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ARTIFICIAL INTELLIGENCE

in Germany's inbound tourism industry

Value creation
Transformation
Data analytics
Ethics of algorithms
Virtual assistants

Contents

Petra Hedorfer

Chief Executive Officer of the
German National Tourist Board

Dear reader,

Artificial intelligence (AI) is now one of the most prominent drivers of technology in the digital revolution, and the tourism industry is at the forefront of these rapid change processes.

But AI has not suddenly appeared out of nowhere, of course. It is the result of ongoing development that goes back many decades. Back in 1937, the engineer Konrad Zuse built the first computer to work exclusively with the numbers 0 and 1. This machine was the forerunner of the first generation of computers. Since the middle of the 20th century, the exponential rise in processing power and the miniaturisation of computer chips have led to ever-shorter innovation cycles for software and hardware. Today, social media, smartphones and other mobile devices have taken the world by storm. The convergence of industrial production and cutting-edge information and communication technology in the Internet of Things marks the start of the Fourth Industrial Revolution, while the use of blockchain technology to link and decentralise data is opening up opportunities to optimise global supply chains. The ability to combine and exploit large data sets from a wide range of sources, what is known as big data, is giving the platforms that collect and store such data unprecedented market power. All the changes so far have already found their way into every part of the tourism value chain and resulted in the readjustment of familiar market mechanisms.

And now we are witnessing how machine learning (ML) and artificial intelligence (AI) have given birth to a new dimension of technological development that is shaping our work and our lives.

How far have we come? According to the 2021 Gartner Hype Cycle, a graphical representation of the adoption of technologies and applications, the AI market is still at the development stage. At the same time, according to the analysts, users' expectations of specific technological capabilities frequently still exceed the power of current AI tools.

To close this gap, the market researchers identified four key challenges as trends and innovation drivers in making AI more relevant in the real world. At the top of the list is Responsible AI. Criteria such as trust and transparency are important in technology too, and the developers and users of technology have to face up to this challenge, if necessary through appropriate legislation. Challenge two is the transition from big data to 'small' and 'wide' data, that is to say moving away from unlimited data collection towards using analytical methods to achieve even better results with less data from multiple sources. The third trend relates to operationalisation, i.e. driving AI projects from initial concept to real-world application and turning visions into real solutions. The fourth challenge is the question of how to use resources more efficiently.

“The aim of our digital strategy is to communicate our brand’s DNA to customers. And it has been a great success. Thanks to digital tools, the Destination Germany brand has achieved unprecedented levels of reach and significantly stronger market penetration.” Petra Hedorfer

In this context, further new technologies are in development, such as multi-experience, composite AI, generative AI and transformer machine learning.

Given that innovation cycles are getting shorter and shorter, many of today’s innovation drivers will reach the mainstream in two to five years’ time. There are clearly many good reasons to begin engaging with the topic of AI and to highlight any foreseeable impact on tourism.

This magazine is designed to provide an analysis of the current situation. A closer look at the expert opinions assembled here shows that we must embrace a new way of thinking if we are to balance the opportunities presented by technological progress with the commercial realities in our industry.

Even before the outbreak of the coronavirus pandemic in 2020, the experts at dwif consulting identified that digitalisation can increase efficiency and value creation in the tourism sector, and improve the standard of service and customer experience. To take advantage of these opportunities, we have to assess existing tourism structures with a critical eye. But it’s not enough to hype technical expertise or devices; we must ensure that we take a broad view of this topic and remain alert to all its analogue challenges.

Digitalisation is ultimately all about people. AI is an opportunity to reach people even more quickly, to delve deeper into the reasons that drive their wishes and requirements, and to use mass-customised services to achieve a new level of customer satisfaction. This is also our current approach in the international market.

The aim of our digital strategy is to communicate our brand’s DNA to customers. And it has been a great success. Thanks to digital tools, the Destination Germany brand has achieved unprecedented levels of reach and significantly stronger market penetration. Brand awareness is high and consistent on account of the ongoing interaction with partners and customers. We are laying the foundations for learning from customer relationships through empathy and dialogue.

This approach has proven its worth during the coronavirus crisis, as digital technologies have shown incredible resilience. While the COVID-19 pandemic put the brakes on vast swathes of the global supply chain, bringing entire industries to a standstill, the digital transformation picked up speed.

And it is here we see that many players in the tourism industry are facing up to the challenges of the digital transformation and getting to grips with the tasks ahead.

On the following pages, you will find effective, real-world examples of how digital tools are making travel safer and more straightforward during the pandemic. Keywords in this context include predictive visitor flow management and touchless and seamless travel tailored to each and every customer. And as AI applications make inroads into tourism, algorithms will play a key role.

The tourism industry is destined to be a pacemaker, actively shaping the digital transformation and driving the use of AI. After all, the industry is global in nature. Its value chain includes companies with very different structures, and it often has to quickly adapt to rapidly changing external factors.

High-quality data – current, structured and available to all market players at any time – is indispensable if these challenges are to be met. Forward-thinking data management requires more than large volumes of data; it also needs a coherent data infrastructure. It is essential if we want to derive learning processes from data.

Using the German government's data strategy as its cornerstone, the GNTB has set standards with the German inbound tourism industry's open data/knowledge graph project. There is probably no other industry that is already able to access data from across its sector so readily. The knowledge graph is a huge leap forward in the interests of the customers, who will have round-the-clock access to even more high-quality information in the future. It also increases the reach of destination marketing organisations (DMOs) during their switch from conventional tourism marketing to managing digital destinations, and presents start-ups with opportunities for new AI-based business models and services.

“Digitalisation is ultimately all about people. AI is an opportunity to reach people even more quickly, to delve deeper into the reasons that drive their wishes and requirements, and to use mass-customised services to achieve a new level of customer satisfaction.” Petra Hedorfer

But it is not enough to set up the knowledge graph once and then consider it done. In fact, we are developing the knowledge graph as a highly complex, integrated system, with multiple nodes that facilitate feedback between the stakeholders. This is an ongoing process that requires solid financial foundations, and for everyone involved to be properly integrated. No organisation can manage these tasks on its own. The solution lies in networking, which is why we have established the Open Data Tourism Alliance (ODTA) as a new forum.

The implementation of the open data project together with numerous active partners will help drive forward the technological revolution in German tourism. But it also requires the people working in the tourism sector to be involved, for example through the provision of training all the way down to the regions and individual points of interest.

The people, the doers, the players – they are just as important to the success of the digital transformation. Technical skills and digital expertise are so in demand that many companies have become embroiled in a war for talent. But people in traditional jobs are also affected. The world of work is changing, remote working and agile management have become key pillars, entirely new job profiles are emerging, and continuing professional development and training are becoming increasingly important for the individual.

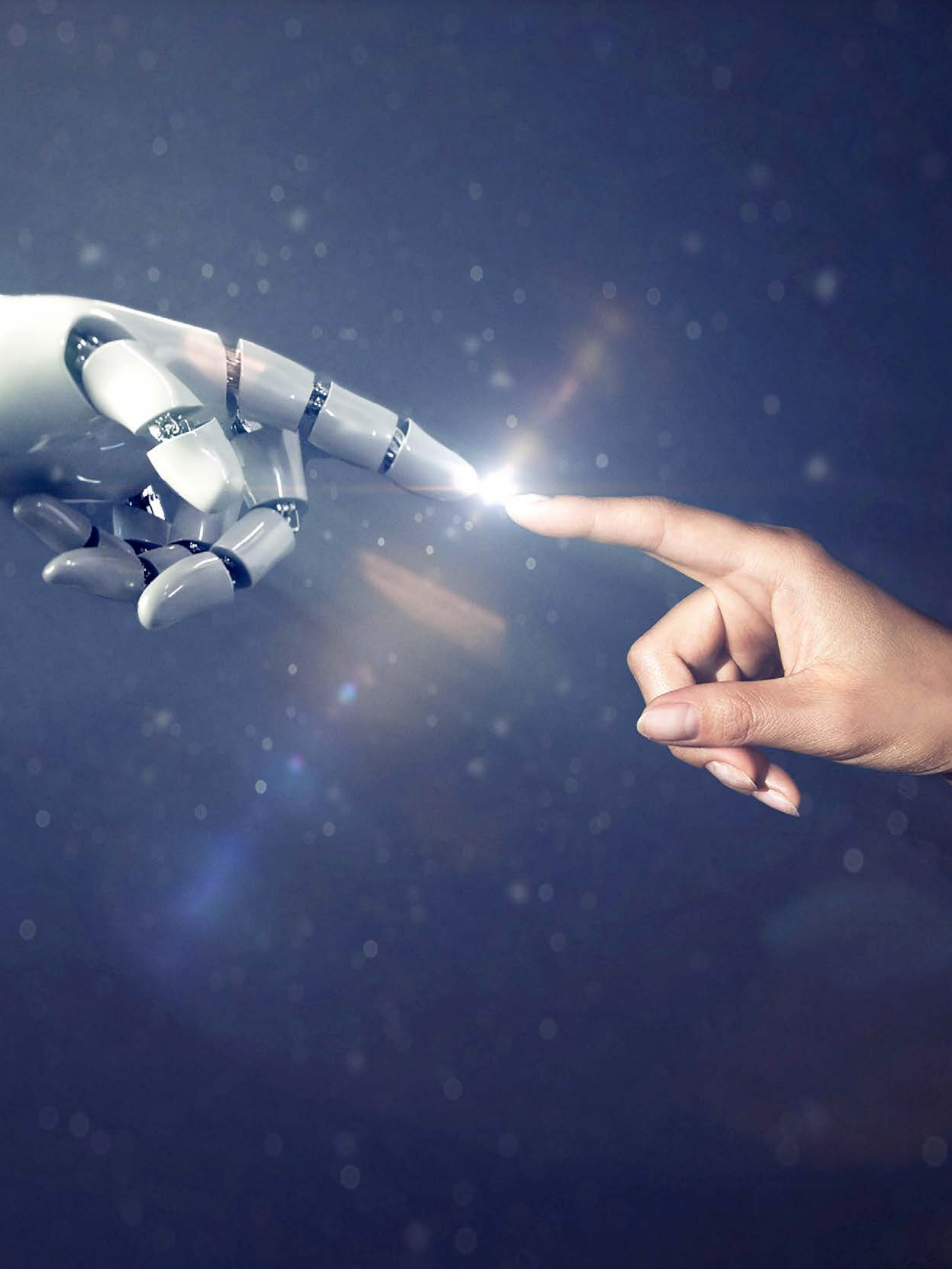
All of us have witnessed this first hand over the last months. We have seamlessly integrated existing, little-used tools into our work, undergone a tremendous learning process and experienced the connection between social distancing and distant socialising. Hard work and close ties have kept the players in Germany’s inbound tourism industry together during the crisis.

This energy will help us to identify the opportunities and challenges of AI technologies and continue successfully deploying them in our work.

I would like to take this opportunity to thank the experts for their forward-looking contributions to this magazine. And I hope you will enjoy reading them.

Yours,

Petra Hedorfer
Chief Executive Officer



SMEs and open data

DR SABINE HEPPERLE

Director-General responsible for SME policy at the Federal Ministry for Economic Affairs and Energy (BMWi)

DEAR READER,

Germany's tourism industry is mostly made up of small and medium-sized enterprises (SMEs). There are more than 222,000 companies in the hospitality sector, including almost 43,000 accommodation providers and over 165,000 restaurants, cafés and other food outlets. Until the outbreak of COVID-19 in the spring of 2020, tourism in Germany was on an upward trend, with the Federal Statistical Office recording around 495 million overnight stays in 2019.

