Chapter X.

ARTIFICIAL INTELLIGENCE IN INSURANCE

Blockchain technology,[1] software robots,[2] Internet intelligent devices[3] and various aspects of Artificial Intelligence (AI) is very often mentioned in contemporary literature as a great potential for improving processes in the field of insurance. Algorithms that are the basis of artificial intelligence reveal statistical correlation in analyzed data and thus enable machines to perform tasks requiring human intelligence. Machine Learning (ML) is a subset of artificial intelligence designed to study and identifies patterns in behavior, using statistical methods of available data processing. The key benefits companies can get from AI are predicting future trends, based on the fact that the software independently perceives patterns in the available data. There are great possibilities for applying artificial intelligence in insurance, which will be described in more detail in the paper.

FROM NATURAL TO ARTIFICIAL INTELLIGENCE STEP BY STEP

The earliest significant papers in the field of AI belong to the British scientist and pioneer in the field of computers, Alan Mathison Turing.[4] In 1935, Turing described an abstract computing machine consisting of unlimited memory and a scanner moving back and forth through memory, symbol by symbol, reading what it found and then writing down further symbols. Scanner actions are dictated by an instruction program that is also stored in the memory in the form of a symbol. This is Turing's concept of a stored program whereby the machine has the ability to work on its own program and thus modify and improve it. Turing's conception is now known as the Universal Turing Machine. In his influential 1950 paper, Alan Turing proposed a test that could determine whether a machine was intelligent. Simply defined, a machine is intelligent unless we can distinguish it from a man in conversation with it. For a machine

[1] Pavlović, B. (2018). Blockchain Technology in Insurance and Reinsurance, XVI međunarodni simpozijum „Novi izazovi na tržištu osiguranja“, Aranđelovac
[2] Pavlović, B. (2019). Robot Usage in Insurance, XVII međunarodni simpozijum „Osiguranje na pragu IV industrijske revolucije“, Zlatibor
[3] Pavlović, B. (2020). Internet of Intelligent Devices Application in Insurance, XVIII međunarodni simpozijum „Osiguranje u uslovima pandemije COVID-19“
[4] www.britannica.com/biography/Alan-Turing

to pass the Turing test, it must have the following abilities: processing natural language, presenting knowledge, drawing conclusions and learning.

The formal beginning of artificial intelligence is 1956 when a group of already experienced researchers in this field organized a conference at Dartmouth College in America to discuss achievements and future directions of development. At the suggestion of American scientist John McCarthy,[5] a later winner of the Turing Prize and creator of the programming language LISP, the area was called artificial intelligence.

The first successes of Artificial Intelligence

The earliest successful programs in the field of artificial intelligence mainly dealt with famous logical and strategic games, where the machine would be programmed and trained to win the game against a man. Christopher Stretchy wrote in 1951 a program for the game of checkers that until the summer of 1952 could be played at a reasonable speed as a complete game of checkers. In the same year 1952, the scientist Arthur Samuel also wrote a program of checkers that has significantly improved over the next few years. The key change was the addition of features that allowed the program to learn from experience. Samuel then turned on the mechanisms for learning by heart and for generalization, which ultimately led to his 1962 program winning the competition against America's fourth-ranked checker player. Samuel's program of checkers was also significant in that it was one of the first attempts at evolutionary computing. His program evolved by changing himself with the best version of program in that moment. The winner of the party would always become the new current version of the program. Evolutionary computing usually involves the use of some automatic method of generating and evaluating successive generations of programs, until a highly professional solution is developed.

In the early 1980s, researchers began to create systems whose use was limited to a narrow area instead of systems that had general intelligence, but they were really useful in that area.

Expert systems

The right application of artificial intelligence in the micro-world was brought about by expert systems. Efforts are being made to incorporate all information in such AI systems about some narrow area that an expert (or group of experts) would know so that a good expert system can often outperform every single

[5] www-formal.stanford.edu/jmc

human expert. There are many commercial expert systems, including programs for medical diagnosis, chemical analysis, credit approval, financial management, corporate planning, financial document routing, etc.

