The Public's Attitudes and Psychology on AI Issues: An Analysis from the Perspectives of Agenda-Setting Theory and Need for Orientation

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Abstract This research aims to confirm the impact of the media on the formation of public opinion on AI issues and to understand the reason behind that formation through agenda-setting theory. This study showed that public opinion is likely formed in a way that corresponds with the tone of media coverage and that negative reporting is more powerful than positive reporting. The concept of Need for Orientation (NFO), a psychological factor in agenda-setting theory, was utilized to interpret the reasons for changes in public opinion. The results of this study found that the 'intellectual' and 'belonging' sub-dimensions of NFO functioned to strengthen the participants' stances in the direction of the articles provided, whereas the 'topical' and 'hedonic' sub-dimensions diminished the intensification of the participants' stances. These results regarding the characteristics of public opinion on AI issues could aid in the analysis of situations highly dependent on public support.

Keywords Artificial Intelligence (AI) Issues · Public Opinion · Need for Orientation (NFO) · Information Seeking Motivation · Agenda-Setting Theory

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Background

The technological development of Artificial Intelligence (AI) has arguably become one of the most important aspects of humanity's progress in recent years (Stone et al., 2016). It was long thought that the human race, that is, *homo sapiens*, were the only beings capable of higher cognitive functions. However, humans may no longer be considered the peak of cognitive intelligence as AI has progressed to operate on a level that surpasses the performance of humans on most cognitive tasks (Nowak et al., 2018). Examples of AI's successes not only include cases where AI has won at Go, chess, and other board games against humans but also cases where its practical applications perform at extremely high efficiency levels, such as in speech and object recognition, self-driving car operation, intelligent tutoring systems, efficient decision support systems, pattern detection in Big Data analysis, and accurate constructions of models of social behavior (Nowak et al., 2018).

AI can solve some of our most challenging practical problems and create entirely new jobs in the process. The World Economic Forum (WEF) (2020) expects that advances in AI technology will create 97 million new jobs over the next five years. However, at the same time, the WEF expects AI to replace human labor in many positions of employment, meaning that as many as 85 million jobs will disappear (WEF, 2020). While there will likely be a net increase in jobs due to the application of AI in the workforce, falling human productivity may cause more job loss in the future (Rotman, 2013). Previous research has shown that many people express fear and concern about the excessive development of technology. The main reason for this is that the utilization of AI allows for the replacement of human labor in industries that have traditionally provided humans with a sense of meaning (Dodel & Mesch, 2020; Kieslich et al., 2021). Although the development of AI has benefited all walks of human life, it has also given pause to many people who are considering the ramifications of the first challenge to the human monopoly on intelligence in history.

Consequently, there has been an expansion of the discussion on the necessity of regulation on developments in AI technology that might negatively impact the current state of human life (e.g., Hawking et al., 2014; Omohundro, 2007). The potential hazards of AI came to the forefront of public discourse when Stephen Hawking and Elon Musk, along with many other renowned AI researchers, published a letter addressing their concerns (Russell et al., 2015). In it, Musk claimed that AI research was analogous to "summoning the demon," and Hawking warned of the potential for the development of AI to "spell the end of [the] human race."

However, this research does not treat AI technology as something that solely requires regulation; instead, it considers the characteristics of AI technology to be a double-edged sword. This is because AI issues cannot simply be evaluated in black and white, as there is no correct answer to the question, "When will our development of AI technology be adequate?" Some studies (e.g., Seong, 2020; Wilson et al., 2020; Zhang et al., 2019) have shown that most people agree that AI technology should continue to be developed but should also be regulated. For this reason, there is a need for studies that deal with the underlying public response to AI issues and the psychological reason behind the conflicting views that show up in the data.

To deeply consider these complicated aspects of AI issues, this study applied agenda-setting theory to analyze participant responses and underlying psychology. Agenda-setting theory effectively measures media effects, which are changes in people's cognition and attitudes, by

dividing them into a first and second level. Furthermore, a key concept of agenda-setting theory is Need for Orientation (NFO), which is particularly suited to explaining public opinion on issues with ambivalent characteristics, such as in cases where individuals have conflicting opinions. This is because NFO was created to interpret people's need to seek information that directly affects their lives and has been consistently used to represent the psychology of people who are undecided about their stances on inherently ambivalent topics (McCombs & Valenzuela, 2020). In this article, therefore, the conceptual background of NFO as it applies to AI issues was expounded upon. NFO was utilized to interpret the psychology behind the effects of the media that participants consume.

Literature Review

Agenda-Setting Effects and Public Opinion on AI Issues

While the development, utilization, and convenience of various AI technologies, such as conversation AI and deep learning AI, have increased, a number of problems have also been observed. Ethical issues, in particular, have gained traction in public discourse (e.g., Chatila & Havens, 2019). OpenAI's conversation AI platform, Chat GPT, has attracted attention from many people because of its seemingly huge leap in technology. However, several previous AI chatbot services (e.g., Tay, released by Microsoft in 2016, and Lee Luda, developed by Scatter Lab in 2020) attracted attention for another reason. These previous chatbot services could not determine whether something was morally right or wrong, so they drew attention when they began outputting discriminatory, untrue, and biased political statements learned from some of the sourced users. The services were suspended after just a short period (Kim, 2021; Zemčík, 2021). Because of these previous cases, there is a growing concern that Chat GPT may provide incorrect information or information that supports social prejudices. These concerns directly conflict with desires to make use of this marvelous new technology.

According to several surveys conducted in the U.S. on public opinion regarding AI issues, the majority of those surveyed supported AI development as well as AI regulations (e.g., Wilson et al., 2020; Zhang et al., 2019). These responses demonstrate the public's complicated attitude towards AI: most of the respondents supported the development of AI, yet many respondents also worried about the dangers of unregulated AI. For example, the results of Wilson et al. (2020) showed that most of the respondents were hopeful at the prospects of AI being used to 'improve health care' (82% being very/somewhat hopeful), 'catch criminals' (80% being very/somewhat hopeful), and 'prevent terrorism' (77% being very/somewhat hopeful). However, they displayed concern that AI would 'invade privacy' (86% being very/somewhat worried), would be used to commit 'cyber-attacks' (80% being very/somewhat worried), and would 'eliminate jobs' (78% being very/slightly concerned). Similar results were seen in South Korea. A survey conducted in South Korea detailed that 78% of the 1,000 respondents were interested in AI issues, and 67% expected AI to bring convenience to and improve their lives; on the other hand, 64% of the respondents worried that developments in AI technology would threaten their jobs (Seong, 2020).

As seen in the results of the above polls, many people acknowledge the benefits of AI technology while also expressing concerns and demanding regulation so that the technology will not be used in an unethical way. To apply appropriate regulations to the development of the various types of AI technologies, a consensus is needed among members of society about which aspects of its use can be deemed appropriate. However, now more than ever, public opinion on AI issues is heavily influenced by the tone of the media as consumed by the public. This is because the development of AI technologies in different fields is so rapid that the public constantly needs more information to remain informed (e.g., Kieslich et al., 2023; Ouchchy et al., 2020). In situations like this, agenda-setting theory provides a suitable means of measuring media effects when the public can be strongly influenced by media coverage.