During the pandemic, Germany's inbound tourism industry has proven its willingness to adapt and, above all, its ability to innovate. The strength of the industry, which mainly comprises SMEs, is derived in large part from the long-standing collaboration between these companies. In the era of COVID-19, digital solutions have taken centre stage without which the safe restart of tourism would not have been possible. A case in point in Germany is a project to digitally manage visitor flows in St. Peter-Ording and the Bay of Lübeck. The resulting cross-regional system provides travellers and authorities with real-time information about visitor numbers at each location. At hotspots, data is recorded using cameras, lasers and scanners that detect the presence of smartphones, then analysed and digitally processed for use on a range of end devices. An AI-based traffic light system now helps to direct visitor flows and maintain social distancing. Increasingly, AI applications such as virtual assistants ensure that visitors are kept up to date on the current situation around the clock.

These technical innovations are often developed by SMEs, while the IT and software service providers at the destination level, in particular, are also mainly small or medium-sized. The regional proximity and long-term business relationships between tourism organisations and these companies have proved to be a major positive during the crisis.

Structured databases as the foundation for future AI services are inconceivable without the involvement of SMEs. For many years, the data used by AI applications was held by a handful of companies such as Google. But now tourism databases at federal state level can open up new opportunities for businesses to better tailor and personalise offers and information along the value chains.

The German government's open data strategy also offers companies opportunities to break new ground. Digitalisation further enables the GNTB and its partners to present Germany as a multifaceted travel destination, and to make it accessible and bring it to life in a way that has not been seen in the 30 years since the dawn of the internet age. The structured database that the GNTB is driving forward with its partners will pave the way for a multitude of new AI applications created by start-ups and SMEs in Germany.

I would like to take this opportunity to thank the companies and organisations in the tourism industry for all their hard work and wish them every success in mastering the digital transformation. I firmly believe that it presents a golden opportunity to equip the tourism industry for the future.

Dr Sabine Hepperle

Regulation with foresight and a sense of proportion

A few months ago, the European Commission presented a proposal for a legal framework for AI applications. Dr Tobias Fuchs, a partner at Deloitte Legal and Head of its Digital Transformation department, gives us the lowdown.

The world has recognised AI as an opportunity and as an essential component of a competitive economy, and countries like China and the US, in particular, are putting considerable effort into becoming leaders in this technology. The EU is at risk of diminished competitiveness unless businesses, policymakers and legislators can bridge the gap between commercial interests and public distrust and reach a consensus on the use of AI.

While AI-supported advertising on tourist websites is widely accepted, society's demands with regard to an autonomously operating nuclear power plant are likely to be considerably more stringent given the consequences of any malfunctions.

So, in addition to broader education on what AI technology is and what it can do, I think what we need is a sensibly regulated environment for its use. Any efforts at regulation must use foresight and have a sense of proportion, and over-regulation must be prevented. The onus is on legislators to take a minimally invasive approach to identifying the need for regulation that takes both economic and social factors into account.

What's more, we should not forget that the German legal system already makes provisions for, and contains regulations applicable to, the use of AI, which can partly cover significant areas such as liability and data use (GDPR).

On 26 April 2021, the European Commission submitted a proposal for a legal framework for AI, and in doing so laid the foundations for future regulation. The fact that the Commission has taken a risk-based approach and is considering predominantly innovation-friendly regulation is to be welcomed. The focus is not on regulating AI's functions, but on its areas of application.

The Commission has created risk groups, and AI applications with unacceptable risk are banned in Art. 5 no. 1 of the proposed regulation. This includes applications that can manipulate human behaviour and thereby cause harm to people. Otherwise, the use of AI is set to be permitted depending on the likely risk.

AI applications will potentially be classified as high-risk by the Commission if

“The EU is at risk of diminished competitiveness unless businesses, policymakers and legislators can reach a consensus on the use of AI.” Dr Tobias Fuchs

DR TOBIAS FUCHS

Partner at Deloitte Legal and Head of Digital Transformation.

they have access to critical infrastructure such as energy generation and transport, or will be deployed in law enforcement or in access to education and employment. The use of AI in these areas is subject to strict requirements, including adequate risk assessment and mitigation systems, the logging of operations for traceability, proper human oversight, and a ban on real-time remote biometric identification for the purpose of law enforcement in public spaces.

For AI systems with a ‘low’ risk rating, on the other hand, only certain transparency requirements apply under the proposal put forward by the European Commission, for example in the case of chatbots, where the use of artificial intelligence must be made obvious. AI systems with a ‘minimal’ risk rating may be used freely, and can be found in the gaming and entertainment sector, for example.

The proposal envisages the creation of a European panel on artificial intelligence, with the application of the new rules monitored by the market authorities at the national level. I believe the Commission is taking the right approach by continuing to pursue, in parallel, its concept for excellence in AI (white paper on artificial intelligence), which is designed to enable Europe to become a leader in AI.

In my view, the European Commission’s proposal is an important step towards building trust in AI technology. Nevertheless, I believe the legislative process should be extensively used to challenge the framework that is now being considered, to incorporate new ideas and to widen the discussion about AI and its application. It must succeed in preserving ethical values and minimising risks while unlocking a great deal of innovative drive and investment. That is the only way that the EU’s regulatory proposal will have the potential to become a much-needed global standard.

AI: Where does the data come from?

AI applications need data; the more, the better. Crawlers, for example, are used to systematically search websites for content and connections. These humble programmes tap into a wide range of data pools from which AI delivers results tailored for tourism services.

DATA HUBS
Databases of regional marketing organisations / destination management systems

SENSOR OR WI-FI TRACKING DATA
e.g. from managing visitor flows

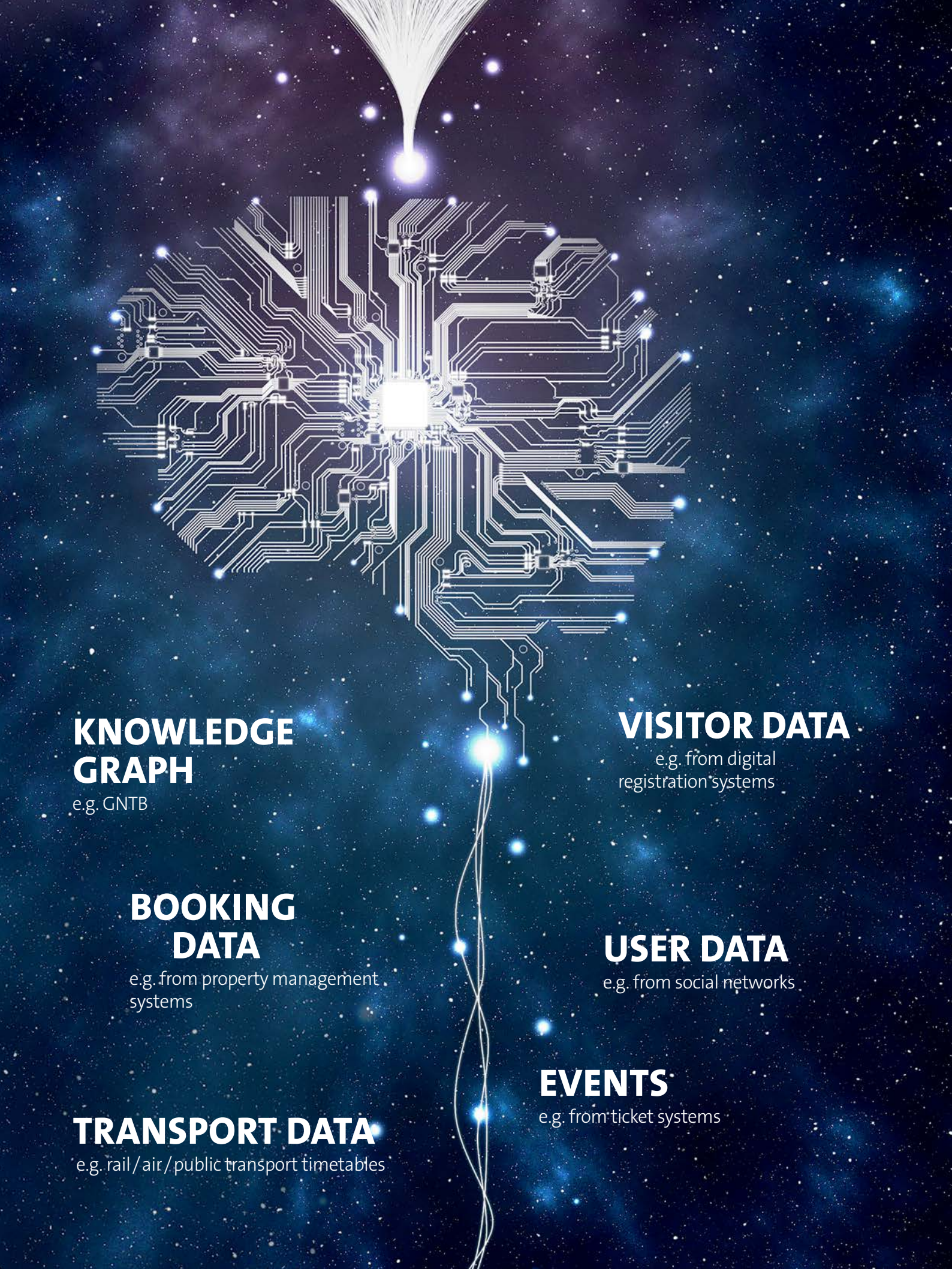
PARKING
e.g. ticket systems

DESTINATIONS / POINTS OF INTEREST
e.g. turnstiles / entry control

WEBCAMS

WEATHER DATA
e.g. weather warnings / forecasts

LIVE LOCAL DATA
e.g. via smartphone location services


KNOWLEDGE GRAPH
e.g. GNTB
VISITOR DATA
e.g. from digital registration systems
BOOKING DATA
e.g. from property management systems
USER DATA
e.g. from social networks
EVENTS
e.g. from ticket systems
TRANSPORT DATA
e.g. rail / air / public transport timetables

Artificial Intelligence. Real value creation.

AI applications are set to change the tourism value chain in a big way, presenting great opportunities but also many challenges for the travel sector. An interview with **Dr Susan Wegner**, Vice President of Artificial Intelligence & Data Analytics at Lufthansa Industry Solutions, and **Professor Norbert Pohlmann**, a professor in the distributed systems and information security department and Director of the Institute for Internet Security at the Westphalia University of Applied Sciences.

The digital revolution has already brought about a whole host of transformation processes. And thanks to artificial intelligence, many processes along the value chain are continuing to change. Which processes are already affected, and will we see even more value creation in the future?

WEGNER To answer these questions, we first have to take a closer look at the term 'value creation'. I think we now use it to refer to more than just monetary value. AI applications are already helping to save time, to increase transparency when presenting travel offers and to produce greater individual flexibility. Those are added value too! AI also influences conventional value creation, of course. In the airline industry, for example, AI is already being used in many areas to predict which parts could fail and when, based on past experience. This knowledge is a great help in maintenance and avoiding delays. When an aircraft takes off, it is also possible to predict with great accuracy when it will reach its gate at the destination airport. This kind of information is invaluable as it facilitates the efficient planning of turnarounds. By providing very precise predictions, AI can also make it easier to use aircraft, trains and ships in the most economical way. Or take the answering of emails: to a large extent, this is already automated in many industries, for example in cargo transport. And in the hotel business, you can check in using facial recognition, which frees up staff for other tasks. AI can also predict room occupancy rates and work out the optimal pricing level. And then there is the management of visitor flows, which is of particular relevance at the current time. It is now possible to analyse peak times at hotspots and provide information to redirect visitors to other sights or locations. This has already been successfully put into action using sensor technology in St. Peter-Ording and Lübeck Bay. And maybe in the not-too-distant future there will be drones to take our luggage from the airport or train station to our hotel.

