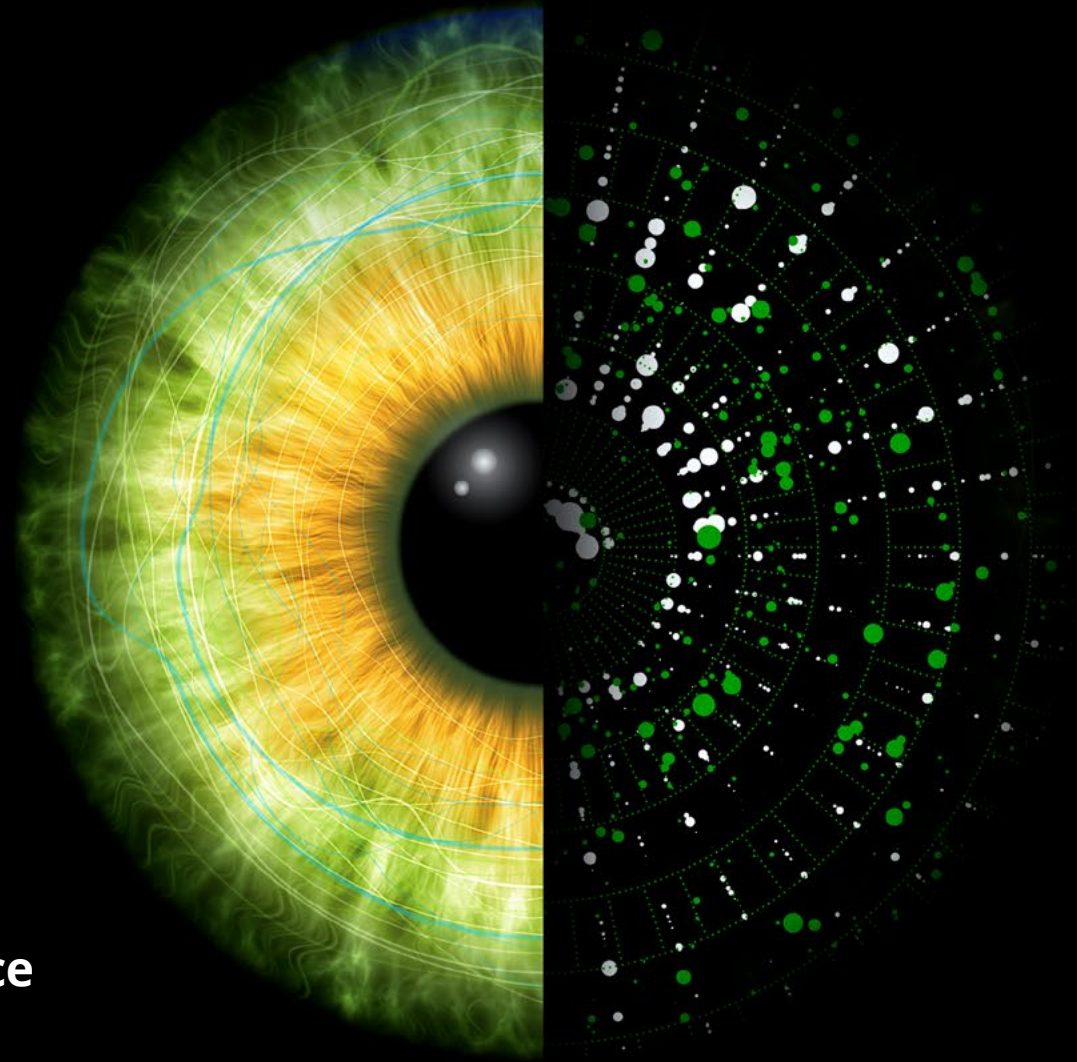


Deloitte.



16 Artificial Intelligence projects from Deloitte Practical cases of applied AI

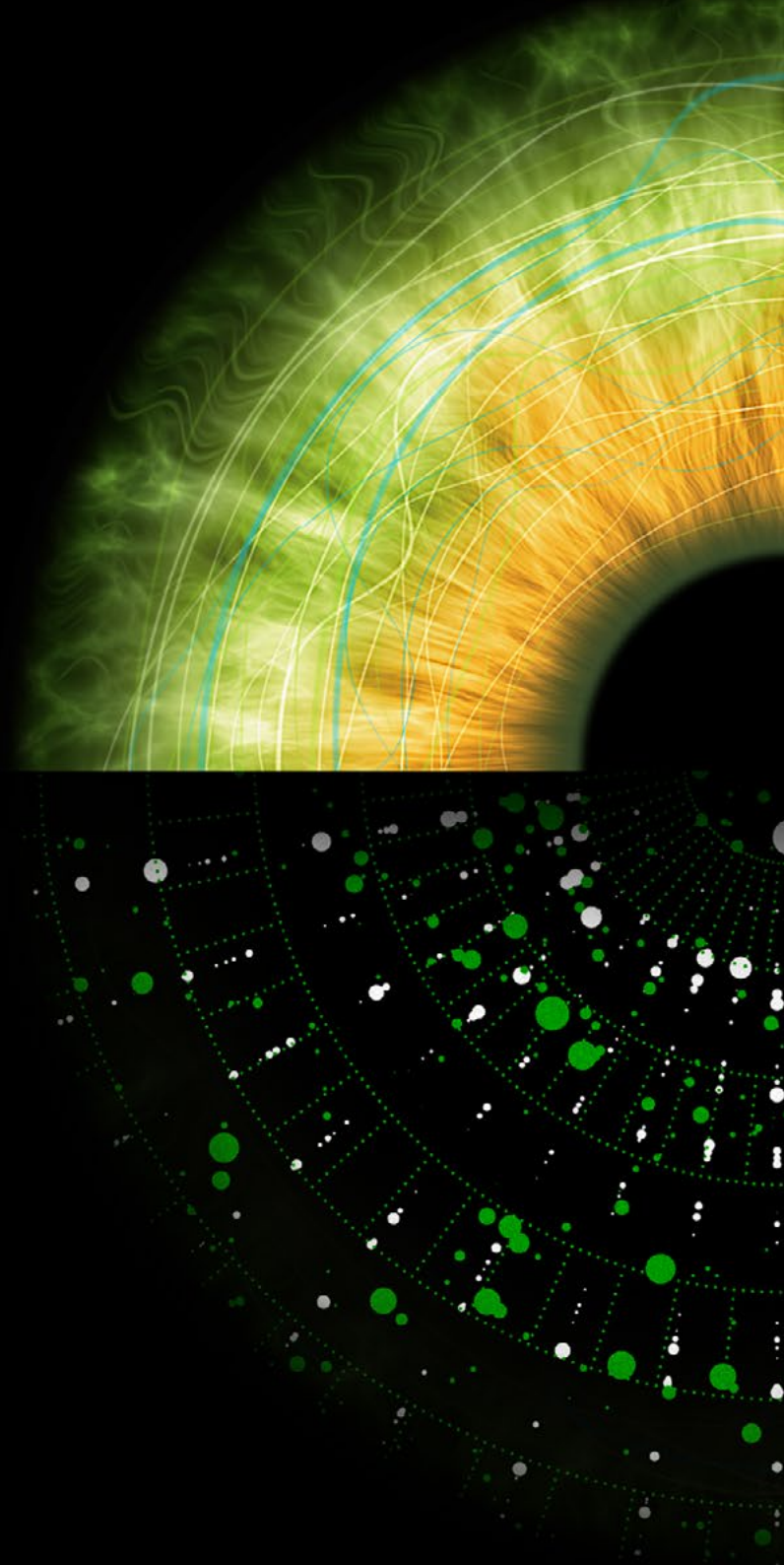
Unleash the power of AI for your organization

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“A computer would deserve to be called intelligent if it could deceive a human into believing that it was human”

Alan Turing



Introduction

According to some, artificial intelligence is the most promising development for the future. From curing cancer to resolving the global hunger crisis, artificial intelligence is being presented as the solution to all of our problems. Others, however, regard it as a threat – artificial intelligence may potentially give rise to unemployment and inequality, and could even jeopardize the continued existence of humankind. As the technology entrepreneur Elon Musk put it: “The benign scenario is that artificial intelligence can do any job that humans do – but better.”

