Deloitte.

Cognitive Artificial Intelligence

The Invisible Invasion of the Media Business

Contents

Introduction

Artificial Intelligence (AI) has been around since the 1950s, but AI and cognitive technologies have only recently taken off in business.

This statement is supported by current venture capital funding for firms with cognitive technologies: In 2016, over 650 AI startups raised $5bn, nine times as much as the $0.59bn that were raised in 2012. Among the most active AI investors are Intel, Google, GE, and Samsung, who have invested in or acquired more than 50 AI startups since 2011.

For our 2016 Global CIO Survey, Deloitte asked 1,200 IT executives to name the emerging technologies in which they plan to make significant investments over the next two years, and 64 percent included cognitive technologies.

The rapid diffusion of new technologies in the digital and cognitive space is also changing the media industry and the way we consume news and entertainment.

The days when your only means of consuming content were through the TV or printed newspapers are gone. Today, the media landscape is more fragmented than ever - there are endless ways to watch your favorite show or read the latest news. Social media channels have become the top destinations for content consumption and even enable consumers to generate their own content. In the most recent digital news report by the Reuters Institute, 51% state social media are one of their sources of news each week, while 36% say they are comfortable with automatically selected content based on past consumption. In particular, younger generations are more comfortable with algorithms than with editors. In fact, only 40% in the EU agree that they can trust news organizations and journalists most of the time.

Millennials and younger generations already spend more time streaming content than watching TV, which creates an enormous opportunity for both content creators and advertisers to forge a personal relationship with end consumers. Personalized content is in high demand, shared via social media platforms every day. It looks like power is shifting between traditional and new media, therefore continuing to learn about new technologies and their business solutions is crucial for understanding the new media landscape. This paper aims to shed light on the next promising technology that has the potential to disrupt media: Cognitive artificial intelligence. But why is cognitive artificial intelligence ready to change the game for the whole media sector? In the following paragraphs, we will establish a common understanding of AI and cognitive technologies before we examine uses cases in the media sector and their relevance to the C-Suite.

What is AI?

While some say that machines are not (yet) capable of true Artificial Intelligence, it is a broadly accepted idea that an AI refers to a system created by humans that is able to perform tasks, that would otherwise require a human being[1]. More precisely: Cognitive AI is based on programs and/or computers with the following abilities[2]:

1. **Cognition**
   The ability to identify objects visually, understand and transcribe human speech, and understand texts

2. **Memory**
   The ability to hold knowledge and to store it somewhere

3. **Learning**
   The ability to create knowledge about the world that can be used for reasoning

4. **Reasoning**
   The ability to use knowledge about the world in order to deduct conclusions from available information

Interestingly, we now even see systems emerging that show the first signs of imagination, which of course is of special interest to the media industry where products are often the result of creative work. We outline the various levels of sophistication of AI below to provide a framework with some tangible examples.

Robotics Process Automation (RPA) tools and solutions currently deployed are used to automate manual and repetitive activities that require no judgment. Instead they rely on a set of simple rules on which they base their decisions. Since those solutions require no automated reasoning, they are actually not an example of AI. Nevertheless, more sophisticated robotics solutions also provide automated reasoning and use machine learning to become better over time. This is a clear sign that the solution is some form of AI. If they are able to process unstructured data like images, text and gestures and understand their actual meaning, one could call it cognitive AI.

What is cognitive AI?

A stage in automation technology where cognitive technology augments human decision-making capabilities, while gradually being able to perform certain judgment-based tasks independently in a manner similar to human beings.

[1] Deloitte University Press – Demystifying Artificial Intelligence
[2] ARTIFICIAL INTELLIGENCE – Artificial Intelligence: Definition, Trends, Techniques and Cases - Joost N. Kok, Egbert J. W. Boers, Walter A. Kosters, Peter van der Putten and Mannes Poel

Stages of AI

Stage	Description
Robotics **Mimics Human Actions**	• Used for rule-based processes, such as invoice processing exceptions • Addresses priority business problems driven by process breakages • Enables - Faster handling time - Reduced handling costs - Reduced error rates
Intelligent Automation **Mimics/Augments Quantitative Human Judgment**	• Processes requiring judgment such as commercial contract understanding, insights, and implications • Covers machine learning capability • Interprets human behavior
Cognitive Automation **Augments Human Intelligence**	• Used for predictive decision making, such as Amazon Echo and Alexa • Dynamically self-managing and adaptable
Artificial General Intelligence **Mimics Human Intelligence**	• Systems that completely replicate human capabilites • Turing Test Definition: "A test for intelligence in a computer, requiring that a human being should be unable to distinguish the machine from another human being by using the replies to questions put to both"

Source: "Robotics Process Automation (RPA) and more advanced automation", Deloitte presentation, October 2016

What are the technologies behind cognitive AI?
We distinguish between the field of AI and technologies that emanate from AI. Individual technologies are getting better at performing specific tasks that only humans used to be able to do. We call these cognitive technologies, and it is these technologies that business and public sector leaders should focus their attention on[3].