POHLMANN AI is intended to create an intelligence that is the equal of, or even superior to, a human. At the moment, we cannot foresee whether and when AI will be superior, and perhaps superiority isn't even the goal. Which is why I prefer to speak of weak artificial intelligence or machine learning, where the focus is on extracting knowledge from existing data. Because the amount of tourism data we have access to is growing, we can extract more and more knowledge from it. And we all know that knowledge is money, that is to say value. At some point, AI will optimise all processes along the value chain. For restaurants and cafés, this can

DR SUSAN WEGNER

Vice President of Artificial Intelligence &
Data Analytics at Lufthansa Industry Solutions

PROFESSOR NORBERT POHLMANN

Director of the Institute for Internet Security if(is)

mean that the AI calculates how many covers are expected on a particular day of the week so that less food is thrown away. And autonomous taxi services will emit as little CO_2 as possible for each ride as they will always take the most efficient route. AI can clearly be useful in many areas of the economy to make processes more eco-friendly and sustainable. In aviation, the autopilot can already fly more efficiently than any human pilot. And holiday experiences are also being optimised. A lot is going to happen in the field of travel assistants, in particular, and in the future we will hold proper conversations with our digital assistants. And because AI will know all about our preferences, habits and dislikes, it will make very good suggestions. It will help us with planning and making things happen, for example by booking concert tickets there and then and storing them in our digital wallet. The wealth of available information will be matched with the individual's experiences.

"In the future, we will hold proper conversations with our digital assistants. AI will make very good suggestions and help us to plan our trip."

Professor Norbert Pohlmann

Does the goal of producing increasingly accurate recommendations based on AI not risk travellers ending up in a bubble? This is one of the biggest criticisms levelled at social media.

WEGNER The variety of AI recommendations is already broad, and that is important. But for AI to offer something completely new, it would have to allow for errors or disruptive factors, that is to say things that do not recognisably fit a person's data profile. Is that what we really want from AI? I think that we will still make up our own minds about what we do and do not want. The final decision will continue to rest with us.

POHLMANN Nevertheless, filter bubbles are still an issue. The better the matching processes become, and that is the goal, the smaller the bubble. So we have to tell the algorithm, which in its basic

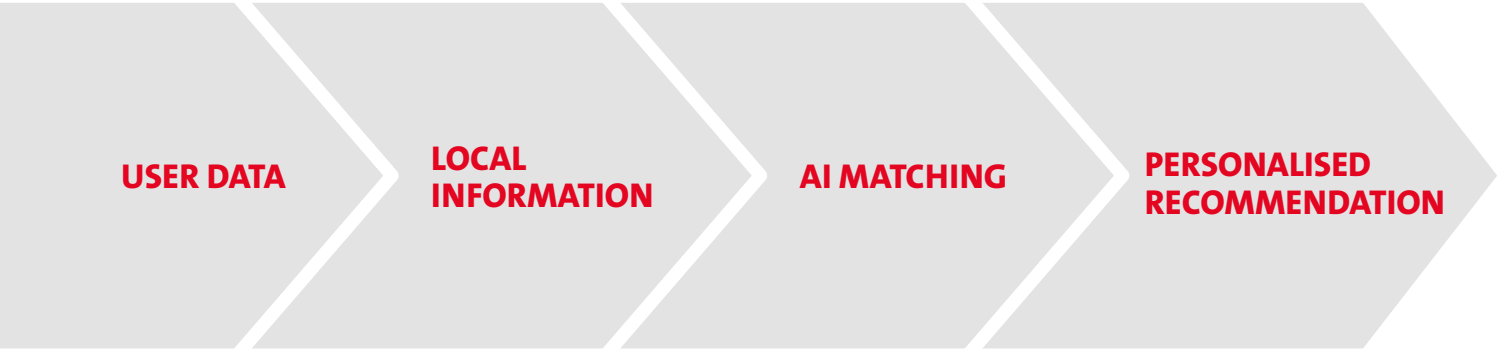
“The variety of AI recommendations is already broad, but the final decision will continue to rest with us.”

Dr Susan Wegner

function can only find matches, to add two or three further suggestions. Ultimately, transparency and trust are paramount when it comes to the use of data by AI. Customers must feel confident that proper boundaries have been set for data protection and targeting and that they are actually being adhering to. AI applications also touch on areas of digital ethics. To ensure that customers buy into AI services, they must be able to understand how the recommendations are made for them. The providers’ trustworthiness is also an increasingly important factor.

WEGNER Allow me to respond with another question: Do you know how an aircraft works? I think the majority of passengers would be unable to even begin to explain how an A380 with a take-off weight of 560 tonnes can get off the ground. The desire for transparency is limited by the level of understanding of a particular topic. One of the ways Lufthansa Industry Solutions is building trust is by formulating ethical guidelines for our work. The EU has also now issued recommendations for AI applications.

Data set for a digital travel assistant, e.g. a chatbot



Lufthansa Industry Solutions helps LH Group customers and others to develop their IT systems further. What role do AI applications already play in this area, and how will it evolve in the coming years?

WEGNER We receive a lot of enquiries in the field of AI and data analytics, and there is a lot of interest in our cloud solutions. But before you get to your first proof of concept, you have to do your homework in terms of data preparation. 80 per cent of an AI project is spent on maintaining and linking data, and keeping it up to date. It takes more than Excel lists!

But even if the data element is ready, implementation is a highly complex task, which is why we are increasingly offering AI solution services. This means that customers send us their data for quality checking, and we test whether the desired outcome is possible with the data. We then create a cloud-based service within two to six weeks, which we can also operate for the customer if they prefer. This is because SMEs, in particular, often lack IT staff with experience of using AI applications.

POHLMANN Without knowing the work of Lufthansa Industry Solutions in detail, when we talk about data as the basis for AI applications, we must always bear data security and data quality in mind. Data must be trustworthy and not manipulable, otherwise we get the wrong results or recommendations. Furthermore, certain data sets must also be representative. The most complex challenge for future AI applications is the linking of data from start to finish. In a travel context, this means that AI must have access to the data of all possible transport providers between A and B in order to plan – and book, if required – a seamless trip. It should be possible to combine all services, from public transport, bike hire and car sharing to long-distance rail travel, vehicle rentals and airlines like Lufthansa. In the future, Deutsche Bahn's DB Navigator app could evolve into just such a 'super-app'.

What potential do you see in the future for new products or services that might be generated by AIs?

POHLMANN I don't believe that AI will become more intelligent or creative than humans any time soon, if at all. And we don't want it to, as we would be handing over a lot of power over future decisions and therefore products. What I do believe is that we will have access to a growing pool of data, and that AI will allow us to draw more and more insights from it. But we will not relinquish our humanity in the process.

WEGNER There is still a long way to go before AI can move beyond a clearly defined task to become creative and generate product ideas. However, we are taking the first steps in that direction. For example, AI has been developed that can paint pictures and compose music. AI is beginning to learn like a child. Our children receive a lot of input that they hardly know what to do with, especially at a young age. But bit by bit, they are able to understand the world by themselves. This already works very well as a basic principle for AI in games. As for potential AI applications in the travel industry, I think a good place to start are questions that, due to their complexity, will be solved using quantum computers in the future. A handful of companies already offer basic solutions in this area, for example. If these solutions continue to evolve as hoped, we could see the advent of a whole new level of travel solutions in the mobile sector, for example, where millions of users are constantly on the move.

Dr Susan Wegner *is responsible* ***for Artificial Intelligence & Data Analytics at Lufthansa Industry Solutions,*** *and has more than 15 years' experience in AI, machine learning and platform design. She was on the management board of Bitkom Big Data Group and was a member of the European Commission's Expert Group on Business-to-Government Data Sharing. Dr Wegner studied computer science and mathematics in Berlin and North Carolina.*

Norbert Pohlmann *has been a* ***professor*** *in the distributed systems and information security department and the* ***Director of the Institute for Internet Security*** *at the Westphalia University of Applied Sciences since 2003. He is also* ***Chairman of the Executive Board at TeleTrusT, the German IT Security Association****.*

Viewpoints

Artificial intelligence will bring rapid changes to tourism. The organisations that represent the regions and the individual destinations are beginning to lay the groundwork to ensure that this transition is a success. The first AI applications are already at work in the field. Here is a snapshot of the progress that has been made.

Self-learning destination management is the aim

AI will open up new possibilities in many areas for society and business. And it will do so for tourism too. Machine learning and algorithms are already hinting at the possibilities, and while we like to write about these scenarios in the future tense, this is a future that will be upon us quicker than we imagine. At Tourismus NRW, we have started to follow this development without getting bogged down in the question of whether we are actually working with AI or merely an intelligent process. Our stated aim is to establish self-learning destination management.

As a first step, we are developing our existing DeinNRW progressive web app (PWA) into a smart system. One of our related projects is about tailor-made recommendations for barrier-free travel, for example. We also want to measure current visitor numbers at several hundred points of interest (POIs) and use this information to manage visitor flows via the PWA. Early next year, we are planning a hackathon with the aim of generating new ideas, including in the field of AI. In this context, our main task as a regional marketing organisation is to connect with the right networks.

DR HEIKE DÖLL-KÖNIG

Managing Director of Tourismus Nordrhein-Westfalen e. V.

Crawlers will automate the identification of weak points

Working with more than 400 regional and local partners, TMB Tourismus-Marketing Brandenburg GmbH uses the Brandenburg content network to maintain up-to-date records on various tourism data points, including 15,000 POIs, tours in German, English and other languages, and around 30,000 events. TMB takes a system-neutral approach to ensure that the information from these databases can be used in a variety of external services. For example, we are now able to record threshold values and sensor data to manage visitor flows at each POI across the region in the DAMAS database, and make it available to other platforms for the purposes of visitor flow management.

In addition to collecting data that is useful for end customers, TMB is currently developing a crawler that can independently collect information about the digital presences of players in Brandenburg's tourism sector. This information is intended to help companies in the sector to automatically analyse and benchmark their weak points without having to fill in questionnaires, for example. At the same time, this innovative tool will be used to provide knowledge transfer services that meet individual requirements.

DIETER HÜTTE

Managing Director of TMB Tourismus-Marketing Brandenburg GmbH

Target groups

TOBIAS WOITENDORF

Managing Director of Tourismusverband Mecklenburg-Vorpommern e.V.

AI-assisted data management has huge potential for B2C and B2B

We are already using artificial intelligence with great success in data management, for example. With the support of the Mittelstand 4.0 digital centre of excellence, we ran a prediction model based on text mining to test the classification of our excursion destination data. As a result, we were able to use AI-assisted data management to optimise the category assignment for, and improve the quality of, data collected from a range of different sources. We are planning further AI projects as part of a modernisation drive that will support the federal state's digitalisation strategy in the tourism sector over the next three to five years. Areas of application include end-customer marketing, partner communication and the publicising of offers.

We also see great potential for B2B processes by making the important but time-consuming task of collecting and updating data easier for all parties involved. For example, AI can provide support where sensors cannot be used, or where sensor technology will not be available for the foreseeable future. We are also using AI in our online marketing via partners such as Google.

Experiences

JAN ROHRBACH

Head of Marketing and Communications of WFB Wirtschaftsförderung Bremen GmbH

Algorithm can tell whether it is talking to an adult or a child

Digitalisation and artificial intelligence are hot topics at the moment, even in tourism, where the focus is still very much on the service provided by people. But there are tasks that can be delegated. Erlebnis Bremerhaven GmbH (EBG) has taken up this challenge in a new joint project with the Institute of Artificial Intelligence Methods and Information Mining (AIM) and the AI lab at Bremerhaven University of Applied Sciences. The project involves preparing Pepper, a humanoid robot, for deployment at the Schaufenster Fischereihafen tourist information office, where it will answer visitors' questions. An algorithm ensures that the robot continues to learn so that it can provide better answers.