According to some, artificial intelligence is the most promising development for the future. From curing cancer to resolving the global hunger crisis, artificial intelligence is being presented as the solution to all of our problems. Others, however, regard it as a threat – artificial intelligence may potentially give rise to unemployment and inequality, and could even jeopardize the continued existence of humankind. As the technology entrepreneur Elon Musk put it: “The benign scenario is that artificial intelligence can do any job that humans do – but better.”

Deloitte has positioned itself on the optimistic side of that spectrum. “We believe that artificial intelligence will be extremely helpful to us and to our clients”, says Richard Roovers, a partner at Deloitte Netherlands and Innovation Lead Transformational Solutions North-West Europe. Artificial intelligence will enable us to solve problems that humans are unable, or hardly capable, of solving, explains Richard. “Artificial intelligence is capable of processing massive quantities of data and has the ability to discover patterns that even the smartest mathematicians are unable to find. That in itself opens up a large number of new possibilities.”

Those new possibilities are what this book is about. The case studies provide an overview of the ways in which Deloitte is working to develop applications incorporating artificial

intelligence – both internally and for use with clients. The applications are diverse, make use of different technologies and can be found in a diverse range of industries. This shows that aside from all of the predictions for the future, artificial intelligence has already been a reality in the business sector for some time and forms a resource that could possibly provide your company with a decisive lead.

What is AI?

Artificial intelligence (AI) is a collective term for the science that is trying to make systems intelligent. The definition, however, has not been definitely outlined: the type of behaviour by a computer that we regard as “intelligent” is shifting as technology achieves new advances. Systems that we would have called “intelligent” back in the 1980s – such as a smart lift system or auto-navigation – have now become such a regular part of everyday life that some people no longer include them under the heading of artificial intelligence.

The British mathematician, Alan Turing (1912 – 1954), was one of the pioneers in the field of artificial intelligence. According to Turing, “a computer would deserve to be called intelligent if it could deceive a human into believing that it was human”. That is the approach adopted by the Turing test: people must be able to chat with a human being and a computer program

– neither of which can be seen – and then must guess which one was the human and which one was the machine. If the computer is selected, it has passed the Turing test and is therefore “intelligent”.

The downside of that definition is that a human judgement is used as a reference. The results of Turing tests show that some people easily assume that relatively unintelligent programs are actually intelligent. Other definitions of artificial intelligence therefore emphasise the self-teaching methods and other advanced forms of data analysis that are used. In the meantime, a whole host of technologies associated with artificial intelligence have been developed – the most important ones can be found in the list of terms.

Why are we suddenly hearing so much about artificial intelligence?

As an area of research, artificial intelligence has been around for decades, but only in the past few years have things begun to develop at a rapid pace. There are a number of reasons for this.

First of all, the advent of the internet and the large-scale use of sensors generated unprecedented amounts of data – in the case of AI technologies, this was a significant development, as they are actually based on the analysis of a large number of examples. Secondly, the emergence of cloud-based services massively simplified and increased access to storage and computing power for businesses. This not only enabled complex calculations to be carried out using all those

“At Deloitte,
we don’t just talk
about AI, we do it”

large quantities of data, but made it possible for applications to be upscaled without restriction.

Finally, major technology companies are now offering smart application programme interfaces (APIs). These make it possible to connect to standardised AI applications and make it much easier to develop applications utilising artificial intelligence. For example, if facial recognition is needed for an app, an API can be used instead of developing a facial recognition algorithm for the individual app concerned.

All of these developments have led to a situation in which artificial intelligence has reached a point that it is having a major impact on our everyday lives. Companies are starting to investigate applications on a large scale. Due to the fact that major technology companies in locations such as Silicon Valley are utilising artificial intelligence in highly advanced ways, the business sector is coming under increasing pressure to innovate in that area. Customers are getting used to receiving guidance from technology and are coming to expect that type of service from other companies.

How is Deloitte using AI?

Deloitte is deploying maximum resources in the area of artificial intelligence. That is why it recently brought together all of its projects and initiatives in the area of artificial intelligence into the Artificial Intelligence Center of Expertise (AICE), in which hundreds of AI experts from the entire organisation are involved. Learning plays a key role, says Innovation Lead, Richard Roovers. “From a technical point of view, there

can be considerable overlap between the AI applications being used in different industries. Take image recognition, for example – you can use that technology for the automatic recognition of installations on satellite images, but also in an app in order to detect skin cancer. Bringing people from different departments together means that we can share knowledge and accelerate learning.”

Deloitte is keeping in touch with the AI external community by means of Meetups and hackathons. This enables the organisation to keep up with the latest technical developments. Here too, it is a case of learning as much as can, as quickly as you can, says Roovers: “And we’re not only talking about AI, we’re doing it too. We are experimenting, trying things out, attracting experts and investing in technology. Only then you can you truly understand how and in what cases you can use artificial intelligence in a sensible way.”

In order to innovate effectively, it isn’t simply a case of investing in technology, but of creating support within the organisation as a whole. That is why Deloitte has launched an in-house campaign in order to increase awareness as to the possibilities offered by artificial intelligence – including amongst employees without a technical background. In order to make an abstract concept such as artificial intelligence more tangible, “AIME” the AI-robot was developed. In order to give staff an impression of the potential offered by artificial intelligence, AIME was stood at the entrance to the Deloitte offices and was active on social media.

The aim of this was to draw attention to artificial intelligence in an accessible way, explains Roovers. "And it worked. Staff were surprised and intrigued. They started conversations with AIME and took selfies with her. She turned out to be a real conversation starter." Our employees could then voluntarily sign up for our "AI for dummies" course to learn more about the subject. "The impetus was considerable – even our CEO took part in the course," continues Roovers.

As far as the company is concerned, Roovers regards artificial intelligence as an opportunity, not a threat. "It's true that artificial intelligence can take over tasks previously carried out by people – and can even do them much more quickly and accurately. But the most important part of our business, the work that sets us apart from the others, lies in the contact we have with our clients and in providing a tailor-made service and those are things you simply can't outsource to an algorithm." He goes on to point out that artificial intelligence can actually make our work more interesting. "The dull, more repetitive work can be outsourced, leaving more time for the creative work that enables we humans to make a difference."

As Roovers says, you can't stand in the way of change. The important thing is actually to understand how the world is changing and how you can benefit from that as a company.

"In order to keep ahead of the rest, you have to stick your head above the parapet. By using artificial intelligence, we can continue to offer our clients the best possible service – and that's what it's ultimately all about."

