Artificial Intelligence as Agent in Journalism: A Concept Explication

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Abstract

This article attempts to provide a conceptual explication for Artificial Intelligence functioning as an agent within journalism. The information presented relies on critical review of existing scholarship written on the topic of Artificial Intelligence operating in journalism and from the field of Artificial Intelligence. The function of this paper serves to better understand key concepts used by scholars and how developing technology in Artificial Intelligence is affecting essential conceptualizations employed by the field of journalism.

Keywords: Artificial Intelligence, AI Journalism, Algorithmic Journalism, Artificial Narrow Intelligence, Artificial General Intelligence, Artificial Super Intelligence, Automated Journalism, Computational Journalism, Communication, Conceptualization, Explication, Generative Adversarial Networks, Human-Computer Interaction, Human-Robot Interaction, Human-Machine Communication, Journalism, Natural Language Generator, Robo-journalism

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One difficulty in researching emerging technology is its inherent ephemerality. The speed at which technology transitions from bleeding-edge to novel, emerging to contemporary, modern to traditional, and classical to archaic make the study of *what is coming* to become a study of *what is here* in rather short order. Being able to predict which technologies the news industry will embrace or reject make the study of emerging technology a study of probabilities and likelihoods. One such area of emerging technology for journalism comes from the field of Artificial Intelligence (AI). AI has been studied for decades as a formal field and for centuries in philosophy. Within the field of AI exists emerging forms of AI and it is these emerging technologies that are presently receiving wider attention and broader adoption into newsrooms and ipso facto into people's lives.

Artificial Intelligence is a polysemic conceptual term often used to identify one of a variety of computational concepts which are operating at the dimensional level within the field of Artificial Intelligence (Broussard et al., 2019). But for those uninitiated in the field of AI science, what is Artificial Intelligence if it is not the "thing" inside our smart devices?

Since its inception as a field of science in 1956, AI was intended to be the field of research under which a machine of humankind's making would have the capacity of mind (Newell, 1973). Newell (1973) submitted that Artificial Intelligence was to be the place from which "artifacts that do what the mind can do…" (p.23) could emerge. This is to say that AI was never intended to be an end product in and of itself, as some contemporary colloquialisms imply.

Before we can begin conceptualizing AI as an agent in journalism, we should establish two conceptual definitions: 1) What is Artificial Intelligence? and 2) What is journalism? Within

the question of defining journalism, it is also important to ask: What is the role of a journalist, the human actor/agent, functioning in a role to perform journalism?

Artificial Intelligence can be defined by two (seemingly opposing) ideas. AI can be viewed as intelligence that imitates human intelligence/behavior and it is also seen as intelligence opposite to natural intelligence (Miroshnichenko, 2018). AI is not human (or natural) intelligence. Rather, AI is designed by humans to imitate humans in behavior and mannerisms, and AI should be capable of exceeding human behavior and intelligence beyond natural fallacy. This distinction will be further developed in the literature review.

Diakopoulos (2019) defines journalism as "a practice of news information and knowledge production that is filtered through a particular value system" (p.23). The function of the journalist fulfilling this definition of journalism can be distilled down to four primary operations. The journalist observes their environment, develops new or amended knowledge, chooses how to frame a story about this new knowledge, and communicates this new knowledge in news story form to inform a civic-minded audience (Diakopoulos, 2019). Within this simplified description of the journalistic process there is an abundance of nuance concerning how these operations are performed that exceeds the limits of this paper. Readers are encouraged to read more on the education, and professional training, development, and practice that journalists undertake to recognize news judgement, newsworthiness, and assess news value to observations, topics, and events. Miroshnichenko (2018) writes succinctly that "journalism is a creative human practice" (p. 183). Both authors define journalism as a human-centric function, though these scholars also believe human exclusivity will not remain the case.[1] Therefore, it becomes important to understand what human journalists may be facing.

AI is more than a single tangible operation and journalism can be viewed as an operation performed by a human actor who understands how to serve that operation. The next sections address how the concept of AI can be operationalized to fulfill the role of journalism in society and the role of the journalist.