Who is asking will be just as important as the question itself. Pepper can recognise not only language and mood but also whether it is talking to a child or an adult. In January, a chatbot was launched on the bremen.de website to help people use the bulletin board and to answer questions about advertising and sector listings. The AI is able to answer simple questions such as 'search for an apartment' around the clock and can even help with more complex tasks such as placing advertisements.

Thinking big when it comes to AI solutions

We are devoting a lot of time and effort to getting the basics of digitalisation right so we can use artificial intelligence under the best possible conditions. Our initial objectives for AI deployment are in the areas of data maintenance and quality management, visitor guidance and conversational interfaces. In marketing, we see great potential in using AI to improve our targeting and upselling, for instance in the context of live target group evaluations and when showing specific ads, or in digital guest folders and apps. Since AI requires huge amounts of data to learn, we need to think big to ensure that our solutions are efficient. In principle, we are open to the possible applications of these technologies, and we believe they will have a major role to play in the coming years.

STEFAN ZINDLER

Managing Director of Rheinland-Pfalz Tourismus GmbH

Strategic digital architecture project lays basis for AI applications

As a key technology of the digital transformation, AI offers great potential to the tourism industry. In Saxony, the strategic 'Digital architecture for tourism in Saxony' project is laying the foundations for using AI applications in the future, whether for customer communications, for the application of new innovative technologies, for new content formats or for managing visitor flows. The potential uses include image recognition, data analysis, intelligent assistance systems, and virtual and augmented reality applications. Artificial intelligence is changing the way we communicate and interact with people who want to receive information specific to their travel experience and their stage of the traveller journey.

VERONIKA HIEBL

Managing Director of Tourismus Marketing Gesellschaft Sachsen mbH

AI-assisted visitor flow management is key to sustainable tourism

Artificial intelligence is an important tool for Bavaria Tourism (BayTM) and for destination management and marketing. Using AI to process data can provide important insights such as capacity forecasts for managing visitor flows. There has been a lot of talk about this type of application, and it is indeed playing a big part in sustainable, low-impact tourism that is accepted by the local population. The first version of Ausflugsticker Bayern, a travel information service for Bavaria, was launched in 2020. AI is mainly used here to predict visitor numbers based on data from POIs, some of which is collected over a period of a year. This data set can be supplemented with weather forecasts and data on holidays, weekends and public holidays to make AI-assisted forecasts. Ausflugsticker Bayern offers event information and tips for excursions, live traffic and parking updates, and waiting times for popular attractions, mountain railways and lake cruises. AI-assisted forecasts such as these have become essential to the effective management of visitor flows.

BARBARA RADOMSKI

Managing Director of BAYERN TOURISMUS Marketing GmbH

DR FRANZ HOFMANN

Managing Director of
Thüringer Tourismus GmbH

The focus of future AI applications will be on assisting and guiding the visitor

To make the most of the opportunities and possibilities presented by AI applications, Thüringer Tourismus GmbH (TTG) is currently concentrating on the Thuringian Content Architecture for Tourism (ThüCAT) project with its partners and neighbouring regions. Tourism-related information is structured in the federal state's database in line with the international schema.org standard and can thus be directly processed by AI applications.

One of the first AI applications we have in development is designed to present targeted tourism offerings and inspiring content. The focus of future AI applications will be on assisting and guiding the visitor. At TTG, we believe that the quality of the available data is essential to AI applications. Our content architecture uses interfaces to also access free, open-data sources to produce an inventory of relevant data.

MICHAEL OTREMBA

Managing Director of
Hamburg Tourismus GmbH

Using AI to move away from one-size-fits-all communications

For us, using artificial intelligence is already an essential part of being a better host, and it will become even more so in the future. And there are two reasons for this. First, AI takes repetitive and monotonous tasks, such as data maintenance, off our hands. We can use the time saved to interact more with our customers, establish direct relationships and engage in communication at a more emotional level. Second, AI systems allow us to leverage matching methods to anticipate predictable requirements. We are now better able to meet visitors' needs at an early stage by providing tailored content on the website, in newsletters and on our app. As a result, we have made a conscious effort to move away from a one-size-fits-all approach in our automated marketing communications. Excellent figures for open rates, sales, and, most importantly, visitor numbers, show that we are on the right path.

DR BETTINA BUNGE

Managing Director of Tourismus-Agentur
Schleswig-Holstein GmbH (TA.SH)

Using AI and programmatic advertising to reach potential visitors more effectively

At Tourismus-Agentur Schleswig-Holstein (TA.SH), we have been using AI for some time in our campaigns. TA.SH has been working with St. Elmo's Tourismusmarketing, an agency specialising in online marketing, since 2020. For example, we ran a cycling campaign online from July to September. Using three different animated visuals and snappy slogans, we promoted cycling in our region in the far north of Germany to our domestic source markets. Thanks to programmatic advertising, a personalised ad was displayed to users completely automatically and in real time – in this instance one of our three bike visuals. Anyone who was curious about the cycling characters in the TA.SH campaign and clicked the ad was redirected to the landing page, sh-fahrradland.de. We have been focusing on online marketing since 2020 and are increasingly relying on AI to reach our audience.

Data-driven channel management opens up new sales opportunities

BURKHARD KIEKER
Managing Director of *visit*Berlin

As connectivity and the use of new digital technologies increase, so does the importance of data. While there is still a long way to go before we reach the third and highest evolutionary stage of AI, i.e. real AI, structured data already forms the basis for machine learning. This allows for decisions to be supported or even made automatically. The focus of visitBerlin in this area is on big data projects involving, for example, the recording of visitor numbers via mobile phone data or the standardisation and consolidation of structured data.

We have taken a further step towards digital, automated data management with our Public Ticket Solution, a combination of online ticket sales and data-driven, hassle-free access management. Here, data-driven channel management can unlock new sales opportunities. What's more, by linking Public Ticket Solution to existing point of sale systems, or by providing hardware or software for validation, we can ensure that visitors can enter a particular POI without having to redeem vouchers or spend a long time queuing. Detailed statistics also provide us with valuable information on visitor booking behaviour, with socio-demographic data and with real-time visitor numbers, all in compliance with data protection regulations. These analyses allow us to identify new target groups and optimise sales activities.

Quality

Data-driven purchasing of the perfect advertising space

MEIKE ZUMBROCK
Managing Director of Tourismus Marketing Niedersachsen GmbH

Tourismus Marketing Niedersachsen GmbH is paving the way for the use of AI applications in the region's tourism sector, and has established the Niedersachsen Hub as the basis of a shared open database for Lower Saxony as a travel destination. AI not only plays a role in the communication of information to third parties but should also lead to significantly improved visitor flow management, for example by combining visitor, weather and time data to make automatic forecasts that can be published in real time.

Nordsee Niedersachsen is already running an innovative project using sensors to digitally manage visitor flows. The real-time data is fed into the Niedersachsen Hub to enable automated analyses and forecasts. We are already using programmatic advertising in media planning for our marketing. Automated and data-driven purchasing of digital advertising space allows us to access premium inventory and high-reach publishers in a cost-effective way. Programmatic advertising uses data to target exactly the right audience. Looking to the future, it is safe to say that AI will change the tourism industry and redefine the customer experience. The task now is to lay the necessary foundations.

ANDREAS BRAUN

Managing Director of Tourismus Marketing GmbH Baden-Württemberg

AI detects patterns in visitor flow management

Whether managing visitor flows, precisely targeting campaigns or communicating via voice systems, artificial intelligence will play a much greater role in the near future than it does today. Not least because AI is already the norm on many booking portals and other providers. Robust base data is essential if the transition to AI-assisted tourism is to succeed. As a regional marketing organisation, we see our main task in helping our destinations to capture data in a structured way. We are already using AI in B2B communications, where a chatbot can answer queries relating to database management. And in our new traffic light system for leisure activities, AI will help us to recognise patterns and optimise visitor flows much better than we could manually. These first steps are just the very beginning of a development that will rapidly change tourism.

HERBERT LANG

Head of Hessen Tourismus, HA Hessen Agentur GmbH

AI is the key to success for digital personas

In the future, our focus will be on the digital identity of our visitors, as digital personas are – thanks to AI applications in the background – an area that reaches far beyond the realm of marketing. Semantically structured data is the basis for future AI applications such as chatbots and digital voice assistants, for efficient visitor flow management and for business intelligence, and for applications that present visitors with information about Hessen and the region's diverse offerings. Through our 2019–2024 strategic marketing plan, we hope to establish Hessen Tourismus as a digital centre of excellence for the local tourism industry. The first step is to design and set up a state-wide database to break down data silos. By standardising and processing data in line with the open-data principle, we will make it possible for the sector to feature tourism content on all relevant channels.

THOMAS EINSFELDER

Managing Director of Investitions- und Marketing-gesellschaft Sachsen-Anhalt mbH

SAiNT breaks down data silos

Drawing on the rapid evolution of technological possibilities and services, regional marketing organisations are increasingly taking on key management tasks at destination level. In Saxony-Anhalt, our visitors' expectations and requirements are at the heart of all our activities. The SAiNT (Saxony-Anhalt intelligent Network Technology) projects aims to break down the data silos that exist in the region. Tourism data sets, from points of interest to hiking trails and canoeing, are being combined with data from the regional development agency, such as the availability of premises in commercial and industrial districts.

This database will then form the basis for future developments, which in Saxony-Anhalt will also involve artificial intelligence. In the medium term, SAiNT users will have access to real-time data from visitor counting systems. Building on this data, AI can play a decisive role by predicting visitor numbers, for example.

Using open data as the basis for AI applications

To create the foundations for future AI applications, the Saarland Tourism Board (TZS) has made structured data capture an integral part of its digital data management. We and our partners maintain tourism information in a shared database using an internationally recognised standard, so that the information is readily accessible to open data sources and can be processed by AI applications. This enables the development of more efficient and user-oriented customer enquiry handling, and optimises processes through the predictive analysis of booking ratings, desired destination forecasts and tourist flows.

TZS already relies on AI applications in key areas of its campaign planning. We use programmatic advertising and programmatic video to granularly address our core demographics, which are based on the meta target groups defined by the Sinus Institute. And we are very successful at targeting potential guests with tailored content and automated marketing via AI systems

BIRGIT GRAUVOGEL
Managing Director of
Tourismus Zentrale Saarland GmbH

Artificial intelligence in figures

68 %

of **PEOPLE** in Germany see **ARTIFICIAL INTELLIGENCE AS AN OPPORTUNITY.**

Source: Bitkom Research 2020.

70 %

of German **COMPANIES** see **AI AS AN OPPORTUNITY** – only 11 % consider it a risk.

Source: KI-Monitor 2021.

154,000

GERMAN-LANGUAGE TWEETS related to artificial intelligence in 2020.

Source: Twitter / KI-Monitor 2021.

1.5 %

of all **PATENT APPLICATIONS** in Germany related to **AI** in 2018 – that figure was just 0.7 % in 2016.

Source: IW patent database 2021.

21 %

of German companies **ALREADY USE AI APPLICATIONS.**

Source: IW-Zukunftspanel 2021.

€488 billion

The amount **GERMAN COMPANIES COULD ADD TO GDP** by 2025 if they were to use AI applications more.

Source: eco – Association of the Internet Industry 2021.

65 %

of companies that already use AI **THINK IT IS 'IMPORTANT'** to their business – 12 % even consider it 'essential'.

Sources: German Innovation Survey 2019, additional survey on AI in 2019/2020.