What types of solutions is AI able to offer your company?

The case studies in this book give an impression of the possible applications of artificial intelligence. Amongst other things, AI technologies are used to improve service by means of chatbots, to avert cyberattacks, to trace potential fraudsters, to generate benchmarking reports automatically, to estimate the risks that new customers pose to insurance companies, to sort large quantities of digital evidence and much more besides.

In short, the potential of artificial intelligence is huge. Roovers: "The trick is to find out how we can make it useable within our own organisation. On the one hand, we can do that by creating smarter processes, but we can also use artificial intelligence to set up entire new products or services."

But where do you start? The first thing you need is a knowledge of the technologies. After that, it is possible to explore the possibilities that exist within your own organisation and identify opportunities and threats. After that, it's a case of developing proofs of concept – and

if those turn out OK, they can then be scaled up.

Deloitte is able to assist with all of these steps: from exploring the possibilities to developing proofs of concept and long-term collaboration processes and co-creation. "Artificial intelligence is no panacea", warns Roovers. "It's a case of looking very carefully to identify precisely what problem you wish to solve and what technologies are available. In some cases, less advanced technologies are already sufficient to solve the problem."

Thanks to the availability of APIs and cloud computing, however, developing a proof of concept is a relatively simple matter. "The nice thing is that you can start small and if it works, you can quickly scale it up", says Roovers. "There is such a lot you can do if you are smart when deploying artificial intelligence. Right now, we're just at the beginning."

Using AI, companies may be able to get a decisive head start

Definitions

There is a whole host of technologies that are associated with artificial intelligence. Here are just a few:

- **Machine learning** is a research field that is capable of recognising patterns in data and developing systems that will learn from those.
- **Supervised machine learning** trains systems using examples classified (labelled) by humans – for example: these transactions are fraudulent; those transactions are not fraudulent. Based on the characteristics of that classified data, the system learns what the underlying patterns of those types of item are and is then able to predict which new transactions are highly likely to be fraudulent.
- **Unsupervised machine learning** is able to discover patterns in large quantities of unlabelled data. It attempts to discover an underlying structure of its own accord, such as by clustering cases that resemble one another and making associations. For example, retail companies are able to use purchasing data to recognise what products are often bought together and can adjust their offer to reflect that, or can even provide personalised offers.
- A **neural network** is a machine learning technology that mimics a structure resembling a human brain (consisting of neurons and connections), and is capable of adapting its own structure to perform the task it has learned more effectively. The more complex neural networks become and the more often they consist of several “layers”, the more we can make use of the term: **‘deep learning’**.
- **Natural language processing** is an area of research that focuses on training artificial models to process a human language.
- **Computer vision** is an area of research that focuses on the processing of digital image material.

“Artificial intelligence will enable us to solve problems that humans are unable, or hardly capable, of solving”

Tax & Legal

TAX-I: your virtual legal research assistant

Whether searching for relevant case law, analysing rulings, or assessing whether a tax case is likely to be successful, tax lawyers have a lot on their plate. And the result is by no means always accurate.

What if you could automate this preliminary legal work? Not only would it enable a tax case to be settled more quickly, but also more efficiently and accurately. That was the idea behind TAX-I, a virtual legal research assistant developed by Deloitte. TAX-I is able to use artificial intelligence to analyse thousands of tax cases of the European Court of Justice, relate them to similar cases, summarise them, and even predict how a court would rule in a case.

Bulk quantities of data

“EU Member States are required by law to publish their rulings and to make them easily accessible to third parties,” says Marc Derksen, Consultant in Data Analytics & A.I. at Deloitte Indirect Tax, and a member of the team that developed TAX-I. “So there are bulk quantities of data available.” Working in two sprints of six weeks, the TAX-I team examined what they were able to do with it, and it soon turned out that the possibilities were numerous.

First of all, the tool visualises the way in which a new case corresponds to earlier cases. An interactive chart of lines shows how cases relate to one another, and the size of a dot indicates the relevance of the case based on the number of references. The tool also produces a summary of all cases, based on how often sentences or parts of them repeatedly occur in a ruling. “The summaries still aren’t well-written, flowing texts,” remarks Derksen. “We intend to improve that in the future. In any case, the summaries are currently at a level that enables you to quickly assess what the case is about.”

Finally, TAX-I is able to predict how the European Court of Justice is likely to rule in a case, based on facts that the user of the tool can enter. It uses a machine learning algorithm that is trained to recognise patterns in tax cases and to draw conclusions. All 1153 tax cases of the EU Court of Justice have now been entered into TAX-I. The team also hopes to analyse all cases from individual countries later on. “In the Netherlands alone,

that already gives us 2.5 million cases,” says Derksen. “This much data will enable us to use deep learning, and produce more accurate insights.”

Continued development

The team has been working for a few months now on making TAX-I simpler and more powerful. The analyses of TAX-I are being evaluated in the meantime by Deloitte’s scientific office and in a study by Vrije Universiteit Amsterdam and Tilburg University.

In the long term, TAX-I is intended to become accessible for all Tax & Legal consultants in Europe. “It will enable them to save time and improve the quality of their services,” asserts Derksen. But the current prototype has already proven its worth. “I regularly speak to colleagues who found related cases using TAX-I that they themselves had missed. That is a valuable achievement in itself.”

All 1153 tax cases of the European Court of Justice have been entered into TAX-I

An AI benchmark study of transfer pricing

If a company forms part of an international group, the prices and conditions applied to the sale of goods and services within this group must be similar to those of third parties. This is intended to prevent improper diversion of profits between countries. However, it saddles companies with a problem, says Martijn Krassenburg, Manager Transfer Pricing at Deloitte. After all, which prices of which companies are deemed 'similar'?

The technology is now being trained using large quantities of data from previous benchmark studies

A benchmark study is required in order to answer that question. One variant of such studies looks at what companies undertake identical activities in a similar industry, and the reported margins are checked against those of the company in question. That is quite a laborious process, in which many repetitive tasks are carried out manually. "This is why we decided to find out whether it was possible to automate this work," explains Krassenburg.

Thousands of screenshots

A benchmark study first examines which companies are similar. An initial selection of a few hundred companies that are possibly similar is made by applying filters to an international database. They have to be screened manually, such as by searching for the websites of all of those companies and taking screenshots of them. Krassenburg: "Robotic Process Automation is the automation of simple, repetitive tasks, which in this case are searching websites and saving screenshots, and it has enabled us to speed up that process considerably."

But the team's ambitions extend further. "We are busy developing artificial intelligence that will automatically estimate the extent to which a company is similar," he adds. The system is already able to perform rough screening, and its self-learning ability means it will become increasingly accurate the more it is used. The technology is now being trained using large quantities of data from previous benchmark studies. and technologies such as natural language processing, neural networks and ultra-precise entity recognition algorithms are being employed for this purpose.

Soon, a percentage will appear next to the name of each company, indicating the likelihood of that company being similar. This will mean that an ever-smaller number of companies will need to be checked manually. Ultimately, the aim is to complete part of the task fully automatically.

The finishing touch

The project is still in the testing stage, but Krassenburg believes that the technology can be rolled out widely once it is up and running. "In this way, you can test how the intercompany prices relate to the market, and substantiate this with detailed documentation. All internationally operating companies that sell products or services are affected by it. In this regard, AI Benchmark helps them maintain consistency and is already saving them time." Deloitte Global has already expressed an interest in this tool. As soon as AI Benchmark can be implemented, it will be employed more widely.

