COMPANIES´USAGE OF AI IN THE CZECH REPUBLIC

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Abstract: AI provides the concept of machine learning that helps to automate the decision-making process by analyzing data inputs. This paper is focused on the usage of AI mechanisms in the Czech Republic across business segments. The data from the Czech statistical office provided from 6 794 companies on the usage of mechanism as text mining, speech recognition and generation, image recognition, and machine learning robotic process automatization. The most used mechanism is image recognition, which used all of the sectors and the least are speech generation and machine learning.

Keywords: Artificial intelligence (AI), data mining, machine learning, image recognition, speech recognition, speech generation, RPA

1 Introduction

Artificial intelligence (AI) agents driven by machine learning algorithms are rapidly transforming the business world, generating heightened interest from researchers [1]. Due to the fast development of AI, we can see an increase in researchers trying to understand the latest trends and developers trying to develop major updates and advance its possibilities. Any technology opens enormous opportunities for individuals as well as societies [2]. This undoubtedly will contribute to the welfare of individuals and the growth of society [3]. Since any technology is the creation of human intellect, it may also carry issues of sociocultural and environmental concerns, such as issues of acceptability, access, and equity [4]. AI is no exception to this [5]. Nováková and Kučera [6] saw, that artificial intelligence can be used in a variety of business sectors. Artificial intelligence (AI) in the context of customer service, we define as a technology-enabled system for evaluating real-time service scenarios using data collected from digital and/or physical sources in order to provide personalized recommendations, alternatives, and solutions to customers' enquiries or problems, even very complex ones [7]. The AI can be the future of our lives. In today's world AI can be helpful in a variety of tasks, from mundane tasks we have to conquer every day to data-driving analysis and much more [8]. Through all the advancement of AI-based solutions, it can solve societal issues effectively [9]. One of the used methods done by AI can be text mining [10]. Text-mining, one of the most popular Artificial Intelligence (AI)-based data analytics approaches for extracting information from social media is exploited [11]. With social media being used every day, it is one of the most effective text sources. After text mining, another highly used feature of Ai is speech recognition and generation. An Automatic Speech Recognition (ASR) module transcribes the speech signal into a textual representation from which a Natural Language Understanding (NLU) module extracts semantic information [12]. The speech generation but lack of the human "touch" it only follows the basic of human responses. Task-oriented dialogue system (TOD) is one kind of application of artificial intelligence (AI). The response generation module is a key component of TOD for replying to user's questions and concerns in sequential natural words [13]. Another notable feature used in our daily lives by companies is image recognition. With the development of digital image processing technology and the updating of computer electronic products, digital image processing technology has been applied to various fields and has made great contributions to the progress of science and technology and the development of productivity [14]. Other interesting features are machine or deep learning for the needs of

data analysis, It trains machines by providing it sample data and thus makes the system intelligent that is helpful for real-world AI applications. Machine learning algorithms are applied to such social feedback data to excerpt useful information that confers a competitive edge to several enterprises [15]. Robotic process automation with elements of artificial intelligence (so -called intelligent RPA), in recent years, Robotic Process Automation (RPA) has been widely adopted across the industry as an important enabler for business process automation and digital transformation [16].

2 Literature research

The stochastic nature of artificial intelligence (AI) models introduces risk to business applications that use AI models without careful consideration [17]. Findings It is found that social entrepreneurship will use the opportunities of Industry 4.0 for optimization of its activities until 2030, but will refuse full automatization, using human intellect and AI at the same time.

2.1 Mining from text (advanced text analysis)

The data mining from text became one of the most key features to analyze responses from customers, based on their messages. Recognizing the importance of these applications and the role of challenge evaluations to drive progress in text mining [18]. These data can be gathered even from scanning articles on the internet any many more. Artificial Intelligence (AI) is not a general method but an umbrella that includes many digital tools that are changing the library environment. Chatbots, document classification, personalized services, text, and data mining (TDM), intelligent education, and user discovery are some of the AI tools that offer new and broad possibilities for research, access, and use of vast amounts of data [19]. This corresponds with say from Chatterjee et al. [20]. Specifically, it has been identified that different approaches are needed to tackle various types of customer data so that those may be made fit and actionable for appropriate utilization of AI algorithms to facilitate business success of an organization [20]. Since AI is still evolving so the text mining options. Advances in the availability and sophistication of software to facilitate the analysis of secondary data have contributed towards the growth of textual analysis [21]. But the Ai still lack some human reliability depending on which texts are important and which are not. Commonsense knowledge acquisition is one of the fundamental issues in realizing human-level AI. However, commonsense knowledge is difficult to obtain because it is a human consensus and rarely explicitly appears in texts or other data [22].