- **Computer vision**
  Technology that allows computers to identify objects in images and to describe what is actually going on by using sequences of image-processing operations to decompose image data into manageable pieces.

Modern image recognition typically uses neural networks. Technically a neural network is a set of nodes (neurons) that are linked together via edges. The nodes are defined by an activation function and the edges going in and out of them. Each edge carries a so-called weight. Structurally, the network is organized in the form of layers, starting with an input layer, followed by some hidden layers and ending with an output layer. For the task of plain image recognition, the structure used most widely is that of a Convolutional Neural Network (CNN), which mimics the structure of the visual cortex of the human brain. For more complex tasks like describing the actual content of a picture in natural language, one would use a different structure, e.g. a Recurrent Neural Network (RNN). The input layer is used to capture the input data, i.e. for image recognition each node would receive the color information of a pixel of the respective image. The hidden layers are used to store both the knowledge the network has gathered about the world and the logic it uses to reason about it. The output layer is used to present the results of the networks reasoning. Training such a neural network is typically done in the form of supervised machine learning. This means that the system learns from a set of labeled examples, in the case of image recognition these are images labeled by their content, e.g. cat, dog, house etc. During the training process, the network has to look at each image and make a guess about the label. Depending on how good the guess was, i.e. how far off it was from the true label, the weights of the network are changed slightly. This process is repeated for many iterations, typically until no significant improvement can be achieved. As these neural networks have many hidden layers, i.e. they are deep, this process is also called Deep Learning.

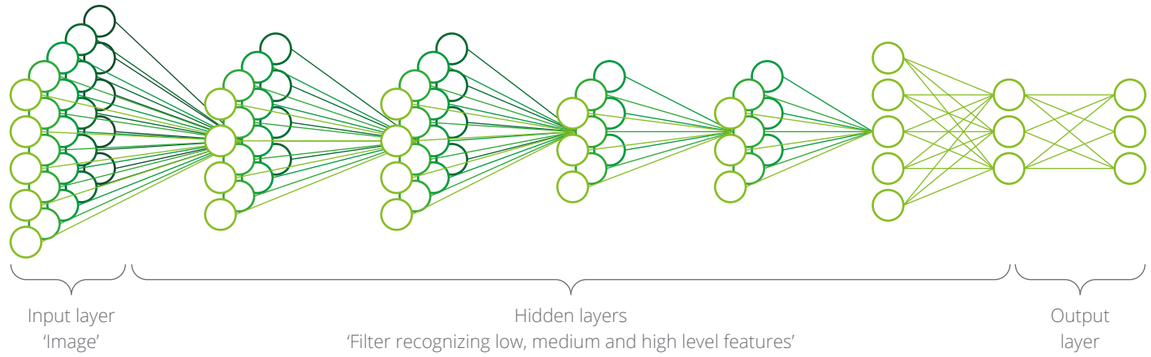
- **Speech recognition**
  The ability to automatically and accurately transcribe human speech.

State-of-the-art speech recognition systems rely on neural networks, too. While the training process is basically the same as with neural networks for image recognition, their structure is that of a Recurrent Neural Network (RNN). These types of networks differ from typical image recognition networks with regard to the direction of the edges connecting the nodes. While in the former the edges always point in the direction of the output layer, i.e. forward, the edges of the latter can also point backwards.

A RNN is able to handle time-dependent data such as speech, as well as text, through its ability during training to remember significant events. This is important for speech data (and other sequential data) where what came last helps determine what comes next. For instance, if someone says “the apple is”, the next word is more likely to be “red” than “Fred”, although both might sound quite similar, especially over the phone.

[3] http://www.theatlantic.com/sponsored/deloitte-shifts/demystifying-artificial-intelligence/257/

Deep neutral network example



Source: “unsupervised learning of hierarchical representation with convolutional deep belief networks’, ICML 2009, & Comm. ACM 2011. Honglak Lee, Roger Grosse, Rajesh Ranganath, and Andrew Ng

- **Natural language processing**
  The ability of computers to process text (extract meaning from or generate text), e.g. translate or summarize it.