When it comes to the question of whether AI Benchmark will render his own job surplus to requirements, Krassenburg is not concerned. "Performing a benchmark study is not what creates our added value. It is the finishing touch, one part of a much larger and more complex process. The really interesting work, understanding exactly how a company functions and how it relates to tax rules, is not something that can be simply outsourced."

SONAR: find labelling errors in databases

Just under a year ago, Deloitte was approached by a major retailer. Its range consisted of over 30,000 products, and the commodity codes provided by suppliers had to be checked manually for around 600 new products every month. In addition, information had to be entered relating to the VAT rate and any local levies, such as the battery tax that applies in Belgium for products containing batteries. It was not unusual for something to go wrong when it came to this labelling. The retailer asked Deloitte for assistance in checking the information entered by human staff members.

“SONAR allows you to check the information entered by humans far more quickly and accurately”

“Previously, we would have carried out spot checks,” says Gerhard Smit, information architect and data analyst at Deloitte.

“But then we thought, can’t we automate the checks?” Within one week, he and his team members created a proof of concept: Similarity Observant Network Analytics Report, or SONAR for short. It is a tool that predicts the likelihood that the information relating to VAT, the commodity code and local levies entered into in a product database is correct.

Comparing data

It works like this: a client supplies a data file containing as many details as possible – the commercial product description, the VAT rate, the commodity code and an indication of whether or not each local levy applies. But it also contains, for example, the barcode and other information that can assist with understanding the nature of the product.

SONAR compares this information against a customs database containing all commodity codes, a textual description for each commodity code, and the applicable rate of VAT. The comparison results in a percentage to indicate the likelihood that the label added by the client is correct. If a label is more than 80 percent likely to be incorrect, for example, the product can be checked by a person.

A great deal of label-related work is simple, but new, innovative products often require additional attention. “Legislation often fails to keep up with reality,” remarks Smit. “Take smartphones. Should we classify them

as a phone, or as a navigation system, for example?” Such cases need to be assessed by an expert. SONAR allows the checking of the vast majority of products to be automated, so that additional attention can be paid to the difficult cases.

Bicycle lights

The SONAR team went to a shop together with the client to test the tool, and carried out a random check on a shelf of bicycle lights. In the case of one bicycle light, SONAR indicated that something was likely to be incorrect regarding the battery tax. “Upon closer inspection, it turned out that there was indeed a small battery included in the packaging, although that wasn’t included in the description,” recalls Smit. “We thought it was highly amusing; something we had built within a week had an immediate impact.”

SONAR was developed for a client, but Smit believes the technology is generic enough to be implemented for other problems. It works particularly well with databases containing at least 2,500 products, and a reference database must be available. “SONAR allows you to check the information entered by humans far more quickly and accurately,” asserts Smit. “And the best part about it is, the more often you use the technology and the more product information that becomes available, the more accurate the results will be.”

Transaction detector with regard to the Dutch work cost regulations

The work-related expenses scheme in the Netherlands, known as WKR, causes a world of problems for many companies. Deloitte has developed a clever solution to assist its clients in implementing this tax scheme correctly.

Unfamiliar scheme

The WKR permits companies to spend 1.2 percent of taxable wages on tax-free allowances and benefits in kind for their employees. "When the scheme became compulsory for all employers back in 2015, it soon revealed a number of problems," explains Guy Thien, tax consultant at Deloitte. "In practice, for example, there is a major lack of clarity regarding who is responsible for implementing the scheme. It requires data from HR, salary and financial records, to name a few, but no one takes the role of managing it."

What is more, it is still a fairly unfamiliar scheme, and consequently many expenses are incorrectly excluded from it. "If a director gives ten employees an iPad each, he is often unaware that this has implications under the WKR," continues Thien. "He fails to inform the

appropriate parties, and the expense falls through the cracks."

Categorising and learning

In order to overcome these problems, Deloitte's Financial HR Analytics team developed an intelligent system that reads descriptions of expenses and is able to categorise them: WKR Analytics. "You enter all your expenses, and the system then picks out what is covered by the WKR. Without our tool, a client might achieve a quality level of 20 percent in its implementation of WKR. We increase it to 95 percent," asserts Thien.

A tax expert is called in for the remaining 5 percent. The expert wastes far less time on WKR than was previously the case, and is able to focus his attention on the doubtful cases. "If WKR Analytics categorises an expense incorrectly, you can correct it and the system will learn from it," explains Thien. "Every correction makes the system smarter and more efficient. The longer you use it, the less time you waste on it."

"Once you have gained an advantage with AI, you don't lose it very quickly"

WKR Analytics comprises a combination of machine learning technologies and natural language processing – in other words, knowledge of language and use of words. "The WKR is relevant in specific situations," continues Thien. "Take going for lunch. When I go and have lunch with a colleague, that may have different implications under the WKR to

when I go for lunch with a client. WKR Analytics understands that distinction."

The advantage

WKR Analytics is now being used by over forty clients. "I have noticed that the time is ripe for smart solutions," says Thien. "Back in 2014, when I told employers about WKR Analytics, they scarcely believed that it would really work. Now, they are actually curious as to what we can offer." Not only is the number of users growing, WKR Analytics is continuing to develop too. "We are continuing to improve the dashboard, as well as adding new information and constantly increasing the degree of integration with VAT analytics," says Thien. "We are now also demonstrating what the level of data quality is. In just two hours, we can know whether a company's data are good enough to enable WKR Analytics to be used."

The success of WKR Analytics has not gone unnoticed. There are even a few companies that have attempted to copy it. Thien considers it a compliment: "That doesn't scare me. Once you have gained an advantage with AI, you don't lose it very quickly."

Audit

GRAPA: assistance with risk strategies

When auditors determine a risk strategy, they partly base it on knowledge that they gained during previous audits. Deloitte is now developing a smart personal assistant that supports auditors using the pooled expertise of all their fellow professionals.

Knowledge gained

Determining the risk strategy forms an important part of an audit. Twan van Gool, Director Innovation & Analytics within the Audit department at Deloitte, explains: “The auditor determines which sections of the annual accounts are high-risk, based on market developments, new legislation and regulations or events within the company, for example. The chosen risk strategy determines the subsequent audit method.”

When formulating the risk strategy, an auditor’s knowledge gained from previous cases will be very valuable. “Every business is different, of course, but an audit is an audit,” notes van Gool. “While lingerie and cycling might have nothing in common, the retail and stock process of Hunkemöller is largely the same as that of Halfords. So the associated risks are also similar to one another.”

A second reader

Imagine how useful it would be if auditors could use not only their own knowledge and experience, but also those of fellow auditors, when determining the risk strategy. With that idea in mind, Van Gool’s team developed the AI tool Guided Risk Assessment Personal Assistant, or GRAPA for short.

“GRAPA assists an auditor in marking out their chosen strategy against all other risk strategies that have been used before,” explains van Gool. It uses a Deloitte database of 10,000 cases, and each case contains an average of fifty risks.