2.2 Speech recognition and speech generation

Automatic speech recognition often refers to converting human speech or voice to textual information with the help of artificial intelligence algorithms. With the advancement of Artificial Intelligence technologies and extensive research being conducted in AI, speech recognition has received much attention and has emerged as a subset of Natural Language Processing where the advancement and accuracy in speech recognition will open many ways to provide a high standard of human-computer interaction. Existing systems that employ Automatic Speech Recognition (ASR) technology to retrieve information from the BIM model fail to provide remote interaction, retrieve a wide range of data, and automate the entire process [23]. As we discovered earlier, AI lacks human abilities. In this example, it can be emotions and it corresponds with the research done by Amaz Uddin et al. [24]. Human speech indirectly represents the mental state or emotion of others.

The use of Artificial Intelligence (AI)-based techniques may bring revolution in this modern era by recognizing emotion from speech [25].This corresponds with the research from Firdaus et al. [25]. Previously, research on either emotion or sentiment-

controlled dialogue generation has shown great promise in developing next-generation conversational agents, but the simultaneous effect of both is still unexplored [26]. Speech recognition can be used in business and also for educational purposes. The model presented by Zhang and Cao [26] combines voice recognition and text-to-speech technology to create functional modules of an English teaching system that change the traditional teaching mode and adjust teaching strategies in real time based on student status based on feature recognition [26]. Another important thing about speech generation is that the AI cannot consider the previous communication with the customer. However, existing works ignore the fact that not each turn of dialogue history contributes to the dialogue response generation and give little consideration to the different weights of utterances in a dialogue history. In this article, we propose a hierarchical memory network mechanism with two steps to filter out unnecessary information of dialogue history [27]. As modern AI-powered systems are cooperating with human users by not only providing raw reports but also producing information based on text generation algorithms and text-to-speech functions, it is essential to ensure that this sensitive, security-related information is not biased [28].

2.3 Image recognition

With the development of artificial intelligence (AI), the use of intelligent identification technology, invoice information for digital image recognition, extraction of information and recording in the financial accounting system, will greatly improve the efficiency of accounting workflow and information accuracy [29]. The help of image recognition can make many processes easier. The feature extraction and recognition part of the software robot image recognition function is arranged in the edge server so that the judgment and recognition can be quickly realized and the system operation efficiency can be improved [30]. Image recognition can be used in for example retail about a customer. Image recognition and other techniques are used by AI to offer more relevant data to business entities regarding customer behaviour and purchase intention [31]. Other than basic image recognition in retail or marketing it can be used for detection of position. By transplanting the artificial intelligence (AI) based image classification algorithm into the embedded platform, this method uses a forward neural network to analyse the position information coming from the coded optical frequency image received by a camera, and then the positioning results can be obtained [32].

2.4 Machine or deep learning for the needs of data analysis

Manually analyzing the discourse and different rhetorical structures can be a tedious and time-consuming process allowing some deceptive reviews to remain publicly available. However, coupled with artificial intelligence tools such as deep learning approaches, discourse analysis could be performed in a manner that is both efficient and timely. The proposed study used a balanced publicly available deceptive and truthful reviews dataset to design a discourse analysis-based credibility check scheme with high accuracy [33].This corresponds to the paper from [22] in which he stated. However, the data-driven model processes substantial data, resulting in excessive processing time. The processing time includes the time spent to form a diagnosis model and the time for the model to evaluate the machinery condition with quantitative accuracy [22]. And it's followed by Yska, Bustos & Guedes [34]. It can be concluded that the potential of ML in management systems is dependent on the amount and quality of data. However, this latter comes at a high cost and therefore, careful cost–benefit analysis should be made before adopting ML in businesses. Overall, this review provided promising perspectives for applying ML within quality systems and potential leading ways for continuous improvement in safety, environment, and integrated management systems [34]. Deep learning, machine learning and their features can save companies a lot of important time. Since constructing data pairs in most engineering problems is time-consuming, data acquisition is becoming the predictive capability bottleneck of