With this in mind, this study looks at changes in public cognition and opinions on AI issues through the lens of agenda-setting effects by considering the tones of the new articles provided to the participants. These articles were divided into negative and positive stimuli, and the extent to which people's cognition and attitudes were affected by the tone was measured through two agenda-setting effects. The first level of the agenda-setting effects measures the public's cognition of AI and deals with transferring issue salience from the news media to the public. Therefore, it has been used to determine the media's influence on public cognition regarding the importance of an issue. The second level measures public opinion, highlighting the transfer of attribute salience of an issue. This allows researchers to conduct a detailed analysis of the media's influence on the formation of public opinion on an issue. Moreover, these second-level effects are measured by separating out the importance of the attributes of an issue, also known as substantive attribute agenda-setting effects, and the tone (i.e., positive/negative) of the attributes of an issue, also known as affective attribute agenda-setting effects (Colombetti, 2005; McCombs et al., 2014). With these considerations in mind, this research aimed to address to following research questions:

> RQ 1. To what extent do the participants show a significant change in their perceived importance of AI issues based on the provided articles (first-level agenda-setting effects)?

> RQ 2-1. To what extent do the participants show a significant change in their perceived importance of attributes in AI issues based on the provided articles (second level: substantive attribute agenda-setting effects)?

> RQ 2-2. To what extent do the participants show a significant change in the tone of attributes in AI issues based on the provided articles (second level: affective attribute agenda-setting effects)?

Application of the Concept of NFO in Interpreting AI Opinion

In agenda-setting theory, NFO was originally conceptualized as an intrinsic force that creates media effects and explains why people seek out information (McCombs & Valenzuela, 2020). The conceptualization was based on an initial study that focused on the effects of news about the 1968 U.S. presidential election on 'undecided voters' (McCombs & Shaw, 1972). This

initial study observed that voters who were undecided would still 'actively [seek] information.' The NFO concept was conceptualized to represent the psychology of the people who 'actively seek information' despite their 'indecision' (Weaver, 1980). NFO could be used to represent the reason why voters with those same attributes could feel that specific issues were relevant to them while remaining uncertain about those issues, and follow-up studies have utilized NFO as an effective tool for interpreting their psychology in detail (e.g., Camaj & Weaver, 2013; Chernov et al., 2011; Matthes, 2006). Similar to the voters from the initial studies on NFO, public opinion surrounding AI issues often contains a mix of interest in development and fear of overdevelopment that can lead to indecision on how to proceed. Therefore, NFO can be utilized in this study to interpret the public's psychology behind their opinions on AI issues.

The similarity in the public's psychology is not the only reason for using NFO in this study. From the cognitive utilitarian viewpoint upon which NFO is based, people pursue information that is beneficial to understanding their surroundings and adapting to new circumstances (McCombs & Weaver, 1973; Weaver, 1980). This cognitive utilitarian viewpoint can be applied to AI issues because they are closely related to the ontology of human beings; namely, the utilization of AI allows for the replacement of human labor in industries that have traditionally provided humans with a sense of meaning from their work (Guzman & Lewis, 2020). In other words, by using AI instead of human labor, certain AI technologies simultaneously possess the capacity for enriching people's lives and threaten their means of survival. Since AI issues are ambiguous yet fundamental to modern human life, this research decided to utilize the concept of NFO to address the public's foundational needs for information about AI issues.

The concept of NFO consists of two components, relevance and uncertainty, which give form to its conceptual structure (Weaver, 1980). The first component, relevance, can be explained as the users' involvement with a particular issue measured through the amount of their participation in discussions on the topic (McCombs & Weaver, 1973; Weaver, 1980). The second component, uncertainty, represents the users' conviction in news information and is assessed by their confidence in their attitudes or decisions related to the issue (McCombs & Weaver, 1973). Through these two components, the original concept of NFO aimed to describe the reason behind changes in the public's cognition about an issue (Camaj, 2014; Chernov et al., 2011). As indicated earlier, these changes in public cognition are also known as the first level of agenda-setting effects. As agenda-setting theory has expanded to include a second level that covers the public's opinions or attitudes, several scholars (e.g., Camaj, 2014; Lee, 2005; Matthes, 2006, 2008; Valenzuela, 2014) have conceptually elaborated upon NFO to explain the reason behind changes in the second level.

Among these different conceptual iterations, the newly elaborated NFO by An and Lee (2019), in particular, was notable for suggesting the advantages of explaining the public's complicated needs for seeking information. An and Lee (2019) reconstructed the concept of NFO to yield more detailed results than the original interpretation found in previous agenda-setting studies and proposed eight sub-dimensions in the cognitive and affective dimensions for relevance and uncertainty within NFO (see Table 1).

Table 1 Classification of the Concept of NFO (An & Lee, 2019)

Dimension	Type of NFO	Conceptual Definition	Motivation in Uses and Gratification Theory	Relevance in Information Retrieval Studies
Cognitive (Objective) Dimension	Topical	Motivation to search for the concerned topic	Cognitive needs (Katz et al., 1973), Viewing for specific program content (Rubin, 1981)	Topical Relevance (Saracevic, 1996)
	Intellectual	Motivation to search for information to get background knowledge	New information seeking (Blumler & McQuail, 1969), Cognitive needs (Katz et al., 1973), Viewing for information/learning (Rubin, 1981), General information seeking (Rubin & Perse, 1987), Research and learning (Ebersole, 2000), Information seeking (Papacharissi & Rubin, 2000)	Cognitive Relevance (Saracevic, 1996)
	Situational	Motivation to search for useful information to understand the current situation	Cognitive needs (Katz et al., 1973), Decisional utility (Palmgreen et al., 1980), Research and learning (Ebersole, 2000), Information seeking (Papacharissi & Rubin, 2000)	Situational Relevance (Saracevic, 1996)
	Surveillant	Motivation to search for information to maintain oneself as a member of a society	Surveillance (Blumler & McQuail, 1969; McLeod et al., 1974), Social integrative needs (Katz et al., 1973), Research and learning (Ebersole, 2000)	-
Affective (Subjective) Dimension	Hedonic	Motivation to search for information for pleasure (for fun)	Affective needs (Katz et al., 1973), Viewing for entertainment/enjoyment Viewing to Pass Time/as a Habit Viewing for Relaxation (Rubin, 1981), Exciting entertainment (Rubin & Perse, 1987), Interpersonal motives (Pleasure) (Rubin et al., 1988), Easy access to entertainment Something to do when bored (Ebersole, 2000), Entertainment (Papacharissi & Rubin, 2000)	Motivational/ Affective relevance (Saracevic, 1996), Hedonic Relevance (Xu, 2007)

Table 1 Classification of the Concept of NFO (An & Lee, 2019) (continue)

Dimension	Type of NFO	Conceptual Definition	Motivation in Uses and Gratification Theory	Relevance in Information Retrieval Studies
Affective (Subjective) Dimension	Self	Motivation to search for information to establish a sense of self	Personal integrative needs (Katz et al., 1973), Interpersonal Utility (Papacharissi & Rubin, 2000)	Motivational/ Affective relevance (Saracevic, 1996)
	Belonging	Motivation to search for information to establish social bonds	Social integrative needs (Katz et al., 1973), Viewing for companionship Viewing for social interaction (Rubin, 1981) Social utility (Rubin & Perse, 1987), Interpersonal motives (Inclusion) (Rubin et al., 1988), Communication and social interaction (Ebersole, 2000), Interpersonal utility (Papacharissi & Rubin, 2000)	Motivational/ Affective relevance (Saracevic, 1996)
	Evasive	Motivation to search for information for diversion (for escape from reality)	Release tension needs (Katz et al., 1973), Viewing for escape/to forget (Rubin, 1981), Escapist relaxation (Rubin & Perse, 1987), Interpersonal motives Escape & Relaxation (Rubin et al., 1988)	Motivational/ Affective relevance (Saracevic, 1996), Aesthetic Relevance (Reuter, 2007)

Note. In this study, the names of two sub-dimensions of NFO from An and Lee (2019) were adjusted to clarify the role of the sub-dimensions. The first change was 'Substantive' being renamed 'Intellectual.' The second change was 'Aesthetic' being renamed 'Evasive.' No changes were made to the definitions of these sub-dimensions.

