updates, publishing a post on *Twitter* when it identifies any stopped case. "About seven days before, Rui tells reporters that a lawsuit is going to celebrate its birthday. With that, reporters can check it and prepare a story.

One of our goals is to bring out the importance of a legal cause that, sometimes, end up forgotten." (Guilherme Duarte, granted interview, 2019, 9 July).

Rui Barbot was inspired by an idea of the journalist Felipe Recondo, specialized in the Brazilian Supreme Court coverage, who has always been intrigued by its inertia where "stopped lawsuits are infinitely more numerous than tried cases". For Recondo, STF ministers are endowed with a sovereign and immune power of social control: maneuvering time. "The court uses the excessive volume of cases to justify or cover up its choices." (Recondo, 2018). Guilherme Duarte explains that Recondo always drew attention to the fact that Justice in Brazil does not work when it advances, but when it stops. "Actually, actors act to stop processes at STF." (Guilherme Duarte, granted interview, 2019, 9 July). In this scenario, the robot fulfills the mission to support transparency in the Judiciary.
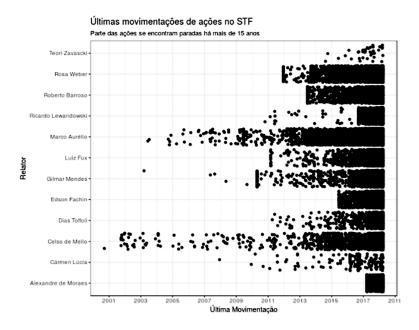
Chart 1 – Latest lawsuits movements in the STF.

Source: Duarte (2018).

There are currently almost 36,000 lawsuits been judged by the Brazilian Federal Supreme Court, which judges an average of 2.45 cases per session. In Chart 1, each point represents a legal cause and on the horizontal axis, it is possible to observe in which year the last progress occurred. The dispersion of the points shows that there are many stopped lawsuits, like a cause from Minister Celso de Melo who has a process on hold since September 2000, or a similar case that Minister Gilmar Mendes has not worked on since March 2003 (Duarte, 2018).

During the process of developing the robot, Guilherme reports that there was always a lot of dialogue between the team involved and several meetings were held with the participation of many journalists and also a product manager. "Jota, like it or not, is basically made up of journalists. Many people attended Rui Barbot's development." (Guilherme Duarte, granted interview, 2019, 9 July). In terms of infrastructure, they use Microsoft Azure's cloud computing.

One of Rui Barbot's inspirations is the journalytics movement, a "deeper way of thinking about data and transforming it into journalistic information. (...) Our idea is to evaluate not only the ministers' choices, but also the processes they leave behind", points out Laura Diniz, one of *Jota*'s partners (Costa, 2018).

5.3 Fátima

Predicting circulation growth of biased news and false information in 2018 due to the presidential elections in Brazil, the website *Aos Fatos* (www.aosfatos.org), specialized in fact checking, created the robot Fátima, a common name in Portuguese that would be also an abbreviation of "Fact Machine". The project was developed for *Twitter* and *Facebook* Messenger platforms and received financial support from the *Facebook Journalism Project*.

The aim of Fátima is to provide readers with checking information tools, giving them autonomy to "feel safe surfing the web reliably and without intermediaries" (*Aos Fatos*, 2018). The project follows the International Fact-Checking Network (IFCN) methodology, and the *Aos Fatos* team also conducts studies to understand the consumption of news by Brazilians and their main doubts.

Figure 5 – @fatimabot on *Twitter.*

Source: retrieved from https://twitter.com/fatimabot

Executive editor of *Aos Fatos*, journalist Tai Nalon comments that the best way to prevent the proliferation of misinformation is to treat the insecurities of those on social media networks with respect. "Fátima will never say that an information is false. Her goal is to give instructions to people, and they will draw their own conclusions" (Monnerat, 2018).
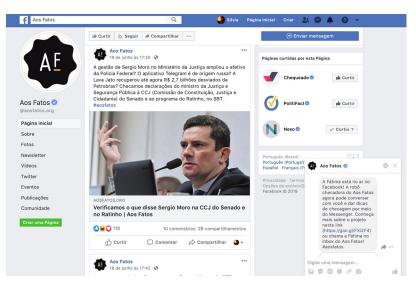
Officially launched in July 2018, Fátima's profile on *Twitter* (@fatimabot) monitors the feed every 15 minutes and when it detects any message spreading a link with biased news, the robot goes into action and sends a message alerting the user and recommending another link with the checked information. In the first month of tests, Fátima identified 881 posts sharing fake news links, posted 500 messages with the accurate information and in 30 of them users deleted the texts after the alert (Veja Rio, 2018). As a result, they verify that most people alerted click on the link with the checked information and some users thank the robot for the message. To keep Fátima running, there is a database continuously updated by the *Aos Fatos* checkers team that stores fake news links and their correspondents with the checked information (Hafften, 2018).