For various reasons, natural language processing is regarded as a very hard problem that is still not completely solved. While accurate and even simple approaches exist to tackle problems like sentiment analysis or identifying the topics a text is about, systems that try to create a good natural language summary of a written text or that translate text from one language to another have still far to go.Some of the main problems are ambiguity, sarcasm, slang and novel words, inconsistencies, typos and grammatical errors as well as complex or long sentences. To give readers an idea of how NLP works, one can start with a very simple example. A much-used technique for tackling very specific NLP problems is to transform a text into a vector of word counts, thereby basically just answering the question, how often does each word occur in a text? One can then simply calculate distances between different text vectors to gain insight into how similar those texts are. Sentiment analysis can be done similarly, e.g. by first assigning sentiment values to words (high values to words that indicate a positive sentiment and low values to those indicating negative sentiment) and then multiplying those values with text vectors.

While these techniques clearly do not involve any sophisticated understanding of the content of texts, they do give reasonable results. However, much more sophisticated approaches are required for real understanding.

Part-of-speech tagging, for instance, is used to determine which words in a sentence are nouns, verbs, articles, conjunctions, and so on. This then allows us to determine how the different parts of a sentence interrelate and to correctly answer questions like "who did what?". Part-of-speech tagging is a basic tool for NLP and helps tackle problems like disambiguating homonyms. It is used to preprocess text for further analysis. Other approaches using neural networks for language translation try to teach systems to understand concepts, e.g. the concept of time. Just a few years ago, advanced translation systems were trained on bilingual corpora (precisely translated text) and then translated the different parts of a sentence by looking for the closest representation of those parts in the other language. New systems (e.g. Google Neural Machine Translation) work differently. The goal here is to teach the system to really understand the message of a sentence. When it comes to the actual translation, instead of translating a sentence part by part, they generate a new sentence in the target language, that conveys the same idea the original sentence did. The advantages of this technique should not be underestimated, because the earlier approaches required huge corpora for each pair of languages to be translated which often just do not exist. This new approach instead teaches the system to really understand languages, making translation basically a byproduct. Once the system understands a particular language, it can translate without specifically being taught to do so by progressing from this language to the idea being conveyed to expressing the idea in all other languages it knows.

"Language is a part of our organism and no less complicated than it."

Ludwig Wittgenstein

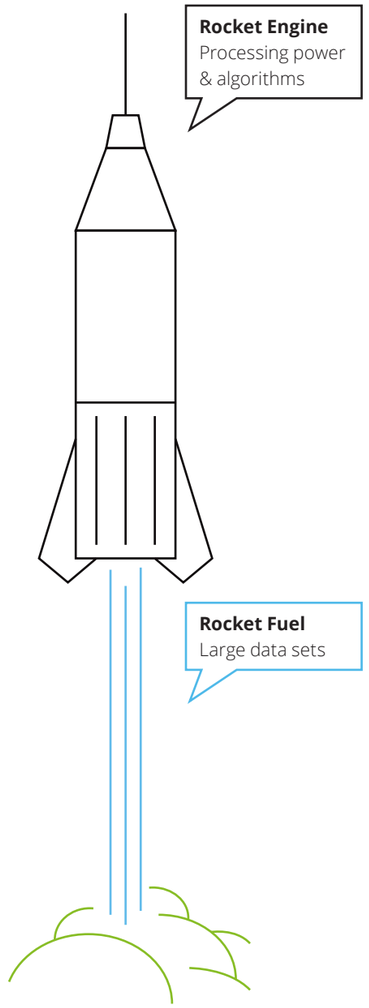
Why is this the right time for AI in media?

1. **Vast amount of and easy access to data**
   Thanks to social media, mobile devices, and low-cost sensors, the volume of data in the world is increasing at a pace never seen before. The amount of data doubles in size every 12 months and is expected to exceed 40 zettabytes (40 billion tera-bytes, or in other words the capacity of 10 billion typical hard drives) by 2020, compared to only 4 zettabytes in 2013[4]. The unprecedented growth of data, especially in form of unstructured data, is critical to the advancement of machine learning as the more data these systems consume, the "smarter" they become.

2. **Big Data Analytics**
   New techniques for managing and analyzing very large data sets, i.e. Big Data Analytics, can be credited with advances in AI because they use statistical models for probabilistic reasoning about images, text, or speech. Exposing AI systems to large sets of data helps to improve and train the decision-making process.

3. **Processing power**
   Moore's Law originated around 1970 and states that the number of transistors in a computer chip will double in size approximately every two years, which continues to apply today. As data volumes have grown larger and analysis methods have become more sophisticated, the distributed networks that make data and processing capacity (cluster computing via the cloud) accessible to individual users have become exponentially more powerful. Today, we can quickly process, search, and manipulate data in volumes that would have been impossible to process only a few years ago. The current generation of microprocessors deliver 4 million times the performance of the first single-chip microprocessor introduced in 1971. However, with regard to certain task this incredible advance is dwarfed by the improvement that comes from better algorithms.