Literature Review

The concept of Artificial Intelligence is ancient. Research traces the earliest examples of the logic all AI is built upon back to Aristotle (Bringsjord & Govindarajulu, 2019). The earliest record of algorithmic logic appears in Aristotle's *De Motu Animalium* and his theory of syllogism (Bringsjord & Govindarajulu, 2019). This is the earliest conceptual measure of Artificial Intelligence and though he was not specifically referring to AI as we know it today, Aristotle, when he wrote the theory of syllogisms[2], produced the logical theory that guided the earliest forms of AI known today (Bringsjord & Govindarajulu, 2019). Early AI scientists used this theory to teach a machine what they wanted it to learn (Russell & Norvig, 2010). For those early scientists and the many who have followed, summer 1956 at Dartmouth College holds a distinctive place in the history of AI as it marked the birth of modern AI research studied today.[3]

That conference came about after the iconized Dr. Alan Turing (1950) wrote his seminal paper, *Computing Machinery and Intelligence*, in which he asked the question 'Can machines think?' and introduced the famous *Turing Test.*[4] Modern advances in two forms of AI operationalized in journalism today, Natural Language Generation (NLG) and Generative Adversarial Networks (GAN) have passed the Turing Test (Graefe et al., 2018; Lehmuskallio et al., 2018).[5] This achievement does not imply that intelligent machines are now naturally intelligent. Imitation should not be confused with replication. Consider the following analogy: A person successfully imitating bird song so that a bird could not distinguish the person singing

bird song from an actual bird does not mean the person is a bird. The test was an important early goal for scientists to contemplate what it would require to build a machine capable of imitating human behavior, however researchers in the field have devoted less time to building a machine that could pass the test and more time working on understanding the principles on which such a machine would function (Russell & Norvig, 2010). While there is ample research available, the limits of this paper in scope, length, and author's knowledge prevent a deeper, more immersive study into the significance and merits of the Turing Test.

In the longer history of Artificial Intelligence, centuries before Turing penned his paper, Descartes also was thinking about machines embodied with artificial intelligence. In 1637 he wrote:

> If there were machines which bore a resemblance to our body and imitated our actions as far as it was morally possible to do so, we should always have two very certain tests by which to recognize that (Descartes, 1637, p. 116).

Descartes was attempting to draw a parallel between the anatomy of a biological being and that of a machine made from industry as he contemplated what separates the living, breathing, animated biological being from a non-living being. In doing so, he established one of the earliest methods for operationalizing such an artifact, which will be introduced later in this paper. Today, Artificial Intelligence is conceptually defined and empirically measurable as a computer system able to perform tasks usually requiring human intelligence (Diakopoulos, 2019). Computer systems are a part of the formal discipline of computing, defined as "the systematic study of algorithmic processes that describe and transform information" (Comer et al., 1989). Diakopoulos (2019) places the algorithm at the core of modern AI by defining the algorithm as "a series of steps" taken "to solve a particular problem or to accomplish a defined outcome".

Stuart Russell and Peter Norvig (2010), in their immersive text, *Artificial Intelligence: A modern Approach*, define AI by its dimensions and levels: thinking humanly, acting humanly, thinking rationally, and acting rationally.

Artificial intelligence can first be thought of by how it applies logic to thought process, reasoning, and behavior (Russell & Norvig, 2010). Defining AI by its thought process, Haugeland (1985) claims the intention of research in AI is to make a computer think; that the "fundamental goal of [AI] is not merely to mimic intelligence" but rather to make "*machines with minds,* in the full literal sense" (p.2). Bellman defines what it means for a computer to think as "a performance of activities that we associate with human thinking, activities such as decision making, problem solving, learning, creating, game playing, and so on" (Bellman, 1978, p. 13). Russell and Norvig (2010), referring to Charniak, & McDermott (1985) and Winston (1992), define reasoning as using computational models to study mental facilities, and computations as those "that make it possible to perceive, reason, and act" (p.2).