most deep surrogate models, which also exist in a surrogate for thermal analysis and design [28]. We can see the future of the business and the internet depend on the development of AI, machine learning and other technologies. Even to this day, it can help. Due to the Internet, a vast amount of data is generated day by day; from those data to find useful insights, there is a need to identify and extract subjective information [35].

2.5 Robotic process automation with elements of artificial intelligence (so -called intelligent RPA)

The function of RPA is closer to human behaviour than AI. Robotic Process Automation (RPA) is a software solution that mimics human behaviour in the form of a 'Software ROBOT,' which is configured and programmed to perform repetitive organizational chores that humans accomplish [35]. Recent advancements suggest that the next generation RPA will require advanced human-robot collaboration capabilities for providing a more natural conversational interface and supporting more complex automation orchestration needs [16].The tendencies and perspective directions of the development of modern digital devices of relay protection and automation (RPA) are considered. One of the promising ways to develop protection and control systems is the development of fundamentally new algorithms for recognizing emergency modes [37]. Automatization has been one of the greatest improvements in the production segment. Robotic process automation (RPA) has emerged as a lightweight paradigm for automation in business enterprises, making automation more accessible to non-techie business users. We can see the usage of RPA in corrosion simulation and monitoring. This RPA engine will change the world of routine corrosion simulation and monitoring. Also, it can be supplied to any routine engineering simulations. For this project, the well will be produced safely with close monitoring of corrosion and an alarm system. In the work of Wang et al. [38] we can see the future of RPA. Fully exploiting RPA technologies potential will empower higher education and finance, which makes a better future together. The mechanism of RPA to mimic the process of human thinking in solving financial problems was discussed [38].

3 Data a methodology

The data used for this article are from the Czech statistical office. Specifically, the data set is called 1. ICT in Czech companies - Results for the period 2021. The data were conducted in the form of a questionnaire, where companies could use an online form and then send an editable PDF file, via Dante Dante Web, or to a printed questionnaire, which has been sent to the news units into the data box or to the postal address.
8 166 companies were contacted but 6 794 companies participated in this research. The companies were divided into categories based on their number of employees and the field of activity, according to the classification of economic activities (CZ-NACE).

Which is the following:

- Processing industry - C (10–33).
- Production and distribution of energy, gas, water, heat and waste -related activities - D, E (35-39).
- Construction - F (41–43).
- Wholesale and retail; repair and maintenance of motor vehicles - G (45-47).
- Transport and Storage - H (49-53).
- Accommodation and hospitality - I (55-56).
- Information and Communication activities - J (58–63).
- Real estate activity - L (68).
- Professional, scientific and technical activities - M (69–75).
- Administrative and Support Activities - N (77–82).

The only sectors that were excluded from this research are Agriculture - A, mining and mining - B, money and insurance – K, and sections O up to U including education, health and cultural activities.

The number used for this analysis represents share of the total number of businesses with 10 or more employees in a given size and sectoral group.

4 Results

Figure 1 represents the usage of data mining from text inputs. We can see that the Information and communication activities sector uses it the most. This corresponds with the literature findings', that data mining will be highly used in the analysis for future prognostics. Most usage of text analysis is used in professional, scientific and technical activities, transport and storage segments and production and distribution of energy, gas, water and heat and waste-related activities. None of the companies in the sector of construction and real estate activity used this technique.