The most notable aspect of their re-conceptualization is that they classified the original NFO concept into cognitive and affective dimensions. The initial concept of NFO did not consider the affective or emotional aspects of people's psychology in seeking information because emotion was initially not considered to be a primary factor in information seeking. However, starting from Evatt and Ghanem (2001), several studies (e.g., Bouza, 2004; Valenzuela, 2014; Valenzuela & Chernov, 2016) tried to separate the dimensions of NFO while considering an affective or emotional dimension within NFO. This is because the theoretical framework has been expanded from the first to the second level of agenda-setting effects. Specifically, the second level of agenda-setting effects includes the public's cognitive and affective attitudes, so it is imperative for the public's cognitive and affective needs for seeking information to be studied. For this reason, An and Lee (2019) decided to organize NFO into cognitive and affective dimensions.

The two dimensions proposed by An and Lee (2019) differed from what came before; the cognitive dimension encompasses intellectual needs that can be directly satisfied through information, and the affective dimension encompasses psychological needs that can be indirectly satisfied through the mediation of information. In other words, the cognitive dimension is operationalized as needs that are satisfied through objective facts (information), and the affective dimension is operationalized as needs that are satisfied through subjective feelings (response to information). Therefore, the cognitive dimension is deeply related to the content of information. In contrast, the affective dimension may not be related to information or content but instead to reaction to information. For instance, while the surveillant sub-dimension in the cognitive dimension considers intellectual satisfaction from institutions, people, laws, and systems described in the content of information, the belonging sub-dimension in the affective dimension deals with the psychological satisfaction that stems from the thought "I'm not so different from other people." To avoid the misperception that the affective dimension is motivated by clear-cut emotions (e.g., anxiety, fear, etc.) rather than a person's underlying affective needs for seeking information, this study renamed the two dimensions as objective (fact-based dimension) and subjective (feeling-based dimension).

The eight sub-dimensions in the objective and subjective dimensions of NFO were conceptualized via review, re-categorization, and assignment. While all eight sub-dimensions of NFO may not provide significant reasons for media effects, some do show significant explanatory power. The sub-dimensions that display meaningful explanatory power may vary depending on the issue. This research examined the explanatory power of the elaborated concept of NFO in the first and second levels of agenda-setting effects regarding AI issues (RQ 3-1 & 3-2). Through the results of the explanatory power of the NFO, what specifically motivates people to access and accept information about AI issues can be revealed.

Additionally, this research tested the change in the explanatory power of NFO when divided into objective and subjective dimensions to verify the impact of the subjective satisfaction from NFO (RQ 4). This is because the conceptual elaboration of NFO made it more applicable to modern issues that require a more sophisticated approach, such as AI issues. Public opinion on AI can be easily swayed by emotions rooted in AI technology's rapid introduction (e.g., Ouchchy et al., 2020).

Therefore, the following research questions were identified:

RQ 3-1. To what extent does the elaborated NFO have explanatory power on the first level of agenda-setting effects?

RQ 3-2. To what extent does the elaborated NFO have explanatory power on the second level of agenda-setting effects?

RQ 4. To what extent does the explanatory power of the elaborated NFO change when the subjective sub-dimensions of NFO are added?

Methodology

Sample and Experimental Design

The online survey in this research was conducted by the survey corporation EMBRAIN in March of 2019. As a result, data from 350 Koreans aged 20 to 60 were collected using stratified random sampling to minimize bias from sex and age. The average age of the survey participants was 40.16, with 178 male and 172 female participants. There were 78 people in their 20s (40 men, 38 women), 80 people in their 30s (40 men, 40 women), 98 people in their 40s (50 men, 48 women), and 94 people in their 50s (48 men, 46 women).

The participants were randomly divided into two groups, one of which was given a collection of positively slanted articles about the issue ($n = 175$, 89 men, 86 women, mean age = 40.30, $SD = 10.78$) and the other, a collection of negatively slanted ones ($n = 175$, 89 men, 86 women, mean age = 40.03, $SD = 10.62$). This division was made because it was confirmed in a previous study that agenda-setting effects differed according to the tone of the article (Coleman & Wu, 2010). The collections comprised a set of three articles that dealt with three separate AI-related topics.

The specific sub-issues of AI were chosen by first screening all news articles about AI published by Korean news outlets from January 2018 to January 2019, the year before the survey was conducted. From reviewing the articles, the primary topics of AI issues were found to be defense, employment, health, and election issues. However, there was no significant difference between positive and negative articles on health issues shown during the pretest ($n = 60$). Therefore, defense, employment, and election issues were used for this study. Furthermore, no differences in the pre-existed cognition and attitudes between the groups were found.

To make the articles look like they were from a real newspaper, participants from each group were provided with a front page that consisted of three articles and one advertisement. The stimuli used in this study had the same topic, headline format, article format, and similar word count. They only differed in tone. Appendix I shows that the blue "Korea Daily" front page contains positively slanted articles and the green "Korea Daily" front page contains negatively slanted articles. To ensure concentration on the stimulus, the participants had to look at the stimulus for at least one minute. They were asked to summarize the contents of each article in one sentence after reading.

The two components of NFO, relevance, and uncertainty, were measured through an application of the re-conceptualized scale by An and Lee (2019). Each participant's level of NFO was measured before they were exposed to the articles, and these levels were utilized to predict agenda-setting effects. The effects were then defined as the differences in the salience of issues and attributes regarding AI, as measured before and after exposure to the articles.

Variables

Public Opinion on AI Issues (Agenda-Setting Effects)

The issue salience in the first level of agenda-setting was measured by gauging each participant's perception of the importance of an issue (Behr & Iyengar, 1985). Participants were asked to rate on a 7-point scale how much importance they placed on AI issues in their daily lives before and after the exposure. The attribute salience in the second level was measured by comparing the attributes of the media and user, and the effects were classified as substantive and affective. Substantive effects measure the perceived importance placed on the individual parts of an issue, and affective effects measure the attitude associated with each part of that issue (e.g., Camaj & Weaver, 2013; Wanta & Hu, 1994). In this research, the substantive effects were measured by comparing the importance reported by each user about the specific aspects of an issue before and after reading articles about them. The affective effects were measured by analyzing the change in the user's stance about the aspects before and after reading the articles. It was carried out by presenting the users with a scale from 1 to 7 before and after reading, where selecting 1 meant that they believed "*The development of the technology is harmful to humans,*" and selecting 7 meant that they believed the "*The development of the technology is good for humans*."

Relevance within NFO

Relevance consists of the various reasons for paying attention to and being interested in media information. Based on the new concept of the attribute discussed above, relevance was classified according to the division of NFO into eight sub-dimensions, four of which were in the objective dimension (topical, intellectual, situational, and surveillant) and the other four in the subjective dimension (hedonic, self, belonging, and evasive). Participants were asked to rate their interests in AI issues on a scale from 1 = *strongly disagree* to 7 = *strongly agree*. All the individual index scores of relevant variables were summed from those 4 or 5 items on the questionnaires. They were shown to be reliable within their respective type of relevance: *Cronbach's* a = .97 for 'topical', a = .94 for 'intellectual', a = .88 for 'situational', a = .89 for 'surveillant', a = .93 for 'hedonic', a = .93 for 'self', a = .93 for 'belonging', and a = .92 for 'evasive'. The concrete items used to measure the level of each type of relevance are outlined below in Appendix Ⅱ.

Uncertainty within NFO

Uncertainty is regarded as the intrinsic self-doubt found in users when seeking information through media. In the reference study, participants were asked to answer three questions for each of the eight sub-dimensions of uncertainty to gauge their degree of confidence in their reason for seeking information and the expected results of their information-seeking behavior. The measurement method was rooted in the expectancy-value approach, which estimates the difference between the expectation and the actual results (Vroom, 1964; Atkinson, 1958; Tolman, 1959).