Dimensions of intelligence exhibited in an intelligent machine that is able to emulate human behavior are defined as: 1, making a machine "perform a function that requires intelligence if a human was to do it" (Kurzweil, 1990, as cited in Russell & Norvig, 2010, p. 2), and 2, able to "perform operations at which people perform better" (Rich & Knight, 1990, as cited in Russell & Norvig, 2010, p. 2). Ideally, intelligent machine behavior can be defined as the design of intelligent agents or "intelligent behavior in artifacts" (Nilsson, 1998, p. 1; Poole et al., 1998). Russell and Norvig (2010) separate the dimensions of their definition by two factors: "fidelity to *human* performance" and "*ideal* performance" (p.1). This circles back to the distinction made by Miroshnichenko. AI can be both the pursuit of matching machine performance to that of human performance, to match artificial intelligent actor behavior to

behavior observable in natural intelligent actors, and of excelling at performance which requires intelligence, even where the fallacies of human behavior may limit natural performance (Miroshnichenko, 2018). The later of these two, Russell and Norvig (2010) explain is rational decision making, describing that an intelligent agent "is rational if it does the 'right thing,' given what it knows" (p.1).

Scholars have put forth a variety of conceptual terms to identify what Artificial Intelligence is to journalism: computational journalism (Anderson, 2013; Lindén, 2017; Waddell, 2019), automated journalism (Carlson, 2015; Graefe, 2016; Zheng et al., 2018), algorithmic journalism (Dörr, 2016), robo-journalism (Miroshnichenko, 2018). These concepts will be reviewed in the next section. While each conceptual label does well to identify unique case scenarios of implementing AI into a journalism workflow, incremental advances in AI application and adaptations in practice show signs of overlap in usage of these conceptual terms.

Computational Journalism

Lindén (2017) relied on a normative approach to conceptualize computational journalism as the unification of algorithms, data, and social science to account for the function of journalism. In his concept, Lindén envisioned AI encased in robot form and that algorithms programmed into the computer system driving the robot performed journalistic duties without thought. Lindén (2017) added that the expected outcome for the robot is to "replicate the end results of journalism" (p.62) [6] but does not make clear how the robot would go about accomplishing this task.[7] Without identifying whether the robot would move directly into the role of messenger, Lindén's heuristic view of infusing AI into a newsroom to serve the production of journalism relegates the robot role to that of a technological tool by which journalism can function.

Like Lindén, Anderson (2013) also views computational journalism as a concept housing the same three subsets: algorithm, social science, and mathematical form. However, here Anderson (2013) diverges, claiming the function of computational journalism is to "supplement the accountability function of journalism" (p. 1006). The similarities between Anderson and Lindén's work stop at the level of identifying the operations functioning under computational journalism. From here, Anderson proceeds to elaborate on the impact operationalizing computational journalism may have on a newsroom without discussing any form of interaction between human journalists and machine.[8] Only when viewing computational journalism through the lens of culture is the human journalist and any association with the technology mentioned, and only as an interaction between the human and machine generated content (Anderson, 2013). Still, we have no clear description of how the human and machine will interact during the production of news.

In a study which asked the question whether source attribution, human vs. algorithm vs. human and algorithm, affected message credibility, Waddell (2019) made no attempt to directly define computational journalism, however, by identifying the independent variables being operationalized, Waddell identifies the role played by AI in the production of journalism. His observations include operational distinctions of AI functioning at different levels in the performance of journalism, from simple news aggregation done by bots, to semi-autonomous machine writing and human collaborative news products, to fully autonomous independently written machine content.