GRAPA is not a stand-alone application; rather, it is added to the software that auditors use when determining the risk strategy. “It’s as if you can ask a second person to read alongside you,” Van Gool continues. “But the advantage is that this second reader has the pooled expertise of Deloitte.” He emphasises that the auditor remains responsible for the chosen risk strategy and audit method. “GRAPA indicates what has happened in similar cases. But if there is anything about the client’s situation

that is special or unusual, it is obviously down to the auditor to tailor the approach accordingly.”

Benchmarking and planning

The tool is therefore not intended to replace auditors. “When it comes to critical consideration of processes, developments and risks, you still need creativity and human intelligence,” maintains Van Gool. However, he does recognise there are opportunities to automate the completion of an audit once the risk strategy and audit method have been determined: “Those activities are so standardised that a robot could do them.”

Deloitte intends to use GRAPA in 2019 for the audit of the 2018 tax year. “We are currently working on a proof of concept,” says Van Gool. The next step is to use GRAPA for more than just examining data from the past. “We want to feed the tool with market development data, such as those relating to Brexit, or high-risk derivatives in the housing market. That knowledge will enable the tool to also present potential future risks to the accountant.”

“When it comes to critical consideration of processes, developments and risks, you still need creativity and human intelligence”

Chatbot as a search tool for an online technical library

Deloitte's online technical library is so extensive that you could easily get lost in it. That is why employees will soon see the introduction of a smart chatbot that will guide them through the jungle of laws, regulations, auditing and accounting standards, and specialist literature.

Question-and-answer game

"Although the technical library has a search engine, you have to enter very specific search criteria to use it," explains Twan van Gool, Director Innovation & Analytics within the Audit department at Deloitte. "People use the search function in the same way as they use Google. They type in 'materiality' when searching for how to determine the materiality of a public interest entity. But the library contains a vast array of specialist information, and the contents are closely related. You won't find the answer by using a general search criterion; it generates far too many search results."

In order to help employees to search more efficiently, the analytics and innovation team is working on a smart chatbot. "The chatbot

takes people to the search result more quickly by playing a question-and-answer game," says Van Gool. "It acts like an intermediary between the user and the library." For example, the chatbot asks whether the user is looking for an accounting or an audit issue, and then poses follow-up questions.

"The smart algorithm uses those questions to guide you to the appropriate information," continues Van Gool. Users chat with the bot in a separate pop-up window, "just as if you were typing a message in Skype. Because it feels as if you are chatting with a real person, you use natural sentences, and you find it easier to give details about exactly what you are looking for."

Japanese model

This is not the first time the team has attempted to make the technical library more user-friendly. "We spent a long time tagging content and enhancing the search function, but that achieved very little," admits Van Gool. "That is why we are now devoting our energy to improving the input side of it. The chatbot is relatively easy to create."

The chatbot is currently being built for one collection in the technical library, and the plan is to roll out the chatbot for all forty collections in due course. Van Gool's team is using the chatbot built for Deloitte Japan's technical library as the model for development, and the results of the Japanese pilot are encouraging. "The technical library has been consulted far more frequently since the introduction of the chatbot," notes van Gool. "Users have also started performing slightly more detailed

searches, and entering far more advanced search criteria."

Valuable data

The chatbot not only simplifies the search process, but also produces valuable data. "While the present search engine shows us what is being searched for and what is being found, it doesn't tell us whether the user considered the answer satisfactory," says Van Gool.

The chatbot shows what exactly is being searched for, and the route by which the user arrives at the result. "We can use that information to feed back into the algorithm in order to make the chatbot faster and more efficient." The data are also of value outside of the technical library. "If we identify trends, developments and current issues, we are able to anticipate them immediately," adds Van Gool.

"Because it feels as if you are chatting with a real person, you use natural sentences, and you find it easier to give details about exactly what you are looking for"

Argus: an eye for detail

The Engagement Team at Deloitte doesn't need to be told how massively labour-intensive it is to scan through lengthy contracts in order to identify minor differences. Fortunately, they will soon receive a helping hand in the form of Argus, an artificial intelligence solution that compares documents quickly and picks out the tiniest details and discrepancies.

Departments that are already using it have noticed that reviews of contracts are being carried out far more efficiently and with a higher level of quality

Minor amendments

“Our department assesses an awful lot of documents”, says Twan van Gool, Director Innovation & Analytics within the Audit department at Deloitte. “Take referral instructions, for example: internal agreements requiring a number of confirmations from Deloitte auditors in other countries.” It is often the case that one of these instructions is returned with a minor amendment. “The original states that the audit is to be carried out in English, but in the returned version, it has suddenly changed to Russian or Portuguese,” Van Gool continues. “By doing this, a team is trying to fulfil specific wishes while keeping an eye on their own budget.”

It is a burdensome and time-consuming task to spot these kinds of minor amendments. “I have seen people placing one page on top of the other and holding it against the light in an attempt to quickly identify whether anything has changed. That’s obviously not the most effective way of going about it,” remarks Van Gool. He is therefore looking forward to the introduction of Argus, a smart tool that scans and analyses documents using cognitive technologies.

“First of all, you teach Argus the structure of a contract, and what the components are that are permitted to vary from contract to contract, such as the name, place, and date. Argus is then able to make comparisons and search for differences,” he explains. Argus analyses the differences, assigns the amendments to categories according to how significant they are, and delivers a risk report.

Global application

For the time being, Argus is only being used within the Audit departments of Deloitte US, Canada and Australia. Deloitte Global is currently in negotiations regarding the licence for global use. “We hope to be able to start using Argus this year. We have to wait a little while, but we will soon receive a tested concept,” states Van Gool. The results of using Argus are plain to see. Departments that are already using it have noticed that reviews of contracts are being carried out far more efficiently and with a higher level of quality.

At first, the tool is expected to be used mainly for analysing differences between contracts. “But there are unprecedented opportunities for providing support in the analysis, appraisal and comparison of documents,” notes Van Gool. “And we are rapidly developing algorithms for analysing other types of documents, such as invoices.” For example, he believes that Argus will bring about an end to manually searching for details in labour-intensive, data-orientated audit tasks, “such as manually re-entering the total amount from a scanned invoice. Very soon, Argus will do that for you.”

The Argus licences are valid specifically for Audit, but Van Gool also recognises opportunities to use it in other Deloitte departments. “Argus could make a major difference in Consulting or Tax. In fact, anywhere where more than a handful of contracts need to be compared, or information needs to be copied across from documents.”

Consulting

HR agent Edgy: the future of Human Resources

It sounds futuristic: a robot that eases the workload of the Human Resources department by resolving employee queries and supporting recruiters at events. Yet a team at Deloitte has shown that it is possible. Its smart robot, named Edgy, has demonstrated a number of areas of application for robotics-based automation within HR.

Doing and thinking

There are numerous processes within HR that lend themselves especially well to robotics-based solutions, says Henri Drogulski, Human Capital business analyst at Deloitte. He describes them as “processes with a high volume of identical transactions and few exceptions,” such as checking the documents submitted in a job application, and subsequently forwarding them to the correct department. “Those types of repetitive tasks performed according to fixed rules are easy to automate using RPA, or Robotic Processing Automation,” says Drogulski.

Rob van Werven, senior consultant in Strategy & Operations at Deloitte, agrees: “HR is also the ideal field for cognitive robotics solutions, in which a robot makes its own assessments and initiates interactions.” For example, a software robot can analyse a CV and determine whether the applicant is open and sociable, or is more of an introvert. “These technologies have matured in 2018, and are accessible enough for our clients to also benefit from them within HR,” adds Drogulski.