In this study, however, one question about the confidence of their resolve was added, giving

the survey four questions for each sub-dimension. The reason for the inclusion of this fourth question was to quantify the respondents' confidence in their expectations. The idea to add this question was based on agenda-setting theory, where the concept of uncertainty is measured by attitudinal consistency (McCombs & Weaver, 1973). It was further supplemented by the expectancy-value theory, where expectation is defined as the perceived possibility of a particular consequence (Fishbein & Ajzen, 1975). This question was added to further detail the user's confidence in future outcomes that were consistent with their current expectation. Therefore, the questions used in the research were: 'Are you confident in your responses about relevance?', 'Are you confident that your responses affect your process of seeking information?', and 'Are you confident that your responses will bring positive results?' as per the reference study (An & Lee, 2019), and the newly added 'Are you confident that your responses will not change?' These questions were measured by using a 7-point scale, ranging from 1 = *strongly disagree* to 7 = *strongly agree*. The scores for the 4 items were summed to obtain index scores for the variables in the dimension of uncertainty. These index scores were found to be *Cronbach's* a = .84 for 'topical', a = .89 for 'intellectual', a = .88 for 'situational', a = .89 for 'surveillant', a = .87 for 'hedonic', a = .89 for 'self', a = .86 for 'belonging', and a = .88 for 'evasive'.

Results

The agenda-setting effects (RQ 1 & 2) were measured by using the SPSS 25.0 program to complete a paired t-test analysis. Before testing RQ 1 and 2, the participants' pre-existing stances on AI issues were measured using an individual t-test analysis to determine whether the pre-existing opinions on AI significantly differed between the two groups. It was found that, except for the 'Election-Cognitive' attribute ($t(348)$ = -2.07, p = .04), there were no significant differences between the general pre-existing stances of either group. The first level of agenda-setting effects was significant in both participant groups (RQ 1, Table 2). Moreover, both groups experienced an increase of their perceived importance of the AI issue, Detrimental: M = .27, SD = .90, $t(174)$ = 3.93, p<.001, Beneficial: M = .15, SD = .76, $t(174)$ = 2.68, p = .008.

However, the second level of agenda-setting effects showed interesting results: each group of participants' affective attitudes towards the AI issue changed in a way that corresponded with the tone of the articles provided (RQ 2-2, Table 2). For instance, when the participants read articles about AI being detrimental (Detrimental Group), their negative opinion of AI attributes significantly strengthened in 'Defense', M = -.47, SD = 1.38, $t(174)$ = -4.56, p<.001, and 'Election', M = -.36, SD = 1.31, $t(174)$ = -3.64, p<.001. However, when the participants read articles about AI being beneficial (Beneficial Group), their positive opinion toward AI attributes significantly strengthened in 'Defense', M = .31, SD = 1.29, $t(174)$ = 3.18, p = .002, 'Employment', M = .55, SD = 1.43, $t(174)$ = 5.12, p<.001, and 'Election', M = .17, SD = 1.07, $t(174)$ = 2.11, p = .036. In addition to this effect on their affective attitudes, the Detrimental Group also exhibited a notable result regarding their substantive attitudes (RQ 2-1, Table 2); the perceived importance of attributes (substantive) decreased in 'Defense', M = -.17, SD = .99, $t(174)$ = -2.22, p = .028, 'Employment', M = -.33, SD = 1.08, $t(174)$ = -4.04, p<.001, and 'Election', M = -.17, SD = .99, $t(174)$ = -2.30, p = .023.

Table 2 Confirmation of the Agenda-Setting Effects According to the Type of Group

			Mean difference	SD	95% CI LL	95% CI UL	T	P
	1st	Issue importance	0.27	0.90	.13	.40	3.93	<.001
Detrimental Group	2nd	Defense -Substantive	-0.17	0.99	-.34	-.02	-2.22	.028
		Defense -Affective	-0.47	1.38	-.68	-.27	-4.56	<.001
		Employment -Substantive	-0.33	1.08	-.49	-.17	-4.04	<.001
		Employment -Affective	-0.17	1.39	-.37	.04	-1.57	.118
		Election -Substantive	-0.17	0.99	-.32	-.02	-2.30	.023
		Election -Affective	-0.36	1.31	-.56	-.16	-3.64	<.001
Beneficial Group	1st	Issue importance	0.15	0.76	.04	.27	2.68	.008
	2nd	Defense -Substantive	0.01	0.90	-.12	.15	0.17	.867
		Defense -Affective	0.31	1.29	.12	.50	3.18	.002
		Employment -Substantive	-0.05	0.93	-.18	.09	-0.65	.515
		Employment -Affective	0.55	1.43	.34	.77	5.12	<.001
		Election -Substantive	0.14	0.94	.00	.28	1.92	.056
		Election -Affective	0.17	1.07	.01	.33	2.11	.036

To examine RQ 3 and 4, this research used significant agenda-setting effects to confirm the explanatory power of the different sub-dimensions of relevance and uncertainty. To do this, this research used multiple linear regression analysis. Multicollinearities in the analyses of NFO's sub-dimensions were not observed. As a result, several types of relevance had explanatory power for agenda-setting effects in the first and second levels. Moreover, not all significant agenda-setting effects were explained by NFO's sub-dimensions at a level of significance (p<.05). Therefore, the effects that were not significantly indicated by NFO's sub-dimensions were not included in Table 3.

In the first level (RQ 3-1), the agenda-setting effects were seen in both participant groups, however the sub-dimensions of NFO only demonstrated negative explanatory power in the Detrimental Group, $F(8, 166) = 3.46$, $p = .001$, $R^2 = .14$. Specifically, the 'surveillant (D)' type of sub-dimension for relevance (R) indicated negative explanatory power ($\beta = -.26$). Therefore, participants who had higher levels of 'surveillant (D)' relevance exhibited a diminished perception of the importance of AI issues (Table 3).

In the second level (RQ 3-2), the sub-dimensions of NFO only had explanatory power for affective attribute effects, especially in the 'Defense-Affective' of the Detrimental Group, $F(8,$

166) = 2.62, p = .010, R^2 = .11, the 'Defense-Affective' of the Beneficial Group, F(8, 166) = 3.93, p = .012, R^2 = .11, and the 'Election-Affective' of the Detrimental Group, F(8, 166) = 2.33, p = .021, R^2 = .10. In the Detrimental Group, the change in participants' affective attitudes was significantly predictable based on the participants' sub-dimension levels for 'topical (A)', 'intellectual (B)', and 'belonging (G)'. Particularly, 'intellectual (B)' and 'belonging (G)' showed significant explanatory power in the negative strength of participants' opinions: 'intellectual (B)' showed power in both 'Defense-Affective' (β = -.44) and 'Election-Affective' (β = -.36), and 'belonging (G)' showed power in 'Election-Affective' only (β = -.39). 'Topical (A)' also showed significant explanatory power in 'Defense-Affective' (β = .42). However, it impacted the participants' negative opinions in a different way than the other sub-dimensions: namely, it counteracted an increase in the strength of the opinion (Table 3).

In the Beneficial Group, participants' affective attitudes toward the 'Defense' attribute of AI issues were influenced by the 'intellectual (B)' and 'hedonic (E)' sub-dimensions of relevance. Among these two, only 'intellectual (B)' reinforced the positive change in attitude toward AI's development (β = .40). Therefore, it was confirmed that 'intellectual (B)' functioned to reinforce the participants' stances in accordance with the tone of the given articles. However, the 'hedonic (E)' sub-dimension that showed significant explanatory power (β = -.28) did not play a role in reinforcing the positive change, unlike the 'intellectual (B)' subdimension (Table 3).