Automated Journalism

In a case study analysis, the term "automated journalism" was defined conceptually as the "algorithmic processes that convert data into narrative news texts with limited to no human

intervention beyond the initial programming" (Carlson, 2015, p. 418). Carlson viewed this as a new distinction separate from computational journalism, observing computational journalism required a human agent to conduct journalism at least in association with the algorithm actor, or independently with the algorithm serving as an instrument by which the human agent could produce journalism.[9] Zheng et al. (2018) rely on Carlson's conceptual definition in a study on cross-cultural contextual perception of automation in news. However, full autonomy is removed from the definition and the researchers add that the algorithm is responsible for generating natural language text to a news format with limited input from a human agent. The authors conflate the distinction by recognizing other scholars label the same (or similar) definition as *algorithmic journalism* (Dörr, 2016) and *robot journalism* (Miroshnichenko, 2018).

Similar to Carlson, Andreas Graefe (2016) labels AI for journalism as automated journalism, yet he makes a key distinction from Carlson in defining the algorithm operates without human involvement beyond the initial programming.[10] Graefe defines automated journalism operationally as categorical by levels of sophistication in the programming. Graefe's operationalization range from simple coding that completes pre-designed templated stories from a database to highly sophisticated programming that is capable of insightful analysis of the data and produces non-prescribed narratives.

Algorithmic Journalism

Dr. Konstantin Dörr (2016) offers his conceptual definition of algorithmic journalism as reliant on NLG, semi-automation, and characteristics of essential algorithmic processing: input, throughput, output.[11] He further operationalizes algorithmic journalism, providing the clearest conceptual framework by which to develop AI in its role to produce journalism to date.[12]

Robo-Journalism

Like Lindén, Miroshnichenko (2018) assigns physical agency to the concept of AI functioning in a journalist's role by labeling the concept *robo-journalism*. Elaboration on Miroshnichenko's definition of AI has been introduced previously in this paper, however, it is important to return to his study, as he also assigns physical agency to AI by employing the *robo-journalism* label. Miroshnichenko (2018) makes an assertion that automated journalism does not always function on AI, but that narrow AI (ANI) is an essential element for robots.

Conceptual Definitions

It was previously stated that artificial intelligence is a human-designed intelligence intended to imitate humans in their behavior and mannerisms, that artificial intelligence should be capable of exceeding human behavior and intelligence beyond natural fallacy, and that journalism is the practice of providing information and knowledge filtered through a specific value system recognized as news. To best link the concepts *Artificial Intelligence* and *Journalism*, examining where they intersect may provide the most insightful pathway. AI and journalism intersect at the journalist. More specifically, they intersect at the journalist's communication.

Journalism, and more broadly communication, has been the exclusive enterprise of humanity[13] until now (Guzman, 2018; Lewis et al., 2019; Zheng et al., 2018). As shown in the literature review, exclusivity of human-to-human communication is beginning to give way to non-human intelligent agents. Though human-machine communication is recognized as taking place generally, this paper limits its research to address this interaction only as it applies to journalism. AI capable machines were first added as a convenience to human journalists, to assist in conducting the daily production of news by operationalizing intelligent algorithms. Eventually

the goal of news-producing intelligent algorithms is to produce journalism without human assistance beyond initial programming (Miroshnichenko, 2018). If artificial general intelligence is realized, human programming may not even be required. That would give artificial intelligent agents full true autonomy in the production of journalism.

To begin to conceptualize AI as an agent in journalism it is important understand how humans and intelligent machines will communicate. Interaction with intelligent machines has been established in human-computer interaction (HCI) and human-robot interaction (HRI) study, and continued study into both should be considered. These two areas of research limit human-machine agent exchange to resigning the machine to the role of the channel or medium by which human exchange is possible (Guzman, 2018). Dr. Andrea Guzman (2018) contends Human-machine communication (HMC), as an area of research, takes HCI, HRI, and human-agent interaction (HAI) into its fold and as a concept attempts to understand "*creation of meaning among humans and machines*" (p.1). In HMC, intelligent agents move from being solely a communication channel or medium into the role of communicator. In doing so, the traditional model of the human journalist dependent upon machine, in this case an intelligent algorithm, to aid in the practice of journalism shifts to a mode of redundancy, where the human journalist is no longer necessary and the intelligent algorithm, now agent, can produce journalism directly to an audience. This transition of moving AI directly into the role of communicator means more than controlling the transmission of information from source to recipient, however. Becoming the communicator establishes a relationship with the recipient of that message (Guzman, 2018).