34.5 %

more **RESEARCH** on AI was published in 2019 and 2020 worldwide than in the previous two years.

Source: KI-Monitor 2021.

15 %

The most recent increase in the number of **AI START-UPS** in Germany.

Source: appliedAI / UnternehmerTUM ecosystem 2020.

9.5 %

of the most quoted and thus most influential papers on AI in the last ten years have been written by **RESEARCHERS BASED IN GERMANY**.

Sources: PAiCE, 2018; EFI expert commission, 2018.

€5 billion

The new level of **FUNDING FOR AI IN GERMANY UP TO 2025**, increased as part of a **PACKAGE OF MEASURES** introduced by the German government to help the country recover from the impact of the COVID-19 pandemic.

Source: BMWi 2020.

Securing the future of artificial intelligence

The federal government regards AI as a key technology in maintaining Germany's position as a leading economy and is making €5 billion of funding available to research institutes and businesses up to 2025. Stefan Schnorr, Head of Digital and Innovation Policy at the Federal Ministry for Economic Affairs and Energy (BMWi), talks about the importance of digital innovation, the ideal conditions for Industry 4.0, and how learning algorithms are helping to lead tourism out of the COVID-19 pandemic.

Mr Schnorr, the German government has increased funding for artificial intelligence from three to five billion euros. What specific goals is it looking to achieve?

The stimulus package and other measures are a response to the huge burden placed on society and the economy by the COVID-19 pandemic. The package of measures has two aims, namely to aid the short-term recovery of the economy and to ensure that Germany emerges stronger from the crisis in the long run.

Artificial intelligence will play a key role in this respect. AI is a technology with a huge range of applications, everything from assistance systems in cars and medical diagnostics support to online shopping recommendations. There is almost no aspect of our professional and personal lives that is not affected by the spread of AI.

This is another area in which we, by which I mean Germany and Europe, are competing for minds, talent, ideas and added value. Which is why a large part of the two billion euros earmarked for AI in the stimulus package will be used to create the right conditions for researchers, for example, but also to ensure – and this is at least equally important to the BMWi – that small and medium-sized enterprises have access to the findings from AI research.

A parliamentary commission has looked more closely into artificial intelligence in Germany. What areas did the committee examine and what recommendations does its 800-page final report make?

We have followed the work of the parliamentary commission with great interest, of course. I think the final report is a success, as it addresses both the opportunities and the risks of artificial intelligence. At the BMWi, we believe it is essential for the quality of AI systems that non-personal data is freely available, and that there is greater support for transferring knowledge to small and medium-sized enterprises, for instance through the use of living laboratories. And we believe our efforts to make this a reality have been successful so far.

STEFAN SCHNORR

Head of the Digital and Innovation Policy department at the Federal Ministry for Economic Affairs and Energy (BMWi) and chair of the advisory council of the Federal Institute for Materials Research and Testing (BAM).

Stefan Schnorr** has headed up the **Digital and Innovation Policy department at the Federal Ministry for Economic Affairs and Energy (BMWi)** since 2015 and **chairs the advisory council of the Federal Institute for Materials Research and Testing (BAM).
He began his professional career as a judge at the administrative court in Trier before leading the public relations team at the Rhineland-Palatinate Ministry of Justice from 1994 to 2001. He later headed up the justice department of the Representation of the State of Rhineland-Palatinate to the Federal Government and the European Union in Berlin, before being appointed head of the Representation of the State of Lower Saxony to the Federal Government in Berlin.

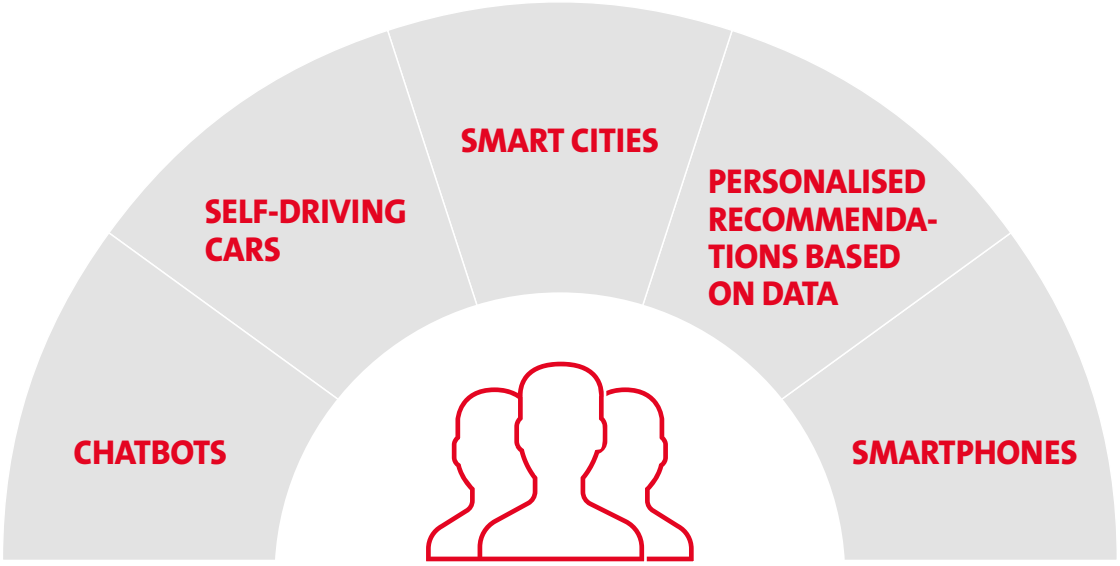
Why do policymakers have to come up with a national AI strategy to promote technological progress? Are companies in Germany not innovative enough when it comes to AI?

The AI strategy is not a political plan for technological progress. After all, it is ultimately up to the research community and industry to develop AI. But what we can and want to do is to support this process, which is why the strategy proposes government funding where it is most needed, for example. It also envisages the creation of an appropriate and uniform framework for research, development and application of AI systems. The values and ethical concerns we have in Germany and Europe with regards to AI are different, in some cases fundamentally so, from those in the US and China. For example, we want the focus to be firmly on people. There certainly isn't a lack of innovative strength in Germany. Quite the opposite, our universities are very strong when it comes to innovation, and we have major players in industry too. But we do sometimes struggle to translate research findings into marketable products and services. This an area we need to improve on, which is why we have launched a knowledge transfer initiative at the BMWi. The main aim here is to boost collaboration between the research community and Germany's many small and medium-sized enterprises to ensure that they remain competitive going forward.

The federal government firmly believes that Germany can take on a leading role in Industry 4.0, with a permanent focus on the benefits of technology for citizens. Why is this key?

Germany's economy has a very broad base, but we are particularly strong in industry and engineering, where we remain world leaders. We regard disruptive technologies such as the spread of AI as an opportunity we must seize if we are to consolidate and build on this position. And it is for us, the German government, to create the right business and regulatory environment for this to succeed. At the same time, AI must always be people-centred, i.e. people are and remain the focus wherever AI is used at work. But let's also not forget that AI can increase safety, efficiency and sustainability in administration, smart cities and self-driving cars.

The focus of all AI applications must be on people



In its presentations, for example in the Tourism Committee of the German Bundestag, the research community has already touched on potential fields of application for AI. Could you describe how these might benefit Germany's economy?

Tourism makes a not inconsiderable contribution to the economy in Germany. And tourism is a good example of how digitalisation has helped to mitigate the impact of the COVID-19 pandemic. The DiscoverGermanyFromHome campaign is a case in point.

AI offers even greater potential to reduce costs, boost efficiency and add value for the customer. It starts with chatbots, which are increasingly used for booking hotels and for general customer enquiries. This frees up employees to focus on those conversations that AI is not yet able to handle. Chatbots can also provide insights into common search topics entered by users, which can help to fine-tune the offering to what people are looking for.

AI also makes it easier to customise offerings more. In principle, the entire customer journey – from the planning of the trip to the stay itself and then the subsequent review – can benefit from AI. There is a lot of potential here, including smart suggestions for travel destinations or accommodation based on similar bookings and predicted travel patterns, the personalised planning of activities at local level, and the evaluation of reviews and other travellers' experiences.

Nevertheless, there are still unanswered questions. For example, meaningful use of AI requires large amounts of data. This data has to be found, collected and processed in a way that is cost-efficient and compliant with data protection regulations. Which is why we are also active when it comes to the data economy, as can be seen in the data strategy adopted by the German government in January 2021.

The right

"Tourism is a good example of how digitalisation has helped to mitigate the impact of the pandemic. The DiscoverGermanyFromHome campaign is a case in point."

Stefan Schnorr

How well have we paved the way for Germany to make rapid progress in the field of AI, and where do you still see room for improvement?

I think we have done well, as we are rapidly moving in the right direction. This applies to the aforementioned transfer of research findings to business and industry as well as to the development of standards and norms for AI. But AI is still very much in its infancy, and there will be an ongoing need to make adjustments in the coming years. We are currently working closely with the European Commission on its AI regulation, and we will use all the policy instruments we have at our disposal to promote both innovation and investment. We also have to accept that we do not have all the answers yet and cannot definitively clarify all areas of regulation. The pace of progress around the world is simply too fast for that. As a consequence, the ability to test and gain initial experiences in a protected environment, for example in living laboratories, is key.

Final question: One of the aims of the German government's AI strategy is to produce a European response to data-driven business models that matches the structure of our economy, our society and our values. In China and the US, the environment in which AI operates is completely different. What could a solution look like here if data is to flow freely internationally?

As I mentioned before, high-quality data is a basic prerequisite for AI applications. Efforts are being made at both national and European level to create a framework that is fit for the future. This includes making it easier to donate data – data altruism – and to access data from public bodies.

The aim of the GAIA-X project, for example, is to build a federated network on top of existing infrastructures. GAIA-X is not designed to compete with 'hyperscalers' in the US and China, but offers a fundamentally different approach instead. The European ecosystem that it aims to establish will allow companies to reliably store, exchange and share data across borders in way that complies with data protection regulations. Our goal is to ensure that data is widely available and that everything is in place for innovation to thrive.

framework

Better links, easier sell

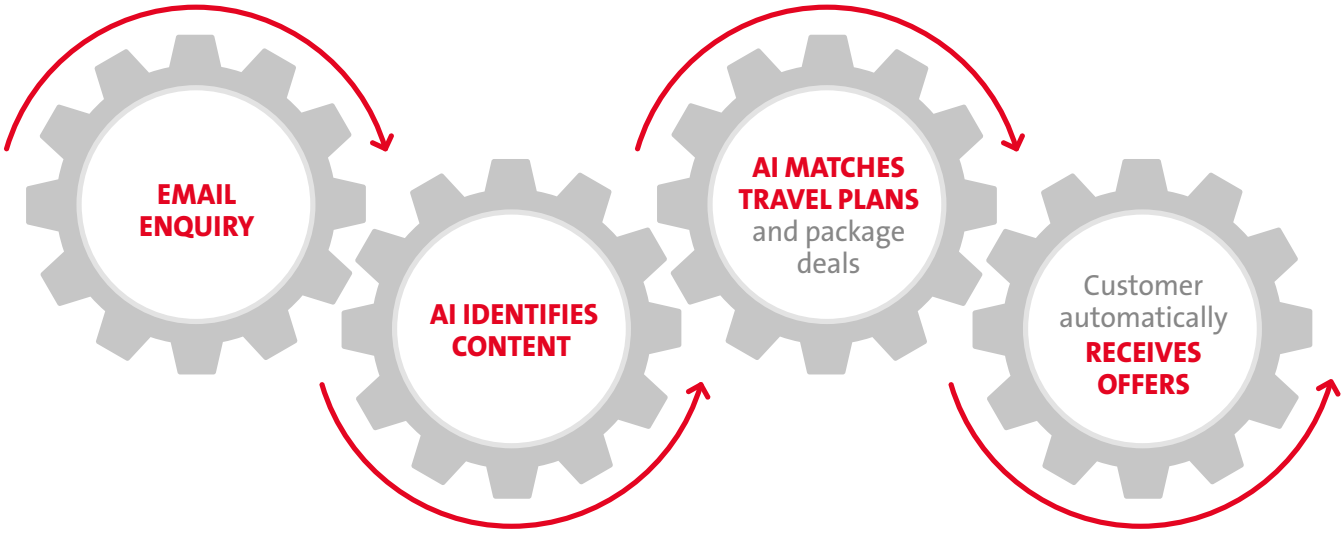
The German travel market is fragmented, which makes managing destination data, points of interest and other experiences all the more important. Open data sets, the Destination Germany knowledge graph and the use of artificial intelligence will provide a clearer picture and form the basis for new applications and services.