We can use different cognitive technologies to develop use cases throughout the media value chain, starting with content production, moving to content distribution and ending with customer experience, as shown in the table on the next page.



Source: Andrew Ng

[4] https://www.emc.com/leadership/digital-universe/2014iview/executive-summary.htm

Cognitive technologies in the media value chain

Benefits of Cognitive Technologies	Natural Language Processing	Speech Recognition	Computer Vision	Media Value Chain
Time/cost efficiency Functionality Generate insights				
Functionality	Narrative-editorial contribution and content creation Speech-to-text translation including creation of logical storyline based on input	Speech-to-text translation including creation of logical storyline based on input	Narrative-editorial contribution and content creation	Media content is produced based on AI-supported writing, speeches and visualizations. → **Content production**
Time/cost efficiency, Functionality	Automated film scene curation and cutting of film material based on language and audio (e.g. film music) analyses	Intelligent music suggestions based on stress level of voice	Combatting fake news and violent content	Media content is curated and aggregated based on smart filtering by relevance and preferences. → **Content aggregation**
Time/cost efficiency, Functionality	B2B-transparency in media buys based on audio and language	B2B-transparency in media buys based on voice	B2B-transparency in media buys based on visuals	Based on the media content, system can recognize in which format to pack the media in order to make it most appealing for target group. → **Content packaging**
Functionality	Automated selection and distribution of content including automated scheduling	Automated selection and distribution of content including automated scheduling	Automated selection and distribution of content including automated scheduling	Automatic distribution of content through most effective channels based on media content. → **Distribution**
Time/cost efficiency, Functionality, Generate insights	Cognitive news feed based on conversations	Cognitive music controling voice (e.g. Amazon Alexa)	Cognitive TV program / media guide / remote control	Intuitive and easy access to devices including remote controlling. → **Access device**
Time/cost efficiency, Functionality, Generate insights	Next level customer service	Next level customer Service	Cognitive chatbots	Cognitive enhancement of overall consumer experience. → **Consumer**

Use Cases

For the scope of this paper, we want to highlight three use cases that will be relevant to the C-Suite in the media sector for the upcoming years.

#1 Fight against fake news and offensive content

Fake news and offensive content (e.g. violance, nudity etc.) continue to be topics of great relevance for most media companies. Especially fake news have become such a concern for society that for example Facebook has launched a national print advertising campaign against fake news in the UK and other European countries to educate the public ahead of political elections. The problem arises when too much information is shared at a high frequency through the internet, thereby not leaving enough time for a manual review. As a result, and in absence of working and mature content monitoring solutions, companies such as Facebook hire more and more employees to review and fact-check content to prevent inappropriate information from going viral and avoid punitive fines. This is however not a long-term solution because, as the volume of data grows rapidly, the manual handling of misinformation and inappropriate content would at some point become prohibitively expensive. Manual fact-checking also introduces bias into the screening process, as it is nearly impossible to prevent personal views, opinions, and beliefs of team members influencing their judgment. In addition to fake news, there is also the fight against offensive material, i.e. content with violence and/or nudity, which is posted on social media and manually flagged and reported by users.

Currently, it takes quite a long time time until these items are removed. However, pressure is building. The German parliament for instance recently adopted the "Netzwerkdurchsetzungsgesetz", or "Facebook law", as it is commonly called, which introduces fines of up to 50 million euros if problematic content is not removed fast enough.

Cognitive artificial intelligence can assist with ensuring data veracity, identifying fake news and automating the censorship or deletion of such content intelligently. In the digital era, not only social media companies, but also traditional (news) media companies can use cognitive technologies to detect inappropriate content, helping them remain credible and trustworthy. The questions are: How can they do it and where should they start?

Cognitive AI has the potential to reduce the manual effort of data veracity, the identification of fake news and violent content to assure credibility and trust.

Current situation
Not only Facebook, but also many news media companies have editors or a designated team that fact-check their stories. The team verifys the author or creator of the article, names stated, titles, geographic locations, numbers, sources used, and so on. There are external tools such as Spike, Hoaxy, or Google Trends that can aid the fact-check team during this process.

However, not only is this time-consuming and relies on human judgment, it is also impeded by the pressure for clicks which has pushed many news organizations to not look too closely. Should a story turn out to be fake, they will publish another story that reveals the "real" truth to push the news cycle another time and generate another round of clicks. Of course these black sheep thereby willingly undermine the trustworthiness of news media companies as a whole.

Current challenges
There are three main challenges regarding the verification of content:

- **Increasing amount of data**
  The amount of content produced and shared is growing at a fast rate and presents a serious challenge to fact-checking teams as they tackle their task manually with limited resources.