The idea to develop a fact-checking robot came up in 2016, when the journalist and programmer Pedro Burgos worked as an

engagement editor at the Marshall Project, in the United States. During a presidential election debate, Burgos predicted that Donald Trump could provide incorrect information on crime statistics, and prepared tweets with the checked data in advance. "The fact that I tweeted these charts just seconds after Trump's speech made a huge difference in terms of engagement, as people were more interested in the subject. This is the logic behind all successful recommendation algorithms" (Hafften, 2018).

Back to Brazil, Pedro Burgos worked with the *Aos Fatos* team in the development of Fátima, including the technology director Rômulo Collopy. Burgos argues that one of the biggest challenges in this project was dealing with the subtleties around fact checking, which are much more complex than just state if a story is true or false. "The ways in which users can conduct dialogue are endless, and we strive to conduct a fluid chat and with content" (*Aos Fatos*, 2018).

Figure 6 – *Aos Fatos*' *Facebook* page with Fátima on Messenger tab.

Source: retrieved from www.facebook.com/aosfatos.org/

Pedro Burgos explains that the development process of the robot did not mobilize an extensive team and that an experienced programmer would be able to create the code in just two days. "It took me a little longer", he reveals. "The big bottleneck today

is having professionals who understand programming well enough to identify automation possibilities, and who can break a journalistic process into small tasks." (Pedro Burgos, granted interview, 2019, 22 July).

In terms of infrastructure and technology, Pedro highlights that many services used are free and do not require large investments. For example, Python language is open, the code is stored on Github and the script runs on a virtual server that, depending on the complexity, can be the free Heroku with a database in the cloud on PostgreSQL. "All of this is free, and you can do a lot with this infrastructure. It is possible to put a robot writing reports based on structured data, for example, with almost zero money." However, for more sophisticated applications that use proprietary Artificial Intelligence programs, a larger investment may be necessary, which was not the case of Fátima. "The cost and the staff depend on how fast we want the product, the amount of data we are dealing with, and the speed of processing." (Pedro Burgos, granted interview, 2019, 22 July).

In addition to *Twitter,* Fátima also runs on *Facebook* Messenger where she acts as a chatbot since October 2018. In this case, she operates more reactively and helps users to check information and verify if a story is reliable or not. To users, Fátima gives tips on how to distinguish a fact from an opinion, how to find reliable data of different topics and how to check if a source is reliable.

6 Are robot reporters a threat or allies of journalists?

In a peculiar way, the robots that appear in Brazil in the journalistic context follow a completely different logic from international initiatives, considering that they do not intend to produce automated news and have chosen to generate small texts published on *Twitter*. The robots analyzed in this research use Artificial Intelligence resources in an original and peculiar way, creating profiles that arrange themselves as a tool, offering support to journalists in the verification stage and helping readers to check information. While many of the international automated journalism experiences are linked to major media companies, such as *Associated Press*, *Le Monde*, *Los Angeles Times* and *Washington*

Post (D'Andréa & DalBen, 2017), in Brazil innovations arise in digital native newsrooms or even in an independent collective that raised funds with crowdfunding campaigns.

Both the Serenata de Amor operation and Rui Barbot, we identified the use of Artificial Intelligence in the processing of open data and a latent concern with transparency and accountability. On the other hand, we see in Fátima an effort to combat disinformation, using this technology to disseminate good practices and improve the critical sense of readers.

From the scenario given by the case studies analyzed in this article, we ask ourselves again if journalism automation would be a threat to the profession. We do not believe that initiatives like these pose any risk to the employment of reporters and we see those technologies inserted in newsrooms as another non-human actor in a complex pre-existing socio-technical network. Rosie and Rui Barbot, for example, are robots that assist in the processing and crossing of public data and reveal important agendas that were previously "black boxed", calling the attention of society to irregular expenditures by federal deputies and to the STF's slowness in the trial of certain processes. Without these robots, would reporters follow these agendas? Would readers have access to these stories?

By giving visibility to these irregular processes or expenditures, robots reveal complex networks and relationships that are still paradoxical. How does the highest body of the Judiciary make decisions based on non-action, while federal deputies responsible for legislating the state do not comply with a law that they wrote and approved? In this context, robots like Rosie and Rui Barbot become important allies of a journalism committed to society in search of agendas of great public interest, which is made possible by crossing technology with data available through the Access to Information Law (LAI).