Table 3 Confirmation of the Explanatory Power of NFO (Relevance) in Agenda-Setting Effects

Type of Articles	Agenda-Setting Effects		Relevance	S.E	β	T	p	95% CI	
								LL	UL
Detrimental Group	1st	Issue Importance	D	.09	-.26	-2.14	.034	-.38	-.02
		F(8, 166) = 3.46, p = .001, R^2 = .14, Durbin-Watson = 2.06							
	2nd	Defense -Affective	A	.16	.42	2.97	.003	.16	.79
			B	.18	-.44	-2.85	.005	-.86	-.16
			G	.15	-.39	-2.95	.004	-.76	-.15
		F(8, 166) = 2.62, p = .010, R^2 = .11, Durbin-Watson = 1.92							
		Election -Affective	B	.17	-.36	-2.29	.023	-.73	-.05
		F(8, 166) = 2.33, p = .021, R^2 = .10, Durbin-Watson = 1.75							
Beneficial Group	2nd	Defense -Affective	B	.17	.40	2.80	<.001	.14	.79
			E	.11	-.28	-2.53	.012	-.50	-.06
		F(8, 166) = 3.93, p = .012, R^2 = .11, Durbin-Watson = 2.04							

Note. A: topical, B: intellectual, C: situational, D: surveillant, E: hedonic, F: self, G: belonging, H: evasive

To test RQ 4, a hierarchical regression analysis was utilized to confirm the increase in explanatory power by adding the subjective sub-dimensions. In the Detrimental Group for 'Defense-Affective', which was successfully interpreted by multiple types of NFO, the results of R^2 of NFO increased when 'belonging (G)' in the subjective dimension was used to supplement relevance in the objective dimension, 'topical (A)' and 'intellectual (B)'. In the Beneficial Group for 'Defense-Affective', the results of R2 of NFO increased by adding the 'hedonic (E)' sub-dimension of NFO in the subjective dimension (Table 4).

Table 4 Confirmation of the Explanatory Power of Subjective and Objective NFO (Relevance) in Defense-Affective Attribute Effects

Detrimental Group			Beneficial Group		
Predictor	Model 1	Model 2	Predictor	Model 1	Model 2
Topical (A)	.366**	.415**	Intellectual (B)	.217**	.301***
Intellectual (B)	-.445**	-.356*	Hedonic (E)		-.169*
Belonging (G)		-.205*			
R^2	.057	.081	R^2	.047	.069
$\triangle R^2$	0.57**	.024*	$\triangle R^2$	.047**	.022*
$\triangle F^2$	5.159**	4.552**	$\triangle F^2$	8.588**	3.992**

*p<.05, ** p<.01, *** p<.001
Note. Model 1 analyzed sub-dimensions in the objective dimension.
Model 2 analyzed sub-dimensions in the objective and subjective dimensions combined.

Conclusions and Discussion

The results of this study demonstrated that the media coverage to which participants were exposed had a major influence on their change in cognition and attitudes regarding AI. Specifically, their change in attitudes corresponded to the tone of the news coverage. The participants in the Detrimental Group showed that their cognitive attributes (e.g., 'Defense,' 'Employment,' and 'Election') and affective attributes (e.g., 'Defense,' and 'Election') changed negatively following exposure to negative articles; the perceived importance of these cognitive attributes decreased; and their negative affective attitudes deepened. On the contrary, it was observed that the affective attitudes of the participants in the Beneficial Group changed in accordance with the tone of the news; their positive affective attitudes strengthened with positive articles.

Moreover, this study looked at the motivations that influence the formation of public opinion on AI technology and found that the public's specific needs caused changes in the public's cognition and attitudes toward AI issues. Furthermore, this study demonstrated that media effects on AI issues could be effectively explained when considering the subjective (formerly affective) aspects of NFO and the objective (formerly cognitive) aspects. With these results, the researchers analyzed users' thinking on AI issues, a topic that has not been the focus of agenda-setting studies before. In particular, a detailed explanation of why the public's behavior of seeking information about AI issues was made possible through the sub-dimensions of NFO, which indicated significant explanatory power.

In this research, therefore, explanatory power was found to be significant for the 'topical (A)', 'intellectual (B)', 'hedonic (E)', and 'belonging (G)' types of relevance in NFO. However, each type of relevance had a different role in explaining the agenda-setting effects. Firstly, the 'intellectual (B)' and 'belonging (G)' relevancies strengthened the participants' stances in accordance with the slant of the articles provided. Specifically, the relevance levels of 'intellectual (B)' accounted for the participants' change of stance in the same direction the media emphasized for both participant groups. When participants with high levels of intellectual needs read negative

articles, their negative opinions intensified, whereas when they read positive articles, their positive opinions intensified. The relevance levels of 'belonging (G)' played the same role in strengthening the stances of the participants, but only in the Beneficial Group. That is to say, it was found that the 'intellectual' needs for both positive and negative aspects of AI information and 'belonging' needs for positive aspects of AI information played a major role in strengthening attitudes held toward AI issues. Further research into the application of these needs would be beneficial.

Secondly, the role of 'topical (A)' and 'hedonic (E)' relevancies in this study offset the strengthening of the participants' stances; the coefficients (β) of these relevancies were significant in the opposite direction of the media effects. This offset was observed for 'topical (A)' in the 'Defense-Affective' attribute effects of the Detrimental Group and for 'hedonic (E)' in the 'Defense-Affective' attribute effects of the Beneficial Group. These results confirmed that even if the offset could be observed for the same attribute effects (Defense-Affective), the NFO sub-dimensions generating the offset depended on the respondents' stances. In addition, this offset is a new facet of NFO that has not yet been discussed. These relevancies that lead to an offset are expected to support critical thinking rather than unconditional acceptance when digesting media information. In other words, the 'topical' and 'hedonic' needs can help prevent a polarization of opinion on AI issues. Future studies are needed to investigate the reason for this offset when it comes to AI issues.

Thirdly, the 'hedonic (E)' and 'belonging (G)' relevancies were found to enhance the explanatory power of NFO as subjective sub-dimensions. From these results, it can be inferred that, unlike NFO in its previous conceptualization, the NFO tested in this study had explanatory power and, especially, affective attribute agenda-setting effects. These findings offer insight into current media situations where affective effects are becoming more powerful. Therefore, to increase the public's subjective satisfaction from AI information, study of the 'hedonic' and 'belonging' aspects of AI issues is required.

With the advent of new news sources such as social media, media information is now spread and reproduced through interactions among users, and the affective aspects of information impact the flow of news production (Papacharissi & Oliveira, 2012). Fierce competition among news agencies promotes the consumption of news that stimulates users' feelings (Colman & Wu 2010). Eventually, the reason for agenda-setting effects in the new media environment will no longer be identifiable without considering that people consume information not just to acquire knowledge, but also to satisfy their subjective needs, such as their need for self-confidence and/or a sense of belonging.

However, in this research, only the explanatory power of relevance was confirmed; the significant explanatory power of uncertainty could not be observed even though the concept of uncertainty was revised to overcome the uncertainty limitation in the original NFO concept. The original relationship between relevance and uncertainty was imbalanced, where the degree of NFO was mostly influenced by relevance (McCombs & Valenzuela, 2020). For example, respondents who showed low relevance would not expose themselves to media messages regardless of the magnitude of their uncertainty. Thus, even if their uncertainty was high, it did not play a significant role in fostering agenda-setting effects. Therefore, it was believed that NFO only existed in the presence of high relevance, and uncertainty was a concept that followed relevance. This unbalanced relationship received criticism from Matthes (2006) but has remained unresolved.