A cross-functional Deloitte team, with members from Human Capital, Strategy & Operations, and Technology, began working on combining RPA and cognitive technologies into a single robot. “We wanted to produce a robot that demonstrates state-of-the-art technologies, while at the same being fun and appealing,” says Van Werven.

More than a gadget

The end result of their efforts was Edgy, a cognitive chatbot within a humanoid robot. Edgy has speakers, cameras and microphones, and is able to interact with employees and potential candidates. It recognises faces, and welcomes people it has met previously by name. It also answers all manner of questions using a wide variety of cognitive cloud services, such as speech recognition, computer vision and natural language processing from Google and IBM Watson. “And to add the personal touch, Edgy can make jokes and cool gestures, like the dab,” says Van Werven.

“A walking, talking robot can easily be regarded as a gimmick,” adds Drogulski. “That is why we are only using Edgy to explain the application of robotics in HR.” Edgy is therefore used to record employees’ sickness and recovery reports, or to assist them with entering expenses claims. Edgy can also tell you everything about working at Deloitte. “It can even match candidates to an existing vacancy during an interview,” asserts Drogulski.

Inspiring

From this spring, Deloitte has been using Edgy for robotics demonstrations and inspiration sessions. “We want to encourage our clients to think about how they could use robotics,” says Drogulski. An initial demonstration of Edgy is followed by a deep dive session on the subject. “We look at which of the client’s HR processes could be suitable for a robotics solution.”

Drogulski does not expect that the HR department will be operated entirely by robots in the future, though: “What we actually want to do is to free up employees to do the tasks that can only be done by humans.” Recent research by Deloitte confirms this idea: directors reported that they intended to use software robotics primarily to make sustained improvements to quality and service-orientation, rather than to make cuts to staff.

And to add the personal touch, Edgy can make jokes and cool gestures, like the dab.

Virtual assistants: beyond the hype

By 2020, we will be having more conversations with bots than with our partners, according to marketing guru Heather Pemberton Levy. That certainly could be the case: now that companies are using chatbots, and smart speakers such as Amazon Alexa and Google Home are on the rise, virtual assistants are becoming increasingly integrated into everyday life.

Virtual assistants are systems that can provide satisfactory answers to spoken or written questions. Virtual assistants have become the subject of hype over the last few years, which has made some people sceptical. "That's not without reason," says Hugo van den Berg, Manager at Deloitte Digital. "Virtual assistants will not be able to solve all of our problems. They are a means of achieving something, not a goal in themselves."

At Deloitte Digital, Van den Berg assists companies with the development and integration of virtual assistants, not as a gimmick, but as a means of enabling them to assist clients more quickly and effectively, while saving on costs and freeing up personnel for work in which the human touch makes the difference.

Learning like a child

There is a myriad of technologies on the market in the field of conversational AI, from start-ups and niche companies to tech giants that are investing heavily in this area. "The most advanced virtual assistants use technologies such as machine learning, natural language processing and sentiment analysis," explains Van den Berg. "Those technologies enable them to hold a typically human dialogue autonomously." Van den Berg describes the technology as akin to a child that learns through experience: "The more examples it is given, the better it understands what is meant."

The 'brain' of virtual assistants is made up of decision trees, which determine what are suitable answers, or when a client has to be referred to a human staff member. "This is where you determine which problems a virtual assistant is able to solve, which words it uses, and what its personality is," explains Van den Berg.

Starting small

Deloitte Digital helps clients to find out whether introducing a virtual assistant is viable, feasible and desirable. "We can also assist with the development and implementation of the technology and the organisational impact," says Van den Berg.

He notes that, while it is tempting to be dazzled by everything that is possible using the technology, "it is important to know what it is that you want to use it for. Sometimes, you can already achieve your goal with just limited use of virtual assistants." The technology is ideal

for relatively simple actions, such as changing a registration number or requesting a status, while in other cases, it could actually be more effective to have personal contact with clients. "Getting that balance is important, between the best from the technology and the best from people," says Van den Berg.

He also believes it is sensible to start small: "Start with a small group of clients who are open to experimentation. Watch carefully what happens, gradually adapt your technology accordingly, and only scale up once the technology does exactly what you want it to."

"Getting the balance is important, between the best from the technology and the best from people"

Risk Advisory

Using machine learning to assess risks for insurance policies

The idea that you can quickly find out exactly what the risk associated with a new policyholder is will be music to the ears of many an insurance company.

At present, this type of risk assessment is still largely carried out with the aid of labour-intensive models, and it often costs a great deal of time to deliver a new risk model. Deloitte is working with new technologies that are helping insurers to make assessments with greater speed and accuracy.

Interactions

Risk assessments are predominantly made on the basis of personal and objective characteristics. "If someone drives a large car, it is more likely that they will cause greater damage. If someone has a thatched roof, fire damage will be more severe, on average," explains Jurjen Boog, Manager in Financial Risk Management at Deloitte.

Since the 1990s, insurers have been using statistically based Generalised Linear Models (GLMs) for these types of assessments. The models are developed by actuaries with many years of expertise and experience. Now that machine learning technologies are on the rise, it raises the question of whether intelligent algorithms are able to make even more accurate assessments.

"With machine learning, an algorithm makes a risk assessment based on pre-determined criteria, rather than estimating parameters for statistical models," says Boog. "A conventional GLM can take account of the interaction between two, but no more than three variables, such as the relationship between a policyholder's age and sex. Machine learning, on the other hand, can 'understand' thousands of variables and much deeper interactions."

New relationships

Deloitte's Financial Risk Management team compared the risk assessment of machine learning with that of a GLM. "We looked at a car insurance policy, and then specifically at third-party liability insurance," explains Boog. "This is a component with a relatively small data set, which enabled us to explain exactly how the two predictions would differ."

Surprisingly enough, machine learning and the conventional model generated predictions of comparable quality. "That's not so strange; there aren't very many deeper interactions that machine learning can take into account in such a narrow data set", reasons Boog. What machine learning was able to do, however, is establish valuable new relationships. "This enabled us to map out clusters of policyholders with a higher risk of losses," says Boog. "This knowledge can be used to manage the portfolio, such as by adjusting pricing or acceptance."

More effective assessment

The team will soon be starting work using a broader data set. "Then we will be looking at combined policies," explains Boog. "If someone combines car insurance with fire insurance, can we demonstrate that this is less risky than two separate insurance policies with exactly the same risk factors? And if so, how much less? By adding more interactions, we expect to achieve more accurate predictions for things like this using machine learning."

Will machine learning radically alter the insurance system? "It will mainly result in more robust substantiation of decisions," asserts Boog. "Insurance is about weighing things up. You want to know the risk posed by every potential new policyholder, and a more accurate risk model enables you to measure what the impact of particular choices will be."

Will machine learning radically alter the insurance system?

Predicting payment behaviour

A client had already spent three years grappling with a problem. The client was a foundation that was to take over tasks from six municipalities in order to save costs. However, talks with the municipalities were not progressing very smoothly with regard to one of those tasks, managing bad debts. The foundation was meant to take over the debts, but how much were they worth? It was unlikely that all the debts would be repaid, so the amount had to be lower than the total debt, but the parties could not work out between them exactly how to determine that value.