Throughout the interviews, when asked whether robots could one day replace journalists, none of the three respondents agreed with this possibility and all said that this type of technology is applied for the "automation of low complexity processes", as described by Pedro Burgos. The robots would be inserted in newsrooms to perform repetitive tasks, which "would change the way people deal with work" (Pedro Vilanova, granted interview, 2019, 6 August) or "would free the journalists from a more tedious

job to dedicate themselves to more analytical tasks". (Pedro Burgos, granted interview, 2019, 22 July). Guilherme Duarte sees Artificial Intelligence being applied in the search for information, to read things and make decisions, "simple processes that we can automate using a computer". (Guilherme Duarte, granted interview, 2019, 9 July).

In terms of infrastructure, all three case studies are similar as they do not mobilize very sophisticated devices. They use services such as cloud computing, spreadsheets, databases, codes stored on GitHub, and also reveal associations with major technology companies like Amazon and Microsoft.

The case studies in this research demonstrate that the development of technologies like these requires the work of many human actors, and not just programmers. On one hand, the robots were programmed by small teams of journalist-programmers and even a lawyer. But to outline the strategy and keep them going, an extensive team is mobilized including several journalists, designers, product managers, or more than 600 volunteers who now work in the Serenata de Amor operation. As Latour would say, real objects are "a black box counting for one or of a labyrinth concealing multitudes" (Latour, 1994, p.46).

These examples corroborate our criticism of the initial definitions of automated journalism that make the work of journalists, data analysts and other professionals invisible, highlighting only the work done by programmers. By giving visibility to three Brazilian case studies, we are looking for a more comprehensive view that recognizes professionals mobilized in the development of systems like these and also the plurality of Artificial Intelligence applications in the journalistic scope, such as data scraping, information crossing, suggestion of stories, page update, chatbots, interaction with readers, checking information, among others.

There are many possibilities, and this research interviewees give some clues on how they envision the future. "It is a no-return path, and journalism in general has already been contaminated by Artificial Intelligence and technology", points out Vilanova. For him, journalists have to learn how to deal with robots, making good use of it to generate good stories and check information. "Soon, we will realize that there is no longer a journalist working without an algorithm." (Pedro Vilanova, granted interview, 2019, 6 August).

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Duarte believes that there is a risk of reducing jobs, but on the other hand "things will become more efficient", for example filling out spreadsheets. He remembers an event in 2014 when he demonstrated in real time how a web scraper could collect in 30 minutes 5,000 unconstitutional actions on STF website. "A girl in the audience almost cried and said to me: 'I spent a year doing this by hand'." Duarte, however, does not believe that robots could replace journalists. "It is a very complex task. I find it very difficult." (Guilherme Duarte, granted interview, 2019, 9 July).

Citing the automated news published by foreign media outlets, Burgos comments that the system uses a decision tree, similar to a recipe, which depends on raw structured data. "Writing a headline like 'Petrobras exceeds forecast and increases revenue by 5% in the quarter' is something that a computer can do, as long as a journalist writes many recipes first." (Pedro Burgos, granted interview, 2019, 22 July). For him, there is a lot of room for simpler process automation and there will be a lot of demand for journalists who can identify automated processes and write small programs and algorithms.

7 Final considerations

The case studies analyzed in this article point out that automated journalism initiatives in Brazil are built on the relationship between platforms such as *Twitter* and *Facebook*. The automated contents constitute new ways of doing journalism, and do not prove to be a threat to the employment of reporters in major media outlets. The technologies are inserted in digital native newsrooms as tools that assist in investigative reporting or in collectives that advocate for open data.

In these examples, we see the application of Artificial Intelligence to process large volumes of data, crossing information and giving visibility to facts that alert reporters of possible investigative reporting. In times when the internet is flooded daily with shallow stories, some also produced by major news outlets, we need to think over the importance of investigating and checking information, which are the basis of our profession.

The fact that the robot Fátima was developed with financial support from the *Facebook Journalism Project* also reveals a movement towards the approach of large technology companies with journalism, which has gained strength since 2016 with the growing debate around fake news and the need to act against disinformation by major platforms.

It is important to point out that who determines how autonomous systems will be used are the people who work on their development, a function that increasingly involves responsibility. Unlike the various robots that spread biased content today on social media networks, this article describes three journalistic initiatives that demonstrate that this type of technology can also be used on topics of great public interest. In this scenario, the adoption of this type of system should focus on ethics, transparency and accountability.

This research suggests a more comprehensive vision for automated journalism that recognizes the plurality of applications of Artificial Intelligence in journalism beyond the production of news with repetitive structures, and with the potential to be used in processing and crossing large amounts of data. In an ethical and responsible way, Artificial Intelligence can become an important ally in quality journalistic production, which assists in the challenge of finding and curating information in an increasingly connected world.

NOTES

1   A preliminary version of this article was presented at the VI Investigative Journalism Research Seminar promoted by the Brazilian Association of Investigative Journalism (ABRAJI) in June 2019 at the Anhembi Morumbi University, in São Paulo, Brazil.

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