Figure1: Mining from text (advanced text analysis)
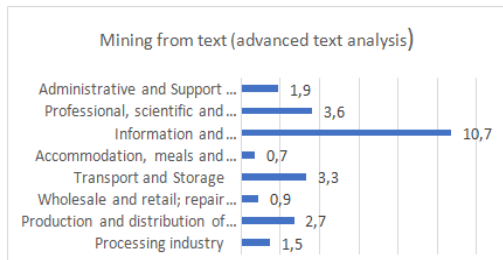
Source: Author.

Figure 2 represents the usage of speech recognition (conversion of spoken speech to machine-readable format). We can see that yet again the Information and communication activities sector uses it the most. It's followed by professional, scientific and technical activities. And the third most used sector of business is real estate activity. Most usage of text analysis is used in professional, scientific and technical activities, transport and storage segments and production and distribution of energy, gas, water and heat and waste-related activities. None of the companies in the sector of the construction and real estate activity used this technique.

Figure 2: Speech recognition (conversion of spoken speech to machine -readable format)
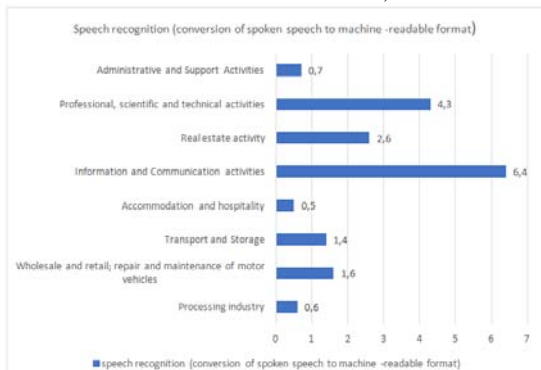
Source: Author.

Another feature of the Ai in the questionnaire was speech generation which can create text or spoken words. Its results can be seen in Figure 3. The trend continues as Information and communication activities use this the most. Another large usage was in the sector of professional, scientific and technical activities, followed by real estate activities. The least amount of usage was recorded in administrative and support activities and the processing industry. Without any data was the production and distribution of energy, gas, water, heat and waste-related activities, Construction, Transport and Storage sectors.

Figure 3: Speech generation (creating a text or spoken word)
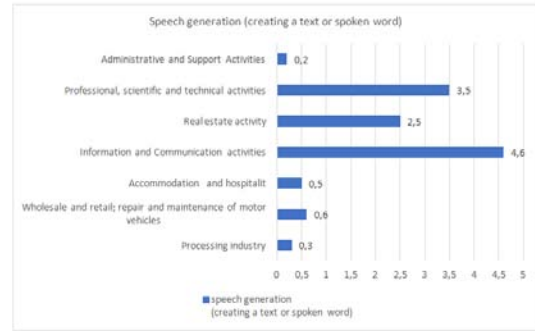
Source: Author.

In Figure 4 we can see the usage of image recognition. In this case, every segment used this technique. The most are again Information and communication activities. Followed by real estate activities. The least usage was recorded construction, accommodation and hospitality and transport and storage sector.

Figure 4: Computer recognition of image (objects or persons)
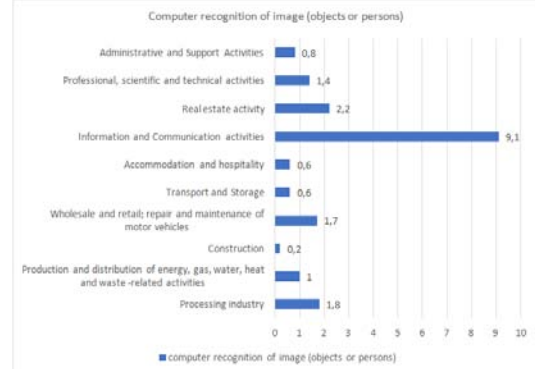
Source: Author.

Machine or deep learning for the needs of data analysis and its usage shows in Figure 5. The only sectors without using this feature are real estate activities, accommodation and hospitality and construction. As the results above the information and communication activities lead the chart.