For this reason, An and Lee (2019) attempted to solve this problem by revising the concept. However, the results of this research still reveal an imbalance of explanatory power, with uncertainty having less explanatory power than relevance. Therefore, the conceptual revision of uncertainty should be pushed beyond the original viewpoint that limits uncertainty to a negative concept to be reduced (An, 2019). Future research should explore new methods of measuring uncertainty that are not constrained by the original viewpoint.

Additionally, there were other limitations. The agenda-setting effects in this study were created in an experimental survey condition with a short duration. Furthermore, this research did not consider factors that impact people's perceptions of AI issues, such as their level of media exposure to science fiction (e.g., Liang & Lee, 2017) and the amount of their interaction with AI at work (e.g., Dodel & Mesch, 2020). Considering the unique aspects of AI as a topic, consideration should be given to how these unique aspects may influence the media effects by comparing participants' changes in cognition and opinions regarding AI issues and other issues as well. Future research synthesizing the results of such studies with this research will be beneficial in deepening the understanding of the formation of attitudes towards AI-related topics.

The findings of this study offer a deeper understating of public opinion regarding AI issues and insight into the possibilities for advancing the theoretical development of NFO in agenda-setting theory. Specifically, categorizing NFO into objective and subjective dimensions will be particularly useful when interpreting the current media landscape, in which people's subjective needs are prioritized. Further clarification of this concept is expected to be gained through studies of more diverse issues within the sphere of public opinion. As such, it is hoped that NFO will be utilized in the interpretation of various other media phenomena.

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Appendix

Appendix I

- Positive articles (Beneficial Group)

매일 아침에 만나는

한국 데일리
KOREA DAILY

2019년 3월 11일

해군, 함정에 첨단ICT 적용 '스마트십' 구축한다
함정체계 통합하는 '스마트십'(Smart ship) 구축

해군이 첨단 정보통신기술(ICT) 기반으로 함정 체계를 통합하는 '스마트십(Smart Ship) 구축을 추진한다.

해군은 지난 8일 오전 계룡대 대회의실에서 열린 국정감사에서 첨단 ICT와 미래 신기술을 해군 전투력의 기본 단위인 함정에 적용해 작전수행 능력을 최적화하고 해상 작전부대의 전투력을 제고하기 위한 스마트십 개념을 제시했다.

우선 4차산업 혁명 핵심 기술을 함정별로 적용하는 구상이다. 인공지능(AI), 5세대 무선통신(5G), 스텔스 등 첨단 ICT를 사업 운

정 건조와 운용에 적용하고 관련 세계 해군 발전 추세를 분석 및 전문연구기관 협업을 통해 함정별 적용방안을 도출한다는 계획이다.

또한 지능형 정비체계도 구축하는 이는 함정의 운용 데이터 수집과 분석, 평가, 정비 권고 및 원격정비로 이어지는 정비체계로 고장 예상 부위를 사전에 예측해 정비함으로써 추가 손상 방지와 정비비용 절감 효과를 기대할 수 있다. 실시간 상태진단과 원격정비까지 가능한 체제로 확장이 가능하다.

해군은 미래 신기술을 활용한 무인수상정(USV)과 무인잠수정(UUV), 무인항공기

(UAV) 등 해양 무인 전력을 확보하고 육상지휘소, 지·해·공 플랫폼과 등과 통합하여 원격 제어 가능한 체계를 구축한다는 계획이다.

특히 해군은 전방위 안보 위협에 효과적으로 대응하기 위해 구축할 전력망과 연계해 3개의 기동전대로 편성하는 기동함대를 창설한다는 구상이다. 또 항공기 전력증강과 임무 확대에 따라 항공사령부 창설도 추진한다. 기동함대사령부는 해역함대의 대비태세를 지원하고 국가이익이 존재하는 먼 해역까지 작전 영역을 확대해 해상교통로와 우리 국민의 자유로운 해양활동 및 안전을 보

기동함대사령부, 항공사령부 등 창설
전방위 안보위협 대비, 新남방·북방정책 지원

호하는데 기여한다는 계획이다. 항공사령부는 대함·대지·상륙·기뢰전 등 다양한 해상항공작전의 완전성을 보장하게 될 전망이다.

심승섭 해군참모총장은 인사말을 통해 "해군은 해양에서의 다양한 도전과 위협에 효

과적으로 대처할 수 있도록 유·무인 융합 무기체계를 펼쳐서 활용하고 첨단 국가과학기술 기반의 스마트한 해군력을 건설해 우리의 해양 주권을 확고하게 지켜내겠다"고 밝혔다. 이어 "해군과 해병대는 새로운 시대에 평화의 수호자이자 해양강국의 국가비전을 구현할 주역으로서 강한 힘으로 한반도의 평화와 번영을 뒷받침하겠다"고 강조했다.

김관용 기자

AI가 직업 뺏는다고?…"새 일자리 26만개 창출"

오는 2025년까지 국내 자율주행 스마트카, 가상현실(VR), 3D프린팅, 사물인터넷(IoT), 클라우드컴퓨팅 등 5대 분야에서 27만 개의 일자리가 새로 생길 것이란 전망이 나왔다. 로봇이나 인공지능(AI) 등 과학기술 발전이 일방적으로 사람들의 일자리를 빼앗는 것이 아니라 새로운 일자리도 창출한다는 것이다.

지난 7일 소프트웨어정책연구소의 '미래 일자리의 급변, 소프트웨어' 보고서에 따르면 2025년까지 국내 자율주행 스마트카, VR 등 5대 유망 분야에서 하드웨어 부문 9만1290

개, 소프트웨어 부문 14만1021개, 서비스 부문 2만8876개 등 26만1187개의 일자리가 생길 것으로 추산됐다.

보고서는 2025년까지 예상되는 시장 규모에 산업별 10억 원의 재화를 산출할 때 직간접적으로 창출되는 고용자 수인 이른바 '취업유발계수'를 활용해 일자리 규모를 산출했다.

스마트카의 경우 자율주행에 필요한 소프트·하드웨어 분석 등에 투입되는 3만284개의 신규 일자리가 생긴다. VR는 VR제작 시스템 개

발, 소프트웨어 개발, 콘텐츠 제작, 플랫폼 운영 등에서 8만2813개의 일자리가 만들어질 것으로 예상했다. 3D프린팅은 7799개, IoT는 12만7578개, 클라우드컴퓨팅은 11만2713개의 일자리가 각각 생길 것으로 추산됐다.

신규 일자리 가운데 54%는 소프트웨어 부문이었다. 특히 클라우드컴퓨팅의 경우 2025년 하드웨어(8900개) 쪽 시장 규모가 소프트웨어(5970억 원)에 비해 더 크지만, 일자리는 하드웨어(3180개)보다 소프트웨어(9533개) 부문에서 더 많이 생길 것으로 예상됐다.

지금까지 과학기술 발전이 사람들의 일자리를 앗아갈 것이냐, 새로운 일자리를 만들 것이냐를 두고 논란은 계속되고 있다.

세계경제포럼 창시자인 클라우스 슈바프는 2020년까지 전 세계에서 500만 개 일자리가 감소할 것으로 내다봤고, 2013년 옥스퍼드대 칼 프레이와 마이클 오즈번은 미국 근로자 47%가 10~20년 사이 직업을 잃을 가능성이 높은 고위험 직군에 종사한다고 주장했다.

하지만 이 보고서는 과학기술 발전으로 인해 일자리가 새로 생긴다는 긍정적인 측면에

초점을 맞췄다. 3차 산업혁명 때도 기술은 기존 일자리를 쇠퇴시키는 동시에 새 직업을 창출하는 역할을 했다는 것이다. 보고서는 "일자리가 없어질 것에 대한 두려움 대신 AI 등 소프트웨어 기술을 적극 활용해 새 일자리를 창출하는 전략 수립이 무엇보다 필요하다"고 강조했다.