- **Longer detection time**
  Verifying sources and authors takes a significant amount of time, which editors are often unwilling to invest, especially when they are under constant pressure to quickly scout the next sensational story.

- **Bias**
  The fact-checking team is made up of human beings with their own emotions and political views, which can influence their judgment of contents.

"If we are not serious about facts and what's true and what's not, if we can't discriminate between serious arguments and propaganda, then we have problems."

Barack Obama (Guardian)

AI-based solution
With cognitive technology, media companies can more effectively identify fake news and content displaying violence or nudity. Techniques that help include (1) natural language processing (NLP) and (2) Image Recognition.

(1) One can start by using NLP techniques to extract information from a text, be it an article or a post on a social media platform. A classification model helps identify the general topic(s) a text is about and whether or not a text is clickbait. The latter would work similar to how spam mail is identified. Other techniques can be used for information extraction, which is basically about extracting structured data from a text.

There are many different techniques for performing text classification. A simple one would be an unsupervised machine learning technique called k-means clustering applied to a collection of sample texts, which could be turned into text vectors as described above. K-means would then group those texts that are most similar into distinct groups. As this is a technique for unsupervised learning, the engineer would have to look at the resulting groups and assign them names (e.g. appropriate and not appropriate). The resulting model can then be used to classify new text. Of course this is a very limited approach, much better yet more complex methods exist. An example would be using neural networks and a technique called word2vec.

(2) In case a text comes with a picture or video, which technically is just a sequence of pictures, one can use a model for image classification to identify its content. Facebook for instance uses neural networks to add tags about the content of a photo to every photo that is uploaded. If a tag is regarded as problematic, the photo/video can simply be removed.

To build such a model, one would first have to create a database containing many labeled pictures which actually contain the unwanted content. Using machine learning, these can then be used to train a model (e.g. a neural network) which screens every picture posted on a website. The same principle applies to videos but requires much more data processing power.

(3) In a next step, the information extracted from the content in previous processing steps can be used for fact checking, which could be simply done by comparing the now structured information with information from fact databases or comparing the information with information extracted from reliable sources.

Impact on media companies
The use of cognitive AI allows media companies to fight fake news and violent content more effectively and with higher reliability. It can support editors and journalists in making informed decisions about publishing a specific piece of content, as it has the power to cope with the vast amount of data and search the whole internet for proof to verify a piece of content, while also eliminating political and emotional judgment human beings have on certain topics. The main benefits of cognitive AI in the fight against fake news come mainly in two forms: (1) cost saving from eliminating time-consuming fact checks, so editors and journalists can focus on their main work, and (2) higher trustworthiness.

Example

Imagine CNN tweets about a certain topic, how can cognitive AI technology support other media news companies to verify the piece of information?

CNN

Netflix plans to spend up to $8 billion on programming next year cnn.it/2ifoVSX.

Language	Reputation	Context	Facts	Total Score
No buzz words identified, correct use of grammar **Score: 5/5**	Verified account, real follower base, posts regularly **Score: 5/5**	Content posted on Twitter, scans history of past posts **Score: 5/5**	Similar facts found on other websites, verified source link **Score: 4/5**	19/20: Content is trustworthy and most likely true

Language

The cognitive technology could consist of a model trained to identify clickbait similar to a spam filter that learns to recognize spam. Through Natural Language Processing, it also understands the semantic meaning by assessing the subject, headline, text, and location of specific content.

Context

Through the analysis of text, pictures, metadata, history, and comparison to past content, the accuracy of context presented receives a score in an attempt to understand the context without relying on external sources.

Reputation

The cognitive technology measures and scores the reputation based on trustworthy ranking websites (e.g. Alexa web rank) by considering features such as domain name or traffic history.

Facts

The cognitive technology can analyze other websites and check for the same or similar facts to weigh it against credible media sources and assign a score.

#2 Customer Service

The digital world has introduced new opportunities for media companies, especially in building a personal relationship with customers as they switch more and more to on-demand content and subscription-based payment models, like the video streaming services offered by Netflix or Amazon Prime video. However, customers have more power than they used to and are becoming more demanding than ever. Today's customers expect customer service on their own terms, which is why media companies need to keep customer service satisfaction high in order to stay ahead of the game.

According to an IBM study, 91% of customers have called a customer service more than once to solve the same issue. Furthermore, 90% complained that they had been put on hold for too long, while 80% had to repeat the same information to a different person during the same call.[5] Poor customer service is the main reason why half of all customer service calls remain unresolved, which leads to significant losses of customers for many companies.