Figure 5: Machine or deep learning for the needs of data analysis
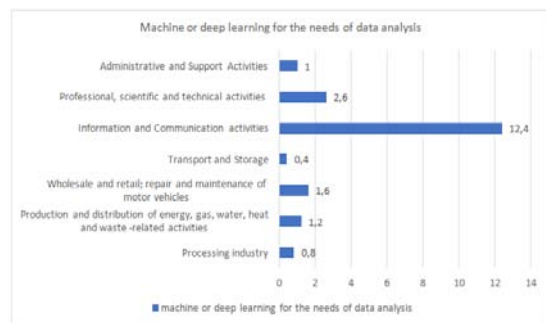
Source: Author.

The last Figure 6 represents the results of robotic process automation with elements of artificial intelligence (so-called intelligent RPA). It was highly used in information and communication activities, then professional, scientific and technical activities and the same amount of usage is represented by the production and distribution of energy, gas, water, heat and waste–related activities and the processing industry. Without any data are accommodation and hospitality and construction.

Figure 6: Robotic process automation with elements of artificial intelligence (so -called intelligent RPA)
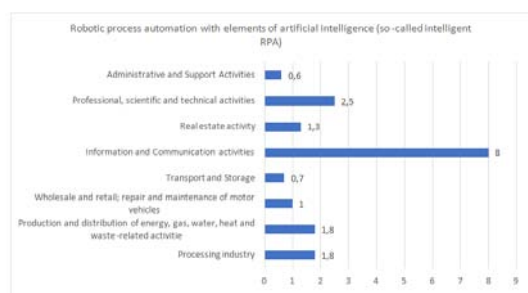
Source: Author.

4 Discussion

The sector of administrative and support activities used every aspect of AI and machine learning in every asked technique. The most used was text mining with the value of 1,9 and the only other feature close to the value of 1 was machine learning, The least used technique for this segment was speech generation. Professional, scientific and technical activities also used all of the asked features. The most used are speech recognition and speech generation, followed by text mining. The least used technique is image recognition. Real estate activities used only 4 mechanics and those are speech recognition, speech generation, image recognition and RPA. The most used were speech generation and recognition.

The most usage of any mechanics shows information and communication activities. In all of the charts, they presented the highest results. Machine or deep learning for the needs of data analysis represents the highest value of 12,4 and the least is speech generation (creating a text or spoken word). Accommodation used text mining, speech generation and generation and image recognition. The feature with the highest value is 0,7 for text mining. Businesses in the transport and storage industry did not use only one mechanic which is speech generation. The highest used feature is text mining, and the least is the usage of machine learning for data analysis.

Wholesale and retail segment same as other 4 segments marked, they use all of the mechanics. The most used is image recognition, closely followed by deep learning for data analysis and speech recognition. The least used is speech generation. production and distribution of energy, gas, water, heat and waste – related activities used four features which are text mining, image recognition, machine learning and RPA. The most used is text mining and the least is image recognition. The last segment focused in this research is processing industry which used all of the features. The most used is image recognition and RPA and the least is speech generation.

5 Conclusion

The results show that the most used mechanics across the business portfolio is image recognition. The results show it highly used in information and communication activities, with the value of 9,1. The only segment that was over the value of 2 is real estate activities. And considerable number of segments didn't even cross the 1 value mark. This shows that the image recognition can be used in every business and provides many features that can help save time and money.

Text mining, speech recognition and the usage of RPA was used in 8 segments across the business. Apart from the information and communication activities with the value of 8 only 2 segments didn't got over the value of 1 (administrative and support activities and transport and storage activities. The fact that a large number of sectors used the mechanics for speech recognition represents the future of this mechanism. Human

speech indirectly represents the mental state or emotion of others. But it still has lack of human touch. The use of Artificial Intelligence (AI)-based techniques may bring revolution in this modern era by recognizing emotion from speech (Amaz Uddin et al., 2023).

Speech recognition and machine learning was adopted and used by 7 sectors. Speech recognition was mostly used in information and communication activities, then by professional, scientific and technical activities and closely followed by real estate activity. Only 3 sectors didn't cross the value of 1, which are administrative and support activities, accommodation and hospitality and the processing industry. The fact that deep learning for data analysis is not common, since this mechanic can help save a lot of time in the processes. Deep learning can produce excellent designs by learning from a large number of design examples (Jiang, He & Chen, 2023).

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