장석범 기자

'AI 접목한 표적 마케팅' 진화하는 미국 선거전

정보기술(IT) 혁명이 미국 정치권의 선거 전략·기획·실행 및 선거자금 모금 방식을 근본적으로 뒤바꾸고 있다. 인공지능(AI)의 도움으로 유권자 성향을 개인 단위로 분석해 최대 지지 층에게는 선거자금을 최대한 끌어내고, 부동층(浮動層)에는 차별화한 감성적 메시지를 쏟아 붓는 선거전이 전개되고 있다.

미국의 대표적인 과학기술론서 잡지 'MIT 테크놀러지 리뷰'는 지난 4일 IT 혁명 이후 최근 10년 간 미국 선거가 진화를 거듭하고 있다고 소개했다. 2008년 대선에서 당시 갓 등장한 소셜미디어(SNS)를 활용하는 방식으로

바락 오바마 캠프가 선보였던 '개별 유권자 맞춤형' 선거운동이 2018년에는 맞춤형 문자 전송 및 기부금 모금 방식까지 영역을 확대한다고 전개다.

민주당과 공화당 모두 TT 선거운동을 전담하는 컨설팅 업체를 운용 중인데, 수백만 명에 달하는 기부자 명단을 AI로 분석해 최소 비용으로 최대 선거자금을 끌어 모으고 있다. 또 SNS 검색을 통해 여론 동향을 살피거나, 개별 지지자 성향을 파악해 캠프와 후보자가 전달할 수 있는 가장 설득력 있는 메시지를 내보낸다.

이른바 P2P(peer-to-peer) 문자도 뉴타임스에 적극적인 P2P 문자의 강점이 친근함이다. 양반의 의원이나 주지사 후보자가 개별 이름을 알게되고 효율적고 생일이나 가족애에 우호 적인 예기를 꺼내려 지지를 호소한다. 유권자로서는 후보로부터 직접 친서를 받은 느낌이 들도록 연출하는 것이다. 유세 현장에서 후보자가 일일이 악수를 간과듯, 대면 효과를 누리는 셈이다.

가상된 높은 P2P 문자 선거운동은 이미 그 효과를 입증했다. 올해 치러진 주요 정당의 당내 경선에서 둘 없는 정치 신인들이 전통

적 선거운동에 집착한 기존 정치인을 극복하는 데 큰 도움을 줬다. 작년 6월 뉴욕 주 민주당 연방하원의원 예비선거에서 당내 중진 조크로울리 하원의원을 정치신인 알렉산드리아 오카시오 코르테스 등 민주당 예비경선에서 돌풍을 일으킨 후보자들 다수가 P2P 문자의 효과를 톡톡히 봤다.

실제 P2P 문자에 대한 유권자들의 피드백은 높은 편이다. 일단 메시지가 도달하는 비율이 과거 방식과 비교가 안 된다. TV 정치광고는 채널을 돌려버리면 그만이고 이메일 역시 스팸메일로 분류되면 빛을 보지 못하는데, 휴대

폰 문자의 경우 98%의 사람들이 5분 안에 내용을 체크한다는 통계가 있다. 민주당 전국위원회 조사에 따르면 P2P 문자의 경우 우편물 만 받은 유권자들보다 기부하는 비율이 8% 높았고, 투표장에 나오는 경우도 많았다. 공화당 디지털 선거 전략 담당자였던 제티 랜싱은 "문자 메시지는 더 인간적이고 정치 참여율을 높일 수 있다"고 말했다.

강윤주 기자

우리가 함께 할 공간은
과학기술 속에 있습니다

- Negative articles (Detrimental Group)

매일 아침에 만나는

한국 데일리
KOREA DAILY

2019년 3월 11일

"기계가 인간生死 결정 안돼"… '킬러로봇' 개발
전 세계 로봇 전문가들, 킬러로봇에 대한 우려의 목소리

스스로 적군을 파악하고 공격하는 이른바 '킬러로봇'이 현실화하면서 "기계가 인간의 생사를 결정하게 될 날"이 가까워지고 있다는 지적이다. 인간의 개입 없이 스스로 전투를 수행하는 킬러로봇 개발이 가시화되면서 전 세계 로봇 전문가들의 우려도 커지고 있다.

지난 7일 미국 시사주간지 뉴스위크 등에 따르면, 호주와 캐나다의 인공지능(AI)·로봇 연구자 수백 명이 각각 자국 총리에게 공개서한을 보내 AI 기술의 군사적 이용 금지를 촉구했다. 호주와 캐나다의 연구자들은 지난주

멜컴 턴불 호주 총리와 쥐스탱 트뤼도 캐나다 총리에게 공개서한을 보내 AI 무기화에 반대한 뜻을 천명할 것을 요구했다. 이들은 "킬러로봇들이 개발되면 충돌 규모가 이전보다 훨씬 커질 것"이며 "최악의 결과는 사람이 아닌 기계가 인간의 생사를 결정하는 것"이라고 경고했다. 작년 8월에는 전 세계 26개국의 정보기술(IT) 및 로봇 전문가 116명이 유엔에 공동서한을 보내 "판도라의 상자를 열지 말라"며 킬러로봇 개발과 제작 금지를 강력히 촉구했다. 이들은 킬러로봇이 전쟁에 사용될 경우 제3차 세계대전이 발발할 가능성

이 있다고 경고했다. 킬러로봇은 보통의 군사용 로봇과 다르게 '자율성'을 갖고 있다는 점에서 논란이 되고 특히 킬러로봇이 독재자나 테러리스트 집단에 들어가거나 시스템이 해킹당할 경우 돌아올 수 없는 강을 건너게 된다는 것이다.

현재 미국과 영국, 러시아, 중국 등 세계 각국은 AI를 활용한 무인전투기와 삼성을 전투 로봇 개발에 열을 올리고 있다. 미 해군의 무인항공 시 헌터, 보잉의 무인잠수정 '에코 보이저, 러시아의 무인탱크 'MK 25, 영국의 무인전투기 '타라니스' 등이 대표적이다. 한국

의 비무장지대(DMZ)에도 사격까지 가능한 자동화무기 '센트리 가드 로봇'이 배치돼 있다. 다만 아직 공격 판단은 로봇이 아닌 군인의 명령에 의해 이뤄진다.

킬러로봇의 실전 투입은 시간문제로 보인다.

호주·加 연구자 공개서한
"AI 활용으로 자율성 커져 충돌 이전보다 훨씬 심각 3차대전 초래할 수 있어"

킬러로봇 반대 운동을 주도하는 호주 뉴사우스웨일스대(UNSW)의 AI 전문가 토비 월시 교수는 "로봇 연구자들에게 로봇을 마지막으로 어디서 쓸 것인가를 묻는다면 그 답은 전장"이라며 "킬러로봇의 시대가 열리고 있다. 사람 대신 킬러로봇끼리 전투를 벌이는 일도 머지않았다"고 말했다.

김세희 기자

"AI 위협에 1천136만명이 고위험군…중산층 타격 집중"

국내 취업자 43%인 1천136만명이 인공지능(AI)으로 대체 가능성이 큰 고위험군에 종사하는 것으로 분석됐다. 직군별로는 사무직·판매직기계조작직 소득 수준별로는 중산층에 일자리 위험이 집중돼 피라미드식 위험을 초래할 수 있다는 분석이다.