As a result, more money is invested to improve customer service and the overall customer experience. Netflix, for instance, has opened a new European customer service hub in Amsterdam just to keep customers happy with their services. Cognitive AI can augment human intelligence to increase customer satisfaction and make their lives better as well as save significant resources for the media companies and increase retention rate. In fact, IBM predicts that by 2020, more than 85% of customer interactions will be handled without human involvement.[6]

Cognitive AI can augment human intelligence to increase customer satisfaction and make their lives better.

1.	2.	3.	4.	5.	6.
Identify customer	**Verify problem and assign the right customer service representative**	**Identify solution**	**Provide solution or rework case (if solution fails)**	**Escalate and reassign case to appropriate customer service representative**	**Close the case & store data collected to improve customer service**

[5] IBM (https://www.ibm.com/think/marketing/customer-service-of-the-future-is-powered-by-artificial-intelligence/)
[6] IBM (https://www.ibm.com/think/marketing/customer-service-of-the-future-is-powered-by-artificial-intelligence/)

Current situation
Current customer services are usually provided by phone, email or live chat with people who have been trained to assist customers with every issue they could potentially have. After receiving an issue, which we call a customer service case, it goes through the following simplified process:

Bots have been implemented to assist or even perform certain steps in the process over the phone or via chat. For example, the bot can name potential causes for a problem based on the information provided or it can decide which question to ask next. With the help of AI, these bots are becoming smarter and can take on more and more tasks.

Current challenges
There are four main challenges current customer service systems within a media company face:

- **Inconsistency of service**
  Providing a consistently high quality customer service experience is essential. However, in reality it can vary massively between agents. Customers demand consistent and accurate information, no matter which agent they talk to.

- **Inefficient information sharing**
  Finding the solution requires the agent to master a complex process and know where to look for information. This is often a time-consuming process and leads to inefficiency, as most content is stored as unstructured text.

- **Availability and time to solution**
  Most customers want a solution now, therefore the solution-finding process not only needs to become faster and smoother, but also 24/7.

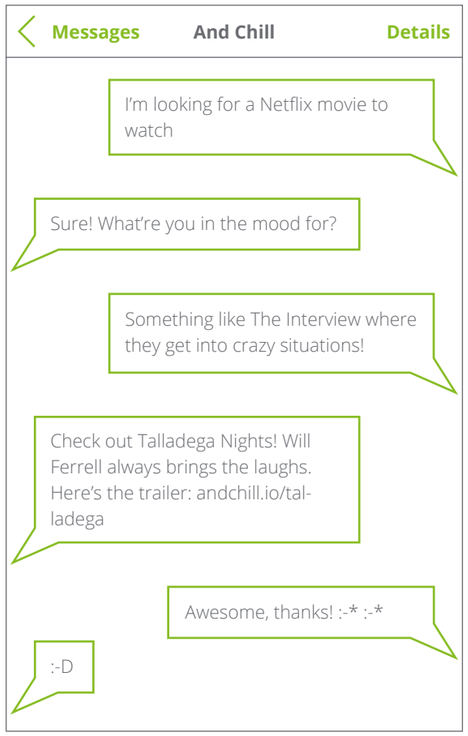
Drawbacks of current bots: Even though bots are becoming smarter, they still lack human-like features to make the conversation more natural (e.g. Alexa, Siri) and pull the majority of answers from a predetermined directory of responses because they fail to capture the meaning behind certain questions.

Cognitive AI-based solution
With cognitive A.I., companies can offer superior customer service by combining the power of bots with that of humans by making use of the AI-based technologies:

The system can use Natural Language Processing (NLP) to extract structured data from natural language, and use this information to create a more capable chat bot. This way it can analyze additional sources of unstructured data, such as publicly available customer information, find similar cases in the case history and also look for clues in other data (error codes, support documents, technical data) to find customer-specific solutions. Behind the scenes, advanced AI solutions (in contrast to e.g. a simple decision tree model) present their solutions together with a confidence level, which can be used to decide whether or not the answer is presented directly to the customer or if the case should be forwarded to a human. The agent would then instantly have access to the results of the AI's analysis, which in turn helps them resolve the case faster. Once the case has been solved successfully, depending on how it was solved, machine learning could be used to improve the bots' abilities.

Technically, creating a continuously learning system can be done by using an optimization algorithm called 'stochastic gradient descent'. One of the most basic optimization algorithms behind machine learning is the 'gradient descent' algorithm. It is an algorithm which iteratively updates a model (the 'brain' of the cognitive AI) by looking at all of the training data and improving it in relatively big steps. By contrast, with 'stochastic gradient descent' the model is updated just a little bit each time a training example is looked at. Besides allowing continuous learning, this method is also computationally much cheaper, which is important when the training data sets are really big. However, its downside is that the learning path is much 'bumpier', meaning that single updates can easily make the system a tiny bit 'dumber' for a couple of iterations. However, deciding on whether or not one really wants to have a continuously learning system is actually a balancing act, as this can also lead to really problematic effects. A good example for things having gone quite wrong is a chat bot from Microsoft which quickly became racist by incorporating the knowledge it gained from the conversations it had. This highlights how important good AI convergence will become in the future.