By Thomas Reintjes,
freelance science and technology journalist.

"I want to go to Ibiza" could be the type of request handled by the system from AI experts Adigi. But according to Adigi's founder, Nicolas Götz, very few people want to just travel to Ibiza; they want to go there to party. The company's artificial intelligence, which has been designed to help online travel agencies and tour operators automate their processes, autonomously responds to customer emails by sending suitable offers or asking questions to narrow down the packages. "But I can't simply ask: Do you really want to go to Ibiza, or do you just want to party?" says Götz. Instead, his company is experimenting with images and related questions, such as: "Which image best meets your requirements?"

If the customer enquiry contains a booking request for two adults and two children, that question becomes superfluous. The

AI can provide travel advice to improve companies' efficiency



***Thomas Reintjes** is a **freelance science and technology journalist** based in New York. He writes for magazines and reports for radio. The 44-year-old has won several awards for his work, including the Georg von Holtzbrinck Prize For Science Journalism for the radio feature 'Machines don't lie – when robots play with the truth'.*

THOMAS REINTJES

Freelance science and technology journalist

AI can simply select family-friendly hotels. Where possible, further information can be gleaned from the email, such as travel dates, departure airport and hotel rating. Comparing this with suitable inclusive package tours in the next step is easy, at least in contrast to other types of holiday, says Götz.

Fragmented markets pose a challenge for AI systems

AI would find it much more difficult to respond to requests for a holiday apartment by the Baltic Sea or a holiday on a farm in the Allgäu, for example. "The market is fragmented. There's no such thing as a single vendor that has all packages in its portfolio," says Götz. "There are simply too many different booking systems, all with their own logic, and their own criteria and attributes assigned to the offerings." In the case of package tours, Adigi uses an interface to Amadeus, with each hotel assigned hundreds of standardised attributes, from the details of the mains voltage to the size of the breakfast room. All of this information is visible online.

Ensuring that destination data and POIs in Germany are equally visible remains a major challenge, but it is also an important task. The German National Tourist Board's knowledge graph project is laying the foundations for this. It relies on a database of detailed, high-quality data on German destinations provided by the regional marketing organisations. Semantic annotation is used for this content. The underlying ontology is based on Schema.org, a kind of dictionary for structured data, which ensures that the contents are labelled uniformly and that the assigned attributes follow a certain hierarchy.

Linking data points ensures sensible suggestions

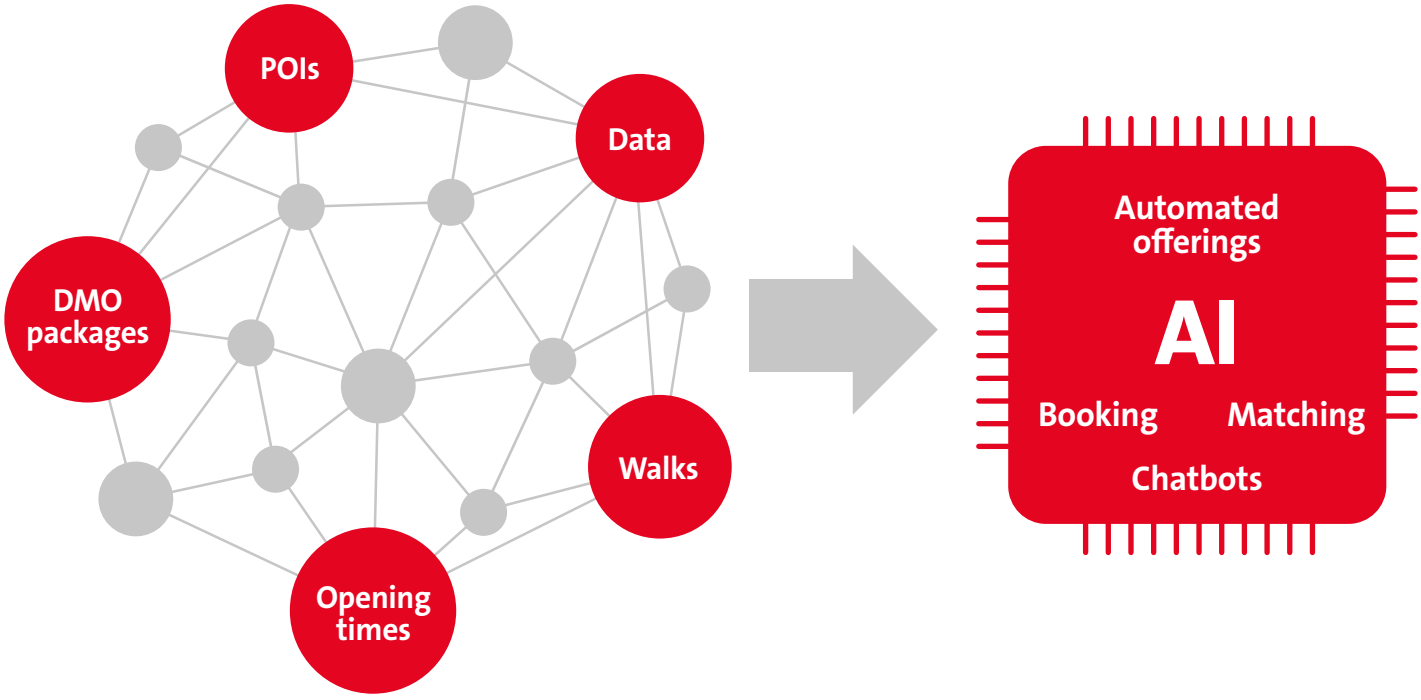
This makes it possible to relate the individual pieces of content to each other using what is known as a graph database. Every single data point becomes part of a network and has connections to many other data points. From this, it is possible to determine which inns are located along a hiking trail, for example, or which beach can be reached by train.

The knowledge graph enables this type of data analysis. The GNTB makes semantically structured data available, and it is down to start-ups and other innovative companies to develop the relevant applications. That is why it is so important to make the data openly available, i.e. accessible to everyone in principle and provided with a licence that permits free use and commercial exploitation.

High-tech start-ups are emerging

"Data is key to making Germany accessible for tourism applications," says Dr Tanja Emmerling, a partner at seed investor High-Tech Gründerfonds (HTGF). "But the indus-

Knowledge graph links data to enable innovative AI services



The GNTB makes semantically structured data available, and it is down to start-ups and other innovative companies to develop the relevant applications.

try is still some way off being able to use data points and automation to create new offerings." Back in 2015, for example, HTGF provided the Berlin-based booking company Bookingkit with seed capital to digitalise the leisure sector. Bookingkit used the money to develop software that helps the providers of local attractions and experiences to sell, manage and market online. While there are still too few well-funded start-ups like this, Emmerling is confident that new AI start-ups will emerge in the German travel industry. But digitalisation is essential before more data can be automated and processed. The industry has a lot of ground to make up in this respect.

The GNTB's knowledge graph could open up new opportunities for start-ups such as Bookingkit and Adigi. "It will be a huge help for us," says Nicolas Götz of Adigi. He wants to expand his company's activities beyond the package tour business; initially probably to cruises, but also to holidays in Germany. Information about destinations and accommodation in a standardised format would allow him to do that. He also sees opportunities to expand his business model and offer customers not just a holiday but also the excursions and activities that go with it.

Linking different data sources

"The pandemic has underlined how important linking different data sources could be to the travel industry," says Dr Emmerling. Currently, travellers still have to painstakingly gather information about the situation at their destination and gauge its impact on travel and related bookings. "The merging of data could enable a better, AI-assisted customer experience over

“Data protection limits the way in which offers can be personalised, but there will be technical solutions for that too.”

Dr Tanja Emmerling, Partner at High-Tech Gründerfonds

the entire journey, from transport and payment to the experience itself and much more besides,” she adds. “There is still a lack of available data, and not just in tourism, because data protection limits the way in which offers can be personalised. But there will be technical solutions for that too.”

There is certainly no shortage of data at internet giants such as Facebook and Google. In recent years, Google, in particular, has expanded booking options – everything from flights to restaurants – on its platform. But many smaller, regional or local providers are not represented here. Open data, linked in the GNTB’s knowledge graph, will help destinations gain more visibility on search engines. Most importantly, new applications and services will emerge that are focused on specific regions or target groups.

Potential for B2B applications

Dr Emmerling believes there is still room for new players on the market: “On the one hand, tourism is a market that is very much determined by who has the most data, makes it the most accessible and can operationalise it the best, which favours consolidation. At the same time, there are many opportunities to gain customers by cutting out the middleman.” Emmerling sees further potential behind the scenes in the B2B sector: “Identifying and processing data, matching it, putting it to use in existing systems – progress needs to be made in all these areas,” she says. “There is a lot of untapped potential in the tourism industry.”

Nicolas Götz’s company is an example of a B2B application based on data that in principle could also be used by others. Adigi sells its AI, which analyses customer emails and makes booking suggestions, to travel agencies and online providers. He is not worried by the fact that open data implies that the data is available to anyone.