One of the questions presented at the start of this paper asked what is the role of the human actor/agent as journalist functioning in a role to perform journalism. By expanding the concept of agency beyond just human to include intelligent non-human machines, the root

question can become: Who is playing the role of the journalist and how does who/what this agent is change the relationship between journalist and audience? The concept of HMC suggests how critical it may be to make this distinction early in the adoption of intelligent agents into the production of journalism, whether they be (semi)autonomous agents, intelligent tools, or something in between.

Guzman (2018) claims communication research is research into who we are as individuals in relation to others and about the reality we create, and this switch from away from an anthropomorphic description of the journalist to a binary distinction where machine intelligence operates in the same functions as its human counterpart alters the relationship between human and machine from a process "to the creation of meaning between human and machine" (p.3). Modern online mass communication often obscures source assignment by the construction of the user-interface (UI), user-experience (UX), or simply the device itself (Sundar, 2008). Source identification becomes irrelevant and source assignment is relegated to the message recipient's psychological assignment of authorship (Sundar, 2008). From another perspective, advances in AI technology render the machine as appearing aware during interaction with a human, which can be disruptive when communication between human and machine has been considered a transmission of information rather than an exchange of information (Guzman, 2018). Within the concept of HMC, communication between human and machine adhere to the same standards as human-to-human communication, which can be viewed as an "exchange of information toward some desired effect" (Guzman, 2018, p. 6). By entering the role of communicator, placed into the role of the journalist, an intelligent machine inherits an obligation to provide information of value according to the principles of journalism the same as if a human journalist were to do it. However, the culture may not be ready to assign such responsibilities

onto a machine. AI is deeply entwined with technology and technology is overwhelmingly recognized as a tool (Guzman, 2018).

Having established this understanding of AI, journalism, and the role of the journalist, an attempt at a conceptual definition of Artificial Intelligence as an agent in journalism can be presented. An Artificial Intelligence functioning as an agent in journalism is an intelligent machine capable of imitating human journalistic intelligence, values, thinking, and/or behavior at a high level of fidelity with no human involvement required beyond initial programming.

Diakopoulos (2019, p. 22) identifies journalistic values as being

> concerned with truth and verification, loyalty to the public, and independence and autonomy from those they cover, as well as being produced with an eye toward building community and fostering deliberative conversation (p.22).

Thinking is the ability of the machine to make decisions, solve problems, learn, and create, as (or better than) a human would (Bellman, 1978). Scholars argue whether programing values and ideologies of journalism and moral behavior into an intelligent algorithm can be the same as natural mores and values, though, according to Turing (1950), designing the highest level of fidelity AI can attain is not demonstrably different from nature.

With this conceptual definition in place, the task of defining how AI could be operationalized as an agent in journalism can be addressed. Here, an expansive amount of literature already exists. This paper does not claim to have exhausted all of the possible literature available. However, in the literature examined, repeating patterns can be identified in how AI has been operationalized in the past. This paper relies on that observation as its initial frame of reference.

Operational Definition

Descartes (1637) provides a first look at how to operationalize an intelligent machine: first by communication, second by action.[14] Descartes' operational model bears striking resemblance to what Alan Turing (1950) would later formalize into the imitation game. This level of operationalization offers a model for how to measure fidelity. However, it does not assist with how to operationalize AI more specifically as an agent in journalism. Before an attempt to offer a way to measure AI in its role in journalism can be made it will be important to identify how AI is operationalized at a higher, more abstract, level.