Impact on media companies
The use of cognitive AI to enhance customer service can benefit media companies in the following ways:
- 24/7 customer service and reduced time to solution-finding
- Cost saving from decreased labor-intensive support services
- Higher customer satisfaction and retention rate
- Personalization of customer service based on customer data records



Source: Screengrab AND CHILL

The 'And Chill' Netflix chat bot helps customers cope with Netflix' overwhelming film library and recommends movies based on a few questions via live chat. Recommendations themselves are generated via Netflix' recommender system, another cognitive engine.*

*75% of Netflix viewership is driven by recommendations" Source: Business Insider 8 http://www.businessinsider.com/netflixs-recommendation-engine-drives-75-of-viewership-2012-4?IR=T

#3 Narrative-editorial contribution and content creation

Current situation
Currently, editors screen relevant channels to identify upcoming (hot) topics or, in some cases, are informed by contacts about important events and news. With the increasing amount of data, especially unstructured data, that is available online, it becomes difficult for editors to analyze and identify relevant content in real time.

Current challenges
This leads to time delays between a current event and the moment it is reported or published, as well as editors spending their valuable time on research instead of creating high-quality content.

Cognitive AI-based solution
Cognitive AI is likely to help editors identify key pieces of information to report, as they emerge, by applying its ability to process and analyze large amounts of data in a much faster manner. A system that really understands the information, compared to one that would just do something simple like a key word search, can link different data sources in real time. For instance, a system powered by cognitive AI can connect data from social media with search trends and weather data and thereby derive fact-based content.

A real-life example of such a system is a bot that used Natural Language Generation to write a Los Angeles Times report once it discovered an earthquake had happened, which was actually almost instantaneously. This way it made the LA Times the first major outlet to report the event, which is quite important in a business where nothing is older than yesterday's news. As already mentioned, Natural Language Processing, and especially Natural Language Generation (NLG), are still challenging tasks. Understanding and creating humorous and sarcastic text is exceptionally difficult for cognitive systems to master - with the exception of unintended humor!

However, if one wants to process or create fact-based text, today's systems are a definite option. NLG works best if the goal is conveying information. Articles about recurring topics often follow quite a standardized scheme, which is why technically rather simple systems will usually suffice. Automating the production of these kinds of articles can be done by reusing text snippets and customizing them at defined positions with the most current data. One could describe this as a template-based approach. More advanced systems exist, but the technical concepts behind even some of the most advanced, like the 'Todai Robot', a cognitive system designed to pass the admission test to Tokio's elite university, resemble more that of a clever 'copy+paste' strategy than that of a human creative writing process. However, while the results of such systems can be quite impressive – the essays written by the latest version of the Todai robot, for instance, were better than those by most students – a writing strategy based on copying and pasting is problematic, and not just from a copyright perspective. While the results of such a system might not be ready to print, they could help accelerate the journalistic research process in future.

Cognitive Artificial Intelligence | Use Cases – Narrative-editorial contribution and content creation

Example of Narrative Science's investment report[7]:

> "The energy sector was the main contributor to relative performance, led by stock selection in energy equipment and service companies. In terms of individual contributors, a position in energy equipment and services company Oceaneering International was the largest contributor to returns."

Based on the informative nature of AI-produced texts, a major part of AI "news" programs can be found in the financial industry. Almost 60 % of the clients of Narrative Science, a company that provides AI narrative programs, are in financial services. Several other companies are also active in the AI market with applications that can derive expert-level reports, analyze current social media streams, and help brands and others to understand the impact of branded content on their audiences. Another challenge is that once the underlying algorithms have been understood, bots could be used to flood the internet with false information on several channels. A narrative AI would link this information and come up with news that provides false facts ("fake news"). Information therefore needs to be verified before publication.

Impact on media companies
Media companies can save on writing and editing costs by using AI to create basic editorial texts. Editors and journalists can also benefit from AI by outsourcing work or pre-work on articles. This frees up time for them to focus on deeper investigations and more sophisticated articles leading to potentially higher quality in journalism.

Example of a sports article from The Guardian written by Wordsmith[8]:

> "It was a season for the ages for Leicester City as they lifted the Premier League Trophy and were crowned champions of England. Leicester City featured one of the league's most skillful attacks, netting 68 goals. Jamie Vardy led the way with an incredible 24 goals. In addition to their offensive prowess, Leicester City possessed one of the strongest defenses in England."