“We were asked to create a dashboard showing the payment behaviour of all debtors up to now,” explains Wouter Pepping, Senior Manager of Technology & Data Risk at Deloitte. The request was to identify for each municipality and debt type the percentage of debtors that had paid off their debt in the past, and to deduce the value from that. “We proposed to take it a step further,” says Pepping. “By using advanced analytics, you can, in fact, make much more accurate predictions, down to the level of individual debtors.”

A step further

The team tried out a number of models, and decided on a Random Forest model. “This is a machine learning algorithm, which uses data to train decision trees, and then creates a ‘forest’ of decision trees with random variables,” explains Pepping. “By navigating very large numbers of decision trees and allowing them to decide on the outcome, you get a close approximation of the risk of each debtor.”

This method is very effective when using inconsistent data sets, continues Pepping. “Two debtors may display the same payment behaviour over an extended period of time, but if one suddenly receives an inheritance or is promoted, that can change overnight. By creating a large number of random trees, the system is able to handle such differences more effectively.”

The result was a dynamic dashboard that can be sorted by different criteria, such as municipality, debt type, debt amount or period. You can zoom in closer and closer on the full

list down to the level of an individual debtor’s transaction history. The system provides a prediction of each debtor’s future payment behaviour. “We validated the system and ended up with an average error margin of four percent,” says Pepping.

An end to the ‘tug of war’

The solution provided the client with a breakthrough. The foundation’s interest was to arrive at the highest possible value of the debts, while the municipalities’ interest was to have them as low as possible. “Our method made it possible to determine the value with a very high level of reliability,” says Pepping. “It was considered a fair outcome by all the parties concerned.”

The model is broadly comparable with the risk analyses that banks perform on clients with debts, “but organisations outside the financial sector still rarely use advanced risk models, although they offer significant opportunities,” adds Pepping. “You can gain far more insight into data sets, which enables you to set your strategy much more accurately. And, as in this case, it could resolve a dispute after many years spent playing tug of war.”

“With advanced analytics, you can make far more accurate predictions”

DocQMiner: contract analysis through AI

In order to comply with international regulations, companies with lease contracts will be required over the next few months to go through thousands of contracts one by one. It's an immense task, certainly when you consider that an analyst will spend around 90 minutes on each contract. That time can be drastically reduced using machine learning technologies. To assist companies with tasks like this one, Deloitte has developed DocQMiner: a self-learning application that reads through and analyses contracts.

The use of new technologies also gives rise to a new form of doing business.

Smart suggestions

A number of our clients were faced with a challenge, says Marc Verdonk, Partner and Innovation Manager at Deloitte Risk Advisory. "In accordance with the new IFRS 16 accounting standard, virtually all lease contracts must be listed on the balance sheet from 2019." For a telecoms company, for example, which leases every mast and every plot of land on which that mast stands, this means it will be required to go through hundreds of thousands of contracts in all manner of different languages. "Our team began working on the question of how machine learning could extract the relevant data points from those contracts. Not to replace contract analysts, but in fact to assist them with smart suggestions."

The result was DocQMiner, a user-friendly application that can be used by analysts to review contracts. "The application features a bot, which we have named Robin. You feed in a number of contracts, and Robin gives you suggestions for the data that you will need, such as the start date of a contract," explains Verdonk. The analyst sees the highlighted suggestion and indicates whether or not it is correct. "Robin learns from this, which means that subsequent contracts are analysed a little more smartly each time, and the reliability of his predictions increases. The analyst is constantly training Robin during the review process."

DocQMiner works using state-of-the-art machine learning and natural language processing technologies. "It features a neural network that understands language,

sentence structure and how words relate to one another," continues Verdonk. "That knowledge is converted into figures, which are used to calculate and make predictions. We also add information to it. By feeding in annotated contracts, showing what data we are looking for, Robin learns how to recognise lease contracts." Because the system's recognition becomes more and more accurate, but does not store any privacy-sensitive client data, it can be taken from one client to the next. "It means our clients benefit from the experience it has already gained."

Broader application

The use of new technologies also gives rise to a new form of doing business. "With DocQMiner, we are not selling the amount of work that goes into it, but rather the result," says Verdonk. "Instead of stating the number of hours that we expect to spend on it, we make an agreement regarding the number of contracts that we will analyse. That results in a low price for the client, and an incentive for us to do it as efficiently as possible."

Although DocQMiner was developed for clients who are required to comply with the IFRS 16 or US GAAP accounting standards, there are numerous other conceivable applications in which large quantities of contracts need to be read through. "One example is Brexit repapering, when all contracts will need to be revised if companies' headquarters relocate. Or the General Data Protection Regulation, which will require clauses in many purchase contracts to be checked. We can use DocQMiner in all kinds of situations."

Eagle Eye: using the web for early detection of credit migrations

Imagine if you could search the entire internet to look for early warning signals for all kinds of events. To see whether a company is likely to experience financial distress in the near future, for example. That is exactly what Eagle Eye, Deloitte's new and state-of-the-art AI tool, does.

Signals

Eagle Eye was developed by Deloitte Czech Republic. Analytics leader Jan Balatka and his team built a model to perform online semantic analytics in order to identify threats and opportunities. Balatka: "We initially made Eagle Eye for a financial company that wanted to know whether their creditors were likely to go into insolvency." Traditional monitoring systems review creditors by checking their bank accounts, credit transfers or financial statements. But by the time you start to see warning signs there, it is too late, explains Balatka. "By then the company is already in financial distress."

Before you can see it in the financial statements, early warning signals of potential decline can be observed online. This is precisely what Eagle Eye does. Balatka: "Eagle Eye uses open source intelligence to collect signals. It was built and tested for one particular problem, but the idea is to retrain the model for different markets and countries."

How does Eagle Eye know what is relevant information – a signal – and what is not? Balatka: "It considers any and all information it finds about the company, client or market we assign it to as a signal." With help from machine learning, Eagle Eye then starts to analyse signals, correlates them and recognises certain patterns. Balatka: "Only AI can handle the vast volumes of data on the internet and find correlations between parameters that humans would not even think of. Once we find certain patterns, Eagle Eye constantly monitors the internet to look out for them."

Joint approach

The Czech team approached international colleagues to join their efforts and Roald Waaijer, Director Risk Advisory for Deloitte Netherlands, responded. Waaijer: "We were very interested in the technology. And when we tested the concept, our client feedback was really positive too." This led to a collaboration with Balatka's team and a joint approach to market.

Eagle Eye is tailor-made for each client, explains Waaijer. "Depending on their needs and preferences, clients can work with an application that gives them access to the monitoring system. Or we can simply supply alerts whenever a signal is spotted." Balatka adds: "Eagle Eye serves as a starting point. Even though the system is right in the majority of the cases it flags, it still only provides an early warning. The client can follow up with its usual reviewing process."

Waaijer sees a wide range of possible implementations of Eagle Eye: "Think of monitoring compliance, detecting fraud or being able to identify potential takeovers in a very early phase." As of 2018, the technology is live and Eagle Eye is being used in different prototypes for clients across Europe.

"Depending on their needs and preferences, clients can work with an application that gives them access to the monitoring system"

Financial Advisory Services

Combating welfare fraud with machine learning

A government organisation in the Netherlands had to contend with cases of fraud. The organisation was responsible for paying allowances to citizens, but hundreds of millions of euros were being paid to ineligible persons. An internal department had identified that processes were not running effectively, and in the aftermath of negative publicity it was clear that the method of tackling fraud needed to be improved.