Artificial Intelligence, at the highest level can be measured by its strength to operate intelligently into three levels: narrow, general, and super (Kaplan & Haenlein, 2019). Artificial Narrow Intelligence (ANI) is the weakest level of AI, below human level intelligence, and ANI contains all known AI systems in operation today (Kaplan & Haenlein, 2019). ANI is considered weaker than human intelligence because, unlike humans, an ANI system cannot borrow intelligence or knowledge from memories or experiences outside of its programmed operation (Kaplan & Haenlein, 2019). Within its programmed operationalization, however, an ANI will outperform a human assigned the same task, though an ANI is incapable of adaptation beyond its specific program (Kaplan & Haenlein, 2019). The next higher level of AI is Artificial General Intelligence (AGI). This is the level of intelligence Haugeland (1985) envisioned in his definition of AI as a machine with a mind. At this level, the intelligence matches human level intelligence. An AGI would be capable of autonomously applying intelligence and knowledge from several areas to accomplish an operationalization (Kaplan & Haenlein, 2019). It could learn through unsupervised learning how to solve a task or challenge, then apply this new knowledge to another, unrelated task or challenge (Kaplan & Haenlein, 2019). The highest level of AI

theorized is Artificial Super Intelligence (ASI). At this level, the AI achieves consciousness and self-awareness; its intelligence can apply to all areas and solve any task or challenge it is presented with; and is capable of outperforming humans in all areas (Kaplan & Haenlein, 2019).

Neither AGI nor ASI currently exist in the observable world. AGI has not yet been achieved operationally and ASI is only theoretical at the moment. ANI is observable, however. By knowing its ability to apply intelligence to a problem is limited to a single area, this means we can recognize ANI by applying a simple syllogistic test.[15] Knowing the three highest level abstractions of operationalizing AI: L_1ANI, L_2AGI, and L_3ASI, focus can be turned to ANI and how it is operationalized for the specific purpose of journalism.

Chaffee (1991) established that an operational definition attempts to identify everyday usage of the concept and that the operational definition may change dependent on the study to which the concept is being applied. Here, a conceptual definition of AI for the purpose of journalism has been established so that while no approach is assuredly the most appropriate, it may be reasonable to assume this operational definition will satisfy the concept addressed in this study.

For consistency, this paper will begin on the premises set forth by Waddell (2019) and Graefe (2016) who have applied operational measures consistent with observations of how AI is currently operationalized in news organizations to three levels of operationalization. Level 1 – Intelligent assistant and content management system. At L_1, AI performs as an intelligent instrument to aid the human journalist in the role of producing journalism by producing relevant resources needed by the human journalist to produce news content, does not produce final written or visual content, and has no exposure to audience (Waddell, 2019). Level 2 – Semi-autonomous intelligent agent. At L_2, AI performs in partnership with human agent[s] to produce

news content for an audience (Waddell, 2019). At this level, the intelligent agent can receive supervised learning by observing patterns of behavior in the human journalist, and the content produced is presented to an audience. Level 3 – Autonomous intelligent agent. At L_3, AI performs sole authorship of news content with no human involvement past the initial programming (Waddell, 2019). At this level, the intelligent agent performs in the same (or exceeds) capacity of a human journalist. When operationalizing a NLG at level 2 and level 3, two within-levels of sophistication that have been defined by Graefe (2016) can be applied. L_{2a} and L_{3a} AI is simply able to retrieve data from a source database and apply it to a pre-designed template. L_{2b} and L_{3b} AI is capable of analyzing source data for deeper insight to create narrative without the aid of prewritten templates.

This operational definition of Artificial Intelligence applied to journalism begins with identifying three distinct levels of AI as it exists purely from the field of origin; artificial narrow intelligence, artificial general intelligence, and artificial super intelligence (Kaplan & Haenlein, 2019). Of these three, only ANI has been realized and is capable of being observed in operation, whereas AGI and ASI remain theoretical levels that scientists are working to achieve (Kaplan & Haenlein, 2019). Next, artificial intelligence applied to journalism was defined by three levels of operationalization that can be observed in operation today, of which only L_2 and L_3 would affirm AI as a communicating actor-agent in journalism. At the L_1 level, the AI would continue to operate within the traditionally set boundaries of a mediator, and function as a tool by which the human journalist would be able to conduct their operation to communicate news information to an audience. However, L_1 operationalization does not discredit the operationalization of AI within the field of journalism.