Forecasting visitor flows

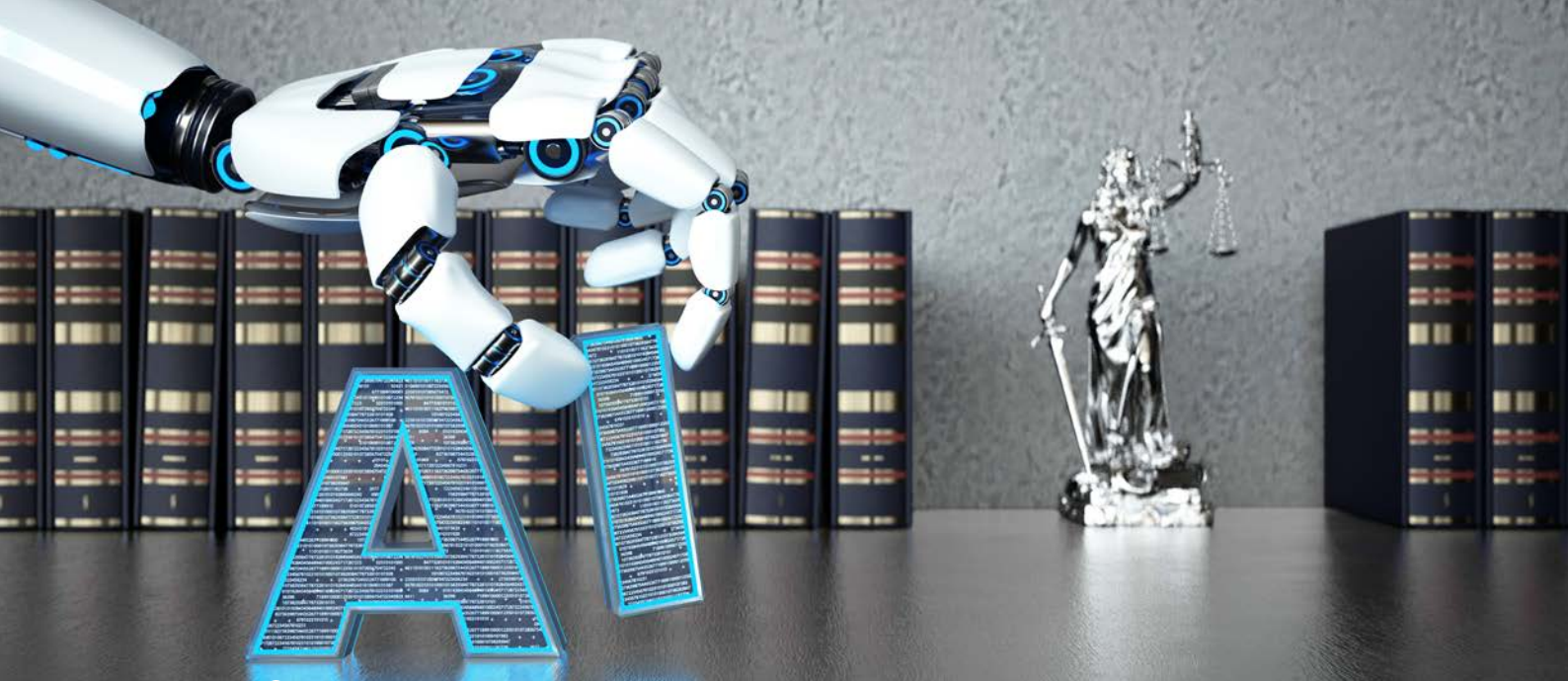
Götz also dismisses the widespread concern that artificial intelligence will replace human workers. Quite the opposite, he says: “AI supports travel consultants. But it is the people – in call centres, travel agents and tourist information offices – who have a feel for what customers want. Where AI can help is by speeding up the process of finding suitable offerings.”

Future applications will go far beyond that. For example, an app could give a business traveller recommendations for leisure activities after work. In the background, an AI could merge event data, weather data and booking data from the city and use it to predict traffic flows, keep an eye on parking availability or plan the distribution of taxi fleets across the city. In the same way, you could also forecast how often litter bins in a nature reserve need to be emptied.

Go-live from mid-2022

The ‘strandticker’ application, for example, demonstrates that something similar is already possible today. It uses sensor data, weather information and seasonal travel patterns to manage visitor flows at the beaches in northern Germany’s Lübeck Bay. And in New York, local company Foursquare has joined forces with the operator of the LinkNYC displays found throughout the city. Visitors and local residents can charge their mobile phones at the displays and get information tailored to their location. A recent addition to the displays is crowd predictions, which can show, for example, when supermarkets in the vicinity will be busy and how busy they will be.

By collating and maintaining data, tourism organisations across Germany are laying the foundations for new routes, destinations and activities. The basic system is in place. Now it is about testing the functionality before the knowledge graph can go live in 2022.



ethics: a must-have, not a nice-to-have

When developing AI applications, ethical principles must be considered from the outset. Waiting until the end of the process to sprinkle them over the algorithm like some sort of fairy dust does not do justice to the social challenges we face.

By Lajla Fetic, consultant and co-lead on the Ethics of Algorithms project at the Bertelsmann Foundation.

More and more areas of life are now being influenced by algorithmic decision-making, creating a need for ethical principles to guide the development of this technology. And that is already happening, with ethics now on many tech companies' agendas. Major players such as Google and Microsoft have adopted AI guidelines, and the European Commission has also published guidelines through the High-Level Expert Group on Artificial Intelligence (AI HLEG). In fact, there are now around 200 such guidelines in total, with some quite similar approaches being taken in Europe, the US and China. All the guidelines share common goals such as fairness, transparency and robustness, but a closer look reveals significant differences. The definition of transparency, for example, can be very different and rather sketchy. Should the AI system itself or only certain parts of it be made publicly available? And to whom should the technology be made transparent? Despite all the international differences and challenges, the task is to translate the recommendations and voluntary commitments into practice, thus making them more tangible.

'People-focused' and 'trustworthy' are buzzwords used by policymakers in Germany and at the European level to describe the vision for AI design. But there is a lack of appropriate frameworks for implementing AI that make it clear that ethical principles cannot be sprinkled over the code at the end of the development phase like some sort of feel-good fairy dust. These principles must be considered from the outset. Ethics are a must-have rather than a nice-to-have. They are not a hindrance to digital innovation, including in tourism, and not every algorithm requires the same ethical considerations and regulatory measures. But we do have to look closely at each AI application in tourism and the transport sector, as they can have unwanted consequences for society. One current problem is that many algorithms always aim to achieve maximum efficiency, or at least what appears to be the maximum. In the case of maps and routing services, this is usually the shortest or fastest route from A to B. But if the shortest route leads through a small town, for example, this can affect local people's lives if increased traffic impacts on the town's charm and peace and quiet. It is important that the principles underpinning the recommendations made by AI are widely discussed, otherwise we could be storing up problems for society.

“Algorithmic systems are neither the problem nor the solution; it is the interaction between man and machine that will be more important in the future.”

Lajla Fetic

LAJLA FETIC

Consultant and co-lead on the Ethics of Algorithms project at the Bertelsmann Foundation

The issue of echo chambers is less clear-cut than many might think as so-called filter bubbles ultimately originate in the analogue world, and not the digital. People do tend to end up marrying partners with the same level of education, after all, and research shows that social classes actually mix relatively rarely in the analogue world. But digital echo chambers can reinforce existing analogue trends, not least because AI learns from existing patterns and becomes increasingly ‘better’ at reproducing them.

One consequence of this, for example, is that Instagram’s algorithm rewards a certain level of exposed skin. According to exclusive research by AlgorithmWatch, photos featuring more skin are shown significantly more often to users. Sexualised content is thus more visible than other content, which leads to the reinforcement of body image and role models. YouTube’s algorithm, on the other hand, has a tendency to recommend increasingly politically radical videos to users, which could lead to greater polarisation. The AI is doing nothing wrong or bad here, it is simply rewarding posts with high click rates by ranking them higher. It is people who determine the criteria by which recommendations are made, so it would be a mistake to cast digitalisation as the scapegoat for negative trends in society. Algorithmic systems are neither the problem nor the solution; it is the interaction between man and machine that will be more important in the future.

Algo.Rules for the ethical design of algorithmic systems

The Algo.Rules are nine formal rules written by 500 experts and coordinated by the Bertelsmann Foundation and the iRights.Lab think tank to facilitate the socially beneficial design of algorithmic systems. The focus is on AI systems that have a significant impact on society or on people's lives.

As algorithms are increasingly making decisions for people, and thus also about social inclusion, the Bertelsmann Foundation and iRights.Lab have published their Algo.Rules in response. Developed using a process of broad participation, the rules facilitate the embedding of ethical standards in programming code. A total of around 500 people from a wide range of academic disciplines and spheres of society took part, including the former Federal Minister of Justice, Sabine Leutheusser-Schnarrenberger.

It is incredibly important that people from a wide variety of fields take part in such processes. We cannot leave the ethics that underpin digital applications to be determined by companies, developers and programmers, especially as programmers, in particular, are predominantly male and are taught just the technical side during their studies. All groups in society must be equally involved in these discussions, as societal risks can be satisfactorily minimised only if those affected by algorithms are able to participate in the development process. Together, we need to develop a sense of how algorithmic systems can affect which areas of life, and what this means for society.

This process is now under way, but its aim is not to make sure that everyone grasps how

"True traceability of AI reasoning paths is more important than transparency. If you want to make AI intelligible to a wide range of people, you have to ask who really needs to understand what?" Lajla Fetic

AI technology works in detail. Hardly anyone will be able to understand every piece of an algorithm's code, even if they were allowed to read it. Too much transparency can even be detrimental to acceptance, as too much information can make people feel insecure. Instead, the goal during the development and use of AI must be to continuously create space to reflect on ethics to ensure that different points of view are heard. Nevertheless, it is important to make the ethical principles measurable and to agree on a common definition of fairness and transparency in the process, for example. Only well-defined principles can provide AI developers with the necessary guidance and effective control over algorithmic systems.

Which is why it makes more sense to focus on the principle of true traceability of AI reasoning paths than to engage in futile discussions about transparency. If you want to make AI intelligible to a wide range of people, you have to ask who really needs to understand what? The focus should be on use-oriented questions. It is much more important to be able to gauge the consequences of an AI recommendation, such as routing traffic through a small town, than it is to understand the technology behind the algorithm.

The developers of artificial intelligence must also be given more time to think about what they are doing: 60 per cent believe that the software products they are working on could have negative outcomes for individuals or society. And 27 per cent have even left their job for this reason. The onus is on management to create more space for employees to assess their work with a critical eye, and to encourage interdisciplinary discussion on the subject. As acceptance of AI ethics grows within the team, the applications will gain trust among users as well, which can result in a real competitive advantage.

What we definitely need is mandatory labelling, especially in the public sector. It should be clear at all times when and how algorithms or AI contribute to important decisions. However, standard tests for AI along the lines of Germany's rigorous TÜV certification would be difficult to implement. It would be naive to believe that you can simply test an algorithm in a digital workshop and then certify it as unproblematic, as it won't always be possible to predict all consequences of using an appli-

AI ethics label for greater transparency and trust in the technology

Environmental sustainability, accountability, transparency, reliability, privacy, fairness

Does this look familiar? Like with the energy efficiency label for homes and appliances, apps, social networks and travel platforms should inform people in a simple and easily identifiable way where AI is being used. Potential elements of the AI Ethics Impact Group's AI ethics label are based on a meta-analysis of over 100 existing corporate and government AI ethics guidelines.

cation. What's more, we are talking about learning systems, so we need an ongoing discussion rather than one-off checks.