김건우 LG경제연구원 선임연구원은 지난 5일 '인공지능에 의한 일자리 위험 진단'이라는 보고서에서 "우리나라 전체 일자리의 43%가 인공지능으로 대체될 위험이 큰 것으로 나타났다"고 밝혔다. 올해 상반기 전체 취업자 약 2천660만명에 적용해보면 1천136

만명이 고위험 일자리에 종사하는 것이냐는 대체 가능성이 보통인 중위험군은 39%인 1천36만명, 저위험군 일자리 종사자는 18%인 486만명으로 나타났다. 자동화 위험도는 직업에 따라 차이가 있었다. 사무직의 86%, 판매직은 78%, 장치·기계조작 및 조립직은 59% 등 3대 직군이 고위험 일자리에 속했다. 반면 전문가 및 관련 종사자는 77%가 저위험군 일자리에 종사하는 것으로 나타나 대체 가능성이 작았다.

단순노무 종사자, 농림어업 숙련자 등에선 중위험군 취업자 비중이 각각 60%, 90%로 가장 높았다. 이 같은 결과는 소득 수준별로 중산층이 자동화 총격에 더 취약할 수 있음을 보여준다. 보고서에 따르면 월평균 소득 100만~200만원, 200만~300만원에서 고위험군 비중이 각각 47%로 가장 높았다. 이보다 소득이 낮거나 높으면 고위험군 비중이 작아졌다. 월 소득 100만~300만원 구간에 전체 고위험군 취업자의 63%가 집중된 것이다.

직업별로는 통신서비스 판매원, 텔레마케터, 인터넷 판매원 등이 대체 고위험 직업이었다. 관세사, 회계사도 자동화 위험이 큰 20대 직업에 포함돼 전문직도 자동화 위험을 벗어나진 못하는 것으로 파악됐다. 반면 영양사, 의사, 교육 관련 전문가와 성직자 등은 AI로 대체되기 힘든 직업으로 꼽혔다. 주로 보건, 교육, 연구 등 의사소통이나 고도의 지적 능력이 필요한 직업이었다. 산업별로 보면 도매 및 소매업(75%), 제조업(67%), 숙박 및 음식점업(59%) 취업

자 중 고위험 일자리 비중이 높았나. 교육 수준별 고위험군 비중은 고졸 51%, 전문대졸 48%, 대졸 41% 순으로 나타났다. 김 선임연구원은 AI로 자동화가 빨라지면 실업, 양극화 문제가 부각돼 사회적 비용이 확대될 수 있다고 우려했다.

김수현 기자

"하지도 않은 말을…" AI 이용 가짜 동영상 '딥페이크' 경계령

'페이크 뉴스(fake news·가짜뉴스)'의 위력을 훨씬 능가하는 '딥페이크(deepfake)'의 만연을 우려하는 목소리가 커지고 있다.

딥페이크는 아직은 큰 문제는 아니지만, 기술발전과 함께 1~2년 안에 미국 정계를 포함해 국제사회에 큰 문제를 초래할 수 있다고 AP통신이 지난 2일 보도했다.

딥페이크는 인공지능이나 얼굴매핑(facial mapping) 기술을 활용해 특정 영상에 합성한 편집물을 일컫는다. 특정인의 표정이나 바 롯 목소리, 억양 등을 그대로 흉내 내면서 하지도 않은 말을 얼굴을 드러내놓고 말한 것처

럼 보이게 한다.

거짓말을 파악하기 어려운 이들 영상을 이 온라인을 통해 유통될 경우 '역정보 전쟁(disinformation war)의 새로운 무기가 되리라는 게 AP의 설명이다.

이 기술은 지금까지는 주로 유명인을 비방하거나 개그맨들의 웃음거리 소재로 활용됐지만, 앞으로는 정치인, 나아가 국가를 상대로 한 악의적인 활동에 충분히 활용될 수 있다.

미국의 정치인들이나 정보관계자들은 딥페이크로 불리는 가짜 동영상이 국가 안보에 위

협이 되거나 선거 개입의 위험성을 내포하고 있다고 우려하고 있다.

공화당 소속 마르코 루비오 상원의원은 외국 정보기관이 가짜 동영상을 만들어 미국 정치인이나 미국의 평판을 크게 훼손할 수 있다고 경고했다. 예전대 대통령 받거나 인종차별적 욕설을 하는 미국 정치인, 또는 해외에서 민간인을 학살하는 미국에 관한 가짜 동영상을 만들어 유포할 수 있다는 것이다.

미국 다트머스 대학의 디지털 포렌식 전문가인 허니 파리드는 "미국에서는 지난 11월 중간선거와 1년 후 전국 차원의 선거에서 이

런 문제들을 겪기 시작할 것이라고 AP에 말했다.

파리드는 또 "물론 이 기술은 극강이 없는 만큼 그 영향이 전 세계적으로 번질 것이라면서 "우리가 직접 목격한 것조차 믿기 어려운 새로운 세상에 들어서고 있다"며 지적했다. 반대로, 진짜 동영상을 믿지 못하는 일도 가능하다.

미국 국방부 소속 방위고등연구계획국(DARPA)은 이 문제의 심각성을 깨닫고 이미 2년 전, 가짜 사진과 가짜 동영상을 분간할 수 있는 기술을 개발하기 위한 4년간의 연구

프로그램에 착수했다.

하지만 현재 DARPA의 기술 수준이 날로 발전하는 딥페이크 기술을 따라잡을 수 있을지는 불투명하다.

미국 스탠퍼드대학 국제안보협력센터(CISO) 앤드루 그로토 연구원은 "1~3년 안에 진짜 동영상과 가짜 동영상을 구별하는 경합로써 어려울 것"이며며 많은 나라가 이를 활용하려는 유혹에 빠질 가능성이 크다고 신호했다.

김기성 기자

우리가 함께 할 공간은
바로 자연입니다

Appendix Ⅱ. Measuring Items of Each Type of Relevance

Objective Dimension	Topical (Rubin, 1981; Saracevic, 1996)	I have an interest in AI AI is what I follow I have a lot of questions about AI I want to satisfy my curiosity about AI
	Intellectual (Blumler & McQuail, 1969; Saracevic, 1996)	I want to acquire novel information about AI I want to learn understandable information about AI I want to get useful information on AI I want to secure high quality information with regards to AI
	Situational (Saracevic, 1996; Palmgreen et al., 1980)	This information on AI is related to my current situation I'm placed in a situation that requires understanding of AI My current circumstances require judgement based on AI This information is helpful for deciding future action regarding AI
	Surveillant (Blumler, 1979; Schutz, 1967, 1970)	I want to know about society by consuming news on AI I want to monitor how the government utilizes AI I want to evaluate politicians' stances and policies on AI I want to become active in society by learning information about AI
Subjective Dimension	Hedonic (Arnold & Reyolds. 2003; Katz et al., 1973; Xu, 2007)	I want to kill time by consuming information on AI Reading about AI allows me to unwind Reading about AI gives me something to do to occupy my spare time Reading about AI allows me to pass the time without any particular purpose Reading about AI entertains me
	Self (Katz et al., 1973; Rubin & Perse, 1987)	I hope to confidently express my opinion on AI I want to know my thoughts on AI I want to find support for my opinion on AI I wish to acquire a higher standard of living by learning information about AI
	Belonging (Papacharissi & Rubin, 2000; Rubin et al., 1988)	I want to identify with the stances of other members of society by learning more about AI I want to talk about AI with people around me I want to feel a sense of unity that comes from my thoughts on AI being similar to those of others I desire to feel satisfaction from being affiliated with society through learning about AI I desire to participate in society by learning about AI
	Evasive (Ebersole, 2000; Reuter, 2007; Rubin & Perse, 1987)	I can escape from reality by reading about AI I can distract myself from what I'm doing by reading about AI I can take a break from the rest of my family or others by reading about AI I can compare my reality with the idealized reality in media through learning about AI Reading about AI fuels my imagination