With this foundation for how to observe operationalized AI in place, the next section will discuss the limitations observed in present labels scholars have applied to this area of study we can proceed to discuss.

Discussion

In this paper an attempt has been made to provide a critical review of existing literature on the concept of AI as it is used in the function of journalism. Several scholars have approached the operationalization of AI in the field of journalism from various positions at different times in the past. From the literature that has been included here, and in the literature discovered but was decidedly outside the scope of this paper, one consistency has been observed; that is, there is no generally agreed upon consensus for how to label AI as it is applied to journalism. Authors Anderson (2013), Lindén (2017), and Waddell (2019) use the term computational journalism; Carlson (2015), Graefe (2016), and Zheng, Zhong & Yang (2018) use the term automated journalism; Dörr (2016) uses the term algorithmic journalism; and Miroshnichenko (2018) uses the term robo-journalism. Other labels have been used and other scholars have employed the afore mentioned labels. This collection is only a small representation of the wider scholarship, and although there are recognized constraints on time and space for this paper, it should be considered representative of the larger collection of existing research.

Algorithms are at the heart of the conceptual labels which previous scholarship has applied. The algorithm has been referred to as itself, yet also as a computation, an automation, and a robot in the literature reviewed. Diakopolous (2019) has defined the algorithm is not, of itself, the intelligence. Rather, the algorithm is at the core of a computer system, and a computer system built on intelligence is defined as Artificial Intelligence (Diakopoulos, 2019). Therefore,

it would be appropriate to say that the intelligent agent is not the algorithm, but the machine built on intelligent algorithms.

Operationalization of AI across industries, including journalism requires conceptualizing the operation. Chaffee (1991) was clear to point out in writing about validity, that the operational definition of a concept may change specific to a project. While labels aid in developing better understanding of a phenomenon, conflicting labels can only complicate progress and hinder development towards unifying theory. “If a concept is to be useful to others, it must be understood by others” (McLeod & Pan, 2004, p. 19). Guzman (2019) recognized this phenomenon as a limitation in communication theory and set to build a conceptual framework, HMC, to help unify the scholarship studying in this area. Here, this paper presents a similar suggestion for unifying the study of AI functioning as an agent within journalism into one agreed upon by consensus to guide the field of study before adoption of AI into the industry becomes widespread.

Conclusion

Literature on the concept of Artificial Intelligence is abundant. Research into Artificial Intelligence applied to fields of industry, including journalism, is abundant. This paper makes no claim to be an exhaustive study of the entire scholarship on this topic. The focus of this paper is to explicate the concept of artificial intelligence functioning as an agent within journalism. In doing so, a critical review of existing literature relevant to the concept has been provided, a conceptual definition has been presented, an operational definition for how to observe and measure artificial intelligence as it is specifically applied to the purpose of producing journalism has been stated, and a discussion concerning the lack of a consensus for how to label AI as it is applied to journalism has been entered. Perhaps in time, as discourse continues and the collection

of literature expands, a label appropriate to represent this phenomenon will receive consensus. Until then, it may be the most advisable path forward to avoid any such labels and identify it as its intended conceptualization, artificial intelligence for the purpose of journalism.

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Footnotes

[1] According to Diakopoulos (2019) the main limiting factor against an algorithm performing the role of a journalist is technology itself. Existing AI technology has not achieved the general ability to apply knowledge acquired by one method to an unrelated task or challenge. This refers to the highest order of operational levels of Artificial Intelligence (Kaplan & Haenlein, 2019). Miroshnichenko (2018) reasons the ultimate conclusion to adding algorithms programmed to produce news content into the news stream will be to eventually replace humans all together. His defense of this hypothesis rests on the merits of economy. Miroshnichenko (2018) asserts intelligent algorithms are already well established in newsrooms, that Artificial Narrow Intelligence (ANI) is capable of producing natural human language coherently enough so as to be undetected by an average human reader, and most importantly, that the quality of natural language generation (NLG) needn't exceed human writing; it only needs to "write good enough (in order to be indistinguishable and to be hired)" (p. 185).