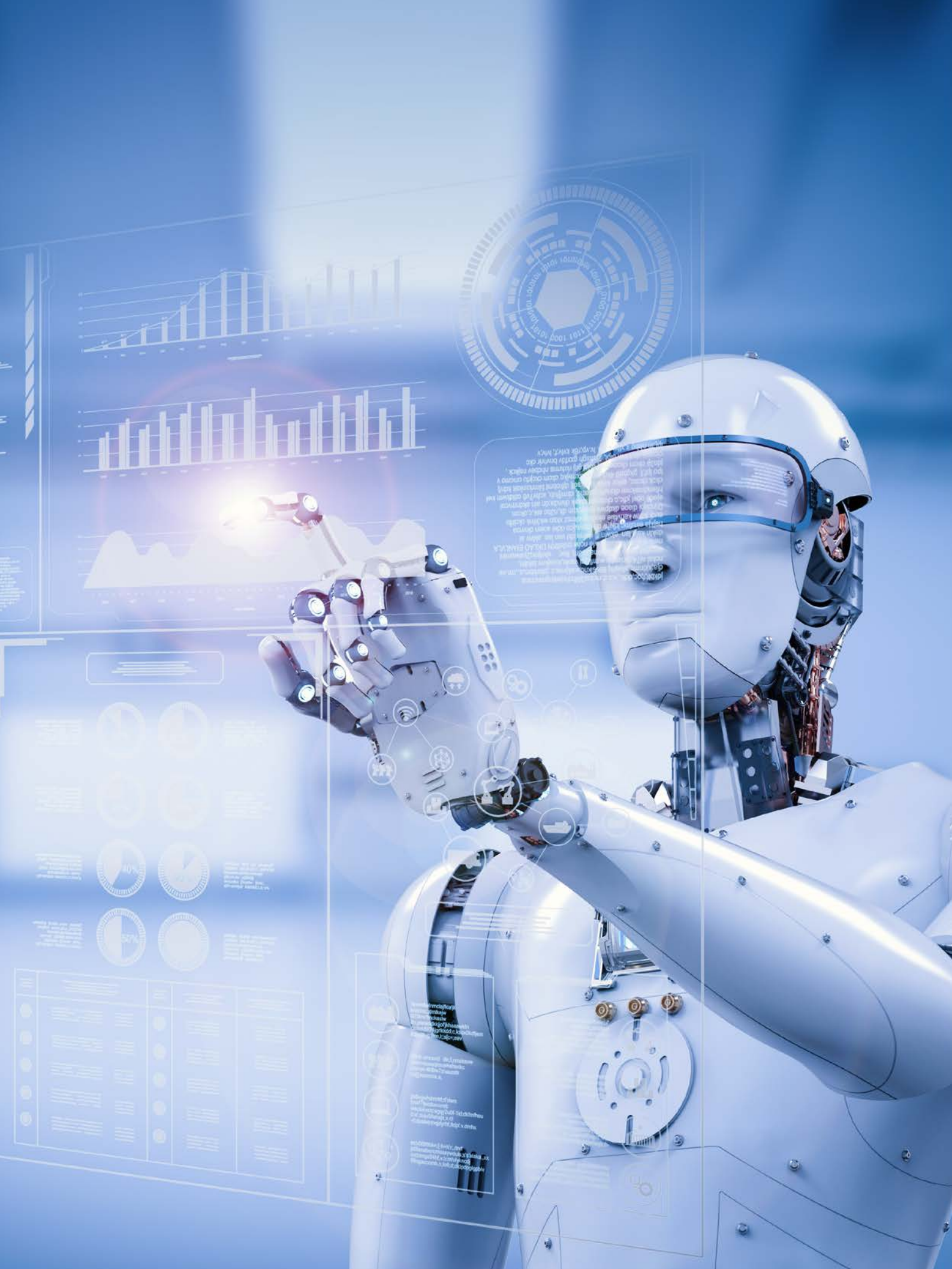
To address this situation, the Bertelsmann Foundation has launched the interdisciplinary AI Ethics Impact Group in cooperation with VDE, a non-profit standards organisation. Their joint working paper fills a gap and explains how ethical principles for AI can be put into practice across Europe. Participants included researchers and experts from the Algorithmic Accountability Lab at Kaiserslautern Technical University, the High Performance Computing Center at the University of Stuttgart, the Institute for Technology Assessment and Systems Analysis (ITAS) in Karlsruhe, the Institute of Philosophy at Darmstadt Technical University, the International Center for Ethics in Science and Humanities (IZEW) at the University of Tübingen, and the iRights.Lab think tank.

At the heart of the paper is the proposed 'ethical' label for AI systems. Similar to the energy efficiency label for electrical appliances, it gives AI developers the option to publicly disclose the quality of their products. The label makes it easier for consumers and organisations that use AI to compare products on the market, and provides a quick overview of whether an algorithmic system meets the ethical standards necessary for its use. This facilitates the ethical development of AI beyond the provisions set out in law.

If we get the ethics right on the system side, AI can lead to greater equality, social inclusion and fairer decision-making, and to better, more personalised offerings. The opportunity is there!

ABOUT THE AUTHOR

Lajla Fetic *is the co-lead on the* ***Ethics of Algorithms*** *project at the Bertelsmann Foundation, where she is responsible for work on the control and regulation of algorithmic systems. She was named one of the 100 Brilliant Women in AI Ethics in 2021 for her research into the societal impact of technology and for developing solutions for the regulation of algorithmic systems. Fetic has a master's degree in public policy from the Hertie School in Berlin and Sciences Po Paris with a focus on digital governance and public sector innovation.*



Major platforms and AI

Artificial intelligence in tourism is no longer the stuff of science fiction. Learning systems are already making processes faster, more efficient and more customisable for travellers and for the industry.

Google Cloud – AI to support climate-friendly flying

Google considers sustainability to be an important driving force but also a great responsibility. Customers of its Google Cloud service benefit from CO_2 savings both in their IT and thanks to their IT, for example through intelligent improvements to core business processes. Air travel is a particularly hot topic due to its carbon footprint, and fuel consumption is the main factor here. It is the airlines' operations departments that are responsible for deploying the most efficient aircraft. These decisions have to be made in a very complex system of interdependencies, and at scale with hundreds of flights per day. By combining previously isolated data on passengers and loads, maintenance intervals, arrival and departure requirements, crew and aircraft rotations, and much more, AI and machine learning can be used to recommend the most efficient aircraft types for each route. This allows for plans to be optimised even at short notice and for CO_2 emissions and fuel consumption to be measurably reduced. The integration of aviation-specific processes with the agility of Google Cloud platform tools such as Vertex AI and BigQuery provides quantitative and qualitative data to support decisions relating to air traffic. This solution makes the need to choose between stable flight operations and sustainability a thing of the past. (Source: Google Germany GmbH)

New booking assistant uses AI to bring multiple channels together

At Booking.com, we like to think of ourselves as an AI company where everything revolves around the customer. This means that any use of machine learning must serve and enhance the customer journey in some way. For us, AI is a means to facilitate an even more personalised and seamless travel experience. One recent example is our booking assistant, where we are now using AI and proprietary machine learning models to bring together multiple channels in one place, including live chat with our customer service team, a self-service feature, and direct messaging to accommodation providers. With this approach, we can help our customers quickly and easily find answers to their questions so that they can continue to enjoy their trip or even plan the next one. Every customer on Booking.com is now assisted in some way by machine learning, and we predict this will grow to include more complex forms of AI to achieve higher levels of personalisation and relevance. (Source: Booking.com)

AI and optical character recognition automate passenger processing

COVID-19 has put an end to self check-in, and airports now need to keep more staff on hand to manually check passengers' health status. Digital document verification, as offered by Amadeus Traveler ID for Safe Travel, can help to streamline processes at airports again and speed them up for travellers. The non-standard formats of digital and paper health documents such as test certificates and vaccination certificates pose a particular challenge. Amadeus has used thousands of document scans to train its optical character recognition (OCR) machine learning feature, and the AI is now able to recognise relevant data such as the passenger name and test result, type and date. The traveller uploads health documents as a scan or photo via the airline website or app, and if there is no readable or activated QR code, OCR is automatically activated. The AI extracts and checks the data before initiating the verification process. If the passenger meets the health requirements in place at their destination, they are given the 'OK to travel' status. In the event that a transaction cannot be processed, the AI hands it over to airline personnel for manual processing, for example via the call centre. Because OCR is constantly learning thanks to AI, the error rate gradually falls and manual processing is required less and less. (Source: Amadeus Germany GmbH)

Lufthansa Technik

One step ahead – AI provides maintenance recommendations

Lufthansa Technik uses AI in its maintenance operations. Aircraft record data every second during their flights, including fuel consumption, turnaround times and operational hours. Based on this and other historical process and aircraft data, artificial intelligence generates predictions of which aircraft parts are most likely to need replacing in the future. Machine learning is then used to analyse this data and issue a maintenance recommendation for a wide variety of aircraft parts. This approach ensures significantly fewer failures and enables more reliable and more efficient operation. What's more, maintenance is only carried out when it is actually necessary, helping to reduce costs compared to routine maintenance schedules. (Source: Lufthansa Industry Solutions GmbH & Co. KG)

Lodgea

AI supports successful direct marketing of accommodation

Ricarda Kies and Jan Kammerath, both members of the DS Destination Solutions management team until 2020, founded LODGEA, a cloud-based booking and marketing engine, with the aim of using AI to take the direct marketing of accommodation to the next level. AI and machine learning are at the heart of the start-up's core processes and incorporate machine vision, natural language understanding and recommendation systems. The software is able to recognise and process the facilities and services available at hotels and other accommodation. High-quality machine translation in 79 languages is another key feature, and AI-assisted geodata analysis automatically assigns location and address information in a uniform format. AI-assisted, automatic content preparation, meanwhile, enables the efficient and direct online marketing of accommodation. LODGEA is the world's first AI-based software for automating the marketing of hotels, holiday apartments, holiday homes and campsites. (Source: LODGEA GmbH)

Deutsche Bahn

AI-assisted, on-demand offering bridges the gap between public and personal transport

Ioki, a subsidiary of the German rail provider Deutsche Bahn, launched an AI-assisted, on-demand shuttle service in Taunusstein in the summer of 2021. In the first four weeks of operation, around 1,500 passengers ordered the electric transport, known as EMIL, to their location using the new app. The app collects passenger requests and uses AI to calculate the best route based on the bookings, saving time and bridging the gap between conventional local public transport and personal transport. 80 per cent of passengers gave their journey a five-star review, with over 95 per cent praising the punctuality. The service is particularly popular in the evenings, with 53.9 per cent of passengers booking the shuttle between 5pm and 1am. Together with its ten partners, the Rhein-Main-Verkehrsverbund (RMV) transport network has created the largest on-demand network in Germany. The operator is GHT Mobility, which is active throughout Germany in the field of electric on-demand transport under the CleverShuttle brand. The booking and scheduling system is provided by ioki, which has rolled out 65 on-demand services in Germany and abroad over the past three years. The Federal Ministry of Transport and Digital Infrastructure (BMVI) and the State of Hessen are providing €27 million in funding for the project. (Source: Rheingau-Taunus-Verkehrsgesellschaft)

A look ahead

Four predictions of how artificial intelligence will change society

By Harry Gatterer, CEO of futurology think tank Zukunftsinstitut

AI forecasts provide a window into the future

Artificial intelligence will become the norm in many areas as it offers a crucial benefit – it makes forecasts cheaper. Unlike conventional, backward-looking 'data processing', AI casts its gaze into the future. AI can predict when systems will fail, show how traffic and visitor flows will change, or identify with a high degree of probability which destinations a person will choose in the coming years. It optimises innovation processes and helps us to shape the future. In short, it provides a window to the future through which we can better see the course of predictable things. Nothing more. But also nothing less.

Re-evaluating communication and empathy

Social media algorithms are a prime example of why it is often counterproductive to base communication on the categories of stimulus enhancement and response enhancement. Human communication is not primarily about likes and efficiency, but about trust, reciprocity and understanding. AI lacks a crucial human capacity in that it cannot read between the lines! Machine logic is unable to use empathy to correctly understand context. The age of learning algorithms challenges societies to re-evaluate what they are seeing and to understand the true essence of experience, meaning and knowledge.

AI is driving a shift in jobs

In the future, AI will take repetitive and monotonous activities off our hands. This shift is not a new process; in fact it started way back during the Industrial Revolution. Learning systems are driving an ongoing transition from uncreative to more creative and from isolated to more communicative activities. This opens up opportunities that were previously hidden by routine. AI is thus pushing the range of professions towards greater complexity, even if many jobs still call for explicitly or implicitly human skills. This shift requires both the intelligent use of AI and healthy self-awareness on our part, but – sooner or later – it will also lead to our emancipation from the yoke of industrial wage labour with its many functional constraints.

HARRY GATTERER

CEO of Zukunftsinstitut

Boldly venturing into a more humane digital world

People tend to delegate their personal responsibility to higher authorities, and it is this tendency that lies at the heart of the subliminal fear of AI. The fear of losing control. Algorithms can certainly be a means of strengthening strategies for domination, but what can be used for control can also be useful in making the world a freer place. Anything you can add to the world in the digital sphere will be amplified by AI. The space where the human and digital realms collide provides fertile ground for new evolutionary stages and a new sense of self. We have nothing to lose except our inner machine. But we could gain a new, more humane world.

Source: Zukunftsinstitut.

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