The existing method consisted of human assessors who performed random checks based on what are known as business rules: patterns established by fraud experts that can point out when something is amiss. “We wanted to find out whether it was possible to improve processes with the aid of machine learning,” explains Hilko van Rooijen, Senior Manager of Financial Crime Analytics at Deloitte. “The benefit is twofold: fewer citizens are wrongly suspected of fraud, while the inspectors are able to spend their time more efficiently.”

Increasing the hit rate

Within four weeks Van Rooijen’s team had created a proof of concept. Following a comparative study of various artificial intelligence technologies, they decided on a form of logistic regression. Huge numbers of past cases were fed into the system, enabling it to learn in which new cases something was suspected to be wrong. The result was amazing: where cases of suspected fraud were assessed by human experts, fraud was found to have actually been committed in 10 percent of cases; this hit rate rose to 50 percent in the proof of concept.

The technology was improved and refined over the subsequent months, and one of the challenges in this respect was ensuring the representativeness of the data. “The system learns from the information you feed into it, so it is important that this information gives the fullest picture possible,” says Van Rooijen. “Once, for example, we used a sample containing many older people who had not committed fraud, and the system then concluded that older people never commit fraud. We had to correct that.”

A not insignificant part of the process was integrating the system into the corporate culture. “We did that by providing detailed explanations, but also by asking for input,” reveals Van Rooijen. “Staff within the organisation had a wealth of expertise about fraud, and that knowledge proved to be extremely valuable in developing the technology.” The system has since been connected to the existing IT infrastructure,

and an internal team has been trained to manage the technology.

From detection to prevention

After six months, the technology’s hit rate had increased to 87 percent. Another six months later, it fell again. “It showed us that simply less fraud was being committed,” remarks Van Rooijen. “Obviously, the detection techniques had become so effective that they served as a deterrent to fraudsters. As well as providing a means of detection, the technology had also begun to act as a form of prevention.”

The approach has successfully prevented fraud worth tens of millions of euros. “And those savings are still ongoing,” adds Van Rooijen. Deloitte has since assisted public authorities in various other European countries in the integration of this technology.

“As well as a means of detection, the technology also acts as a form of prevention”

Using machine learning and network analytics to search for a needle in a haystack

A corporate client contacted Deloitte with a serious problem: the company had been charged with bribing public officials. It needed to find out quickly what exactly had happened in order to prepare its defence. Could Deloitte assist in determining whether unacceptable transactions had indeed taken place?

Thanks to artificial intelligence, the lawyers only had to study a fraction of the millions of documents

“The period to be investigated was twelve years,” explains Christian Cnossen, Manager Financial Crime Analytics at Deloitte. “It meant that we had to assess over 80 million payments and hundreds of millions of emails and internal documents. It was like looking for a needle in a haystack.” In order to set up an effective investigation, Deloitte developed a method that combined machine learning and network analytics with clever human detective work.

One hundred and fifty names and entities

The first stage consisted of classifying internal documents and emails in order to retrieve relevant information. To do this, Wesley van Saane of Deloitte’s Forensic Discovery team used a machine learning module from the Relativity software suite and the categorisation and visualisation tool, BrainSpace. Lawyers checked through a few hundred documents manually to indicate whether or not they were relevant to the investigations, and these were used to train the system. “We carried out a few of these iterations, which gradually made the results more accurate,” explains Van Saane. It meant that, ultimately, the lawyers actually had to study only a fraction of the millions of documents.

Around fifty names of individuals and entities emerged from this investigation that were potentially implicated in the alleged corruption. Cnossen’s team then built a custom-made tool to perform a network analysis of the relationships between these individuals and entities. Searches of publicly accessible online sources, such as the Paradise Papers and OpenCorporates revealed around one hundred new names that were potentially implicated in

the case, such as directors who did not appear in correspondence, or unnamed subholdings.

The next stage was to search through the client’s accounts for transactions involving these one-hundred-and-fifty individuals and entities, and payments were checked against the suspicious emails and documents for any links between them. Ultimately, the team were able to identify around thirty payments that were related to the accusations.

Settlement

It was, of course, unfortunate for the company that bribery had taken place. However, the company was pleased that incidents could be traced quickly in order to produce a swift and cogent response to the allegations. This enabled the matter to be settled relatively quickly with the relevant supervisory authorities. The investigation also shed light on the business processes that had allowed the undesirable payments to take place, and the company was able to take action accordingly.

Machine learning and advanced analytics can be of considerable assistance in carrying out an investigation involving large quantities of data. As far as potential legal proceedings are concerned, however, it is important that all parties concerned understand the technology fully and trust it, cautions Cnossen. “The lawyer must be able to explain the process, and the court or the Public Prosecutions Service must consider the approach acceptable. Thanks to our method of working, we were able to provide detailed statistical substantiation, and the parties concerned were convinced of the outcome.”

Clustering unstructured information in BrainSpace

In e-Discovery – the gathering of evidence from digital data – heaps of data have to be gathered and rendered understandable. But what exactly is a feasible way of searching through millions of documents within a short space of time? The e-Discovery team at Deloitte has spent three years working with BrainSpace, a smart tool that categorises data and renders it understandable with extraordinary speed and accuracy.

“We can show our clients breakdowns in visually appealing formats, which make it clear to see at a glance what we have found”

Millions of documents

BrainSpace is being used to assist in legal cases. Anoeska Schipper, Data Analytics & e-Discovery manager at Deloitte Financial Advisory, explains: “If the authorities carry out a raid on the premises of one of our clients, we can be called to secure data for the purpose of preparing their defence. It usually concerns data on things like laptops, telephones and mail servers, for example.”

The e-Discovery team usually performs a full backup of the system. “The client and its lawyers want us to tell them as soon as possible everything that is saved on these systems,” says Schipper. “What can serve as evidence and what can be used to support their defence?”

The team has spent three years working with BrainSpace, a tool that uses machine learning and cluster analysis to search through unstructured data, such as emails, Word documents and PowerPoint presentations. Schipper explains how BrainSpace facilitates the search process: “BrainSpace shows what types of documents exist, and can make an initial selection based on our instructions. But it can also cluster data and provide a summary of them.” Among other things, BrainSpace can show what is being discussed and by which individuals, and how topics of discussion relate to one another in the email correspondence that has been found.

What is more, BrainSpace is self-learning: the tool gains new knowledge from each data set, and improves its ability to navigate

each time. “If we indicate which documents are important to us, it recognises them automatically, and is really accurate at predicting which other documents are relevant by recognising patterns within text,” says Schipper. BrainSpace also assists with the presentation of relevant data. “For example, we can show our clients breakdowns in visually appealing formats, which make it clear to see at a glance what we have found.”

Faster and more effective

BrainSpace categorises relevant data not only far more quickly, but also far more effectively than people can, asserts Schipper. “Some scientific studies have pitted a human review against a machine learning tool, and they showed that machine learning generates far better results.” This does not mean, however, that BrainSpace works without supervision. A random sample is taken from every review carried out by the tool in order to check how well machine learning is working on the entered data set.

BrainSpace is currently only being used for e-Discovery, but it is also suitable for broader application. Schipper: “We intend to be involved in an increasing number of cross-functional tasks. BrainSpace can also make a significant difference in contract analysis, such as when searching for clauses and categorising employment and lease contracts.”

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