[2] Aristotle's syllogism is constructed of three elements in two parts – two statements that make up the premise, and one statement that serves as the conclusion (Glymour, 1992). Here is an example. Say I have three groups, designated as X, Y, and Z. A syllogistic statement would look like this. All X are Y. All Y are Z. Therefore, all X are Z.

[3] This conference is where famed computer scientist Dr. John McCarthy, and his fellow researchers, first coined the term Artificial Intelligence during a conference of his proposal (Bringsjord & Govindarajulu, 2019; McCarthy et al., 1955).

[4] Passing the Turing Test became the quest by which all accomplishments made in AI were measured for years after. As the test is proposed, if an interrogator cannot distinguish beyond a 50/50 guess which of the two participants in this game (hidden from the interrogator's sight) is human and which is machine after both return a printed response to a question of the interrogator's asking then the machine is said to have won the game and thus passed the test (Turing, 1950).

[5] Natural Language Generation (NLG) is an AI technology capable of rendering coherently written, natural human speech, and Generative Adversarial Networks (GAN) is an AI technology capable of synthesizing digital images of non-existent human beings.

[6] Ryfe (2019) defines the role of journalism through a liberal theoretical lens as obliged to provide impartial, fact-based political news. Journalism serves democracy, central to its mandate, by ensuring those people who make policy are held accountable to the public which they are representative of, however, journalism only functions when the other actors in a civil society function as they're intended to (Ryfe, 2019).

[7] Lindén (2017) does not elaborate on the role of the robot beyond performance of journalistic duty so we are left to wonder whether the "robot" would produce the finished written article which presents to a human reader, if the robot would inhabit the physical environment of the newsroom and move about as human journalists did, and possibly interact with the human journalists in day-to-day operations.

[8] By the language used, one could surmise Anderson also views the technology as an instrument to be used by the journalist in the pursuit of journalism, or Anderson is viewing journalism as an abstract concept separate from any operational definition.

[9] "The tools of computational journalism have technological affordances, but they are also shaped through use." (Carlson, 2015, p. 419).

[10] Graefe (2016) is clear to point out in his definition that the algorithm only works if it has access to clean, structured, reliable data. He does not make clear whether providing this data would be the provision of human actors. It is fair to assume the volume of data required for the algorithm to produce journalism would exceed the limits of what a human actor is capable of providing, and therefore would require a separate, uniquely programmed algorithm actor to acquire and structure the data required.

[11] "Algorithmic journalism [is] defined as the (semi)-automated process of NLG by the selection of electronic data from private or public databases (input), the assignment of relevance of pre-selected or non-selected data characteristics, the processing and structuring of the relevant datasets to a semantic structure (throughput), and the publishing of the final text on an online or offline platform with a certain reach (output)" (Dörr, 2016, p. 703).

[12] "It is produced inside or outside an editorial office or environment along professional journalistic guidelines and values that meet the criteria of topicality, periodicity, publicity, and universality, and thus establishes a public sphere" (Dörr, 2016, p. 703).

[13] An argument could be made that communication exists among and between all biological agents, even some hope of communication between corporeal and non-corporeal beings exists, and (of course) these dimensions of communication could be affirmed by any rational thinking human (even if only by noncommittal recognition).

[14] Descartes (1637) believed that any machine which bore a likeness to humans physically or in action should not have the capacity to speak or use any form of sign or signal beyond its programming, whereas a human is capable of arranging speech or signs to respond to anything presented in their surrounding environment.. He also wrote, about action, that action prompted by knowledge was an impossible task for a machine for the same reason that it cannot know how to respond through communication to all manner of inquiry or statements presented to it (Descartes, 1637).

[15] By requesting a known AI agent to perform one task, measure it is able to satisfy the requested skill it was programmed to perform, then request the AI to perform an unrelatable task or solve an unassociated problem, an ANI can be observed since an ANI will not be able to accomplish the second request or challenge.