[7] https://www.wired.com/brandlab/2015/04/news-flash-ai-startups-reinventing-media/
[8] http://futurecontent.co/automated-content-can-algorithms-write-your-content/

Relevance to the C-Suite

The progress of cognitive technologies within AI has the potential to revolutionize businesses and the respective operating and business models in the media industry.

Embracing cognitive AI and the adoption and implementation of the respective technologies and solutions is relevant to almost all CxO areas:

- **Enable new revenue sources**
  Incorporating Artificial Intelligence technologies into business models opens new revenue sources, such as selling AI applications and managed services to other media players (e.g. fully automated video capturing and archiving or AI-based content creation).

- **Establish new partnerships / M&A strategy**
  Depending on the level of AI integration into the overall operating model, the new technologies will also require CEOs to forge new strategic partnerships and / or integrate AI into the M&A strategy.

- **Realize cost savings**
  AI solutions can increase business automation as well as support processes and related decisions usually performed by humans and thereby decrease the number of employees required as well as respective costs. Especially in support processes (customer service, finance, HR etc.) there is great potential for cost savings through the employment of AI. In the content creation process for fact-based news, AI also has the potential to relieve the editorial teams of less creative tasks.

- **Introduce error-proof and auditable processes**
  Due to process automation in almost all areas and processes, all transactions and activities will be digitally recorded and therefore easily auditable – resulting in less preparation as well as internal compliance and external auditing efforts.

- **Eliminate legal and regulatory risks**
  Potential legal and regulatory risks for the distribution of explicit or illegal (user generated) contents can be avoided, once AI monitoring tools for audiovisual content become more efficient.

- **Streamline operations / customer service**
  Cognitive AI solutions provide CEOs with greater control over operations and related costs due to the potential replacement of humans with AI, which enables "bots" to do more than just execute simple and repetitive tasks. Additionally client satisfaction and brand perception can be significantly enhanced by increasing the level of first time resolution with AI-based and self-learning customer service solutions.

- **Streamlining of program monitoring**
  Especially the automated detection of fake news as well as prohibited contents could relieve CCOs of a lot of their pain points. It is getting more and more complex as well as time and resource-consuming to scan the vast amount of information pieces and detect fake news in the process of creating compelling and well-researched programs / audiovisual content pieces.

- **Automated content creation**
  Additionally, the assembly and aggregation of descriptive news feeds / news tickers without adding opinion will be largely automated, thus the amount of staff working in the editorial / program offices can be reduced and / or redirected to create higher-value content with a journalistic ambition.

- **Improved security**
  AI can erase the biggest source of failures, as well as security breaches, i.e. the human interface. AI enables processes and operations to be fail-proof and more resistant to security threats.

Benefits and challenges

We have seen that AI has the potential to open new areas of activities to media players. In addition, AI has the potential to solve some of the operational issues through process automation.

Ultimately, the impact depends on how actively media players drive the adoption of use cases. Going forward, there will be a need to expand on AI benefits and overcome the remaining challenges.

Benefits
Organizations gain major competitive advantages by using cognitive computing. Cognitive AI is a key lever for enabling future business growth by enhancing customer engagement, productivity and efficiency. Companies from various industries have already achieved a range of beneficial outcomes via their cognitive initiatives.

Challenges
Top adoption challenges include the cost of technology and security concerns, as well as gaps in the maturity of tools and developer skillsets. In conclusion, the benefits of adopting and integrating AI in core and auxiliary operations are plenty, as highlighted above. Media players should take a long-term view on AI and its potential to add value to the enterprise in both their current and new business models. There will be challenges to adopting AI, as with any new technology that holds the promise of significant disruption. However, media players could benefit from jointly realizing collaboration and alliances around AI to establish industry standards and avoid wrong investment decisions in non-standard AI technologies. There are already many companies in the (digital) media sector which are investing heavily in the development of mature AI solutions.

"Forget digital – cognitive business is the future."

Ginni Rometty (IBM)

Contact & Authors

Authors

Mirko Gramatke
Director | Consulting
Tel.: +49 (0)151 5800 4621
mgramatke@deloitte.de

Johannes Gegner
Manager | Consulting
Tel.: +49 (0)151 5800 4662
jgegner@deloitte.de

Sascha Bauer
Senior Manager | Consulting
Tel.: +49 (0)151 5807 1526
sasbauer@deloitte.de

Marcus Boenisch
Senior Consultant | Consulting
Tel.: +49 (0)151 5800 3503
mboenisch@deloitte.de

Viet Dung Bruce Le
Consultant | Consulting
Tel.: +49 (0)151 5807 1235
viele@deloitte.de

Contact

Alexander Mogg
Partner | Consulting
Tel.: +49 (0)151 5800 1290
amogg@deloitte.de

Deloitte.