The basic components of the expert system are the knowledge base and the inference mechanism. The information to be stored in the knowledge base is obtained by interviewing people who are experts in the field. The interviewer or knowledge engineer organizes the information obtained from the experts into a collection of rules, typically of the "if-then" structure. Rules of this type are called production rules. The inference mechanism allows the expert system to create a deductive inference process as follows, if the base contains rules "if k, then i" and "if i, then z", the inference mechanism can derive the inference "if k, then z". The expert system could then ask its user: "Is k true in the situation we are considering?" If the answer is yes, the system will continue to infer. Later expert systems began to use Fuzzy Logic. In standard logic, there are only two values, true and false. This absolute precision makes fuzzy attributes or situations difficult to characterize (e.g. when, exactly, does thinned hair become a bald head?). For this reason, fuzzy logic, in which a claim can be both true and false with a certain probability, becomes much more applicable.

Connectionism

Connectionism or neural-based computing, is an attempt to understand how the human brain works on a neural level and especially how people learn and remember. In 1943, neurophysiologist Warren McCulloch and mathematician Walter Pitts published an influential treatise on neural networks and automatons, according to which every neuron in the brain is a simple digital processor, while the brain as a whole is a form of computing machine. As McCulloch later said "What we thought we were doing (and I think we succeeded fairly well) was treating the brain like a Turing machine."[6]

In 1957 Frank Rosenblatt began researching artificial neural networks he called Perceptrons. He made a major contribution to the field of artificial intelligence, both through experimental research into the properties of neural networks (using computer simulations) and through detailed mathematical analysis. Rosenblatt and his followers called their approach Connectionism, to emphasize the importance of learning to create and modify neuronal connections.

Good examples of the application of neural computation are visual perception, natural language processing, financial analysis, medical application, etc. Visual

[6] www.britannica.com/technology/artificial-intelligence/Connectionism

perception enables the recognition of faces or other objects, so-called visual data. The neural network designed by John Hamel and Irving Biederman could identify about 10 objects from simple line drawings.

AREAS OF ARTIFICIAL INTELLIGENCE DEVELOPMENT

A prerequisite for the intensive development of artificial intelligence is the possibility of storing, connecting and processing a huge amount of data. Modern computer processors have reached the necessary power to work fast enough with a large amount of data. The cost of data storage has fallen dramatically. Relatively simple possibilities have emerged for connecting a large number of computers into clusters that can manipulate data at a satisfactory rate.

In the modern world, we're already surrounded by artificial intelligence. From assistants like Apple's Siri or Amazon's Alexa, through online stores that predict what we might buy next, then playing computer games (e.g. Doom and Counter-Strike), quizzes, text classification, translation, analysis of social networks and speech recognition, to specific business analyses and predictions, AI is everywhere. Research and development of artificial intelligence take place in almost every segment of life and society. The following areas are currently the most developed and most frequently applied in practice.[7]

Machine Learning

Machine Learning is the most advanced and commonly used model of artificial intelligence. It is intended to develop systems that improve their performance with experience. In the last decade, progress in AI can easily be attributed to the progress of machine learning and ML has become synonymous with AI. Researchers are now focusing on scaling state-of-the-art ML algorithms over large datasets. Machine learning is based on the ability of specialized software to make its logic and independently perceive the connections between data.

Although the concept of ML is quite simple, it takes considerable experience to successfully apply it to a particular problem from practice.[8] Research has shown that machine learning software configured by an experienced IT professional provides much better data interdependencies than when an expert in a particular

[7] Uj, A. (2018). Understanding three types of artifcial intelligence, www.analyticsinsight.net
[8] Hurwitz, J. and Kirsch, D. (2018). Machine Learning for Dummies, IBM Limited Edition, John Wiley & Son, New York, USA

field tries to formulate rules and relationships based on knowledge and experience. The software gives a function, which is for the man who configured it the black box, but even though the man does not understand the interdependencies between data – correlations, he can show examples that the results given by the software are correct.

Machine learning only works in cases where there is a connection between data in reality. If the software includes data on which books the owner of the property read and the price for which the property was sold, no magic can determine the price of the property based on the books. The best results are obtained when ML is included in the problems that man could solve because machine learning software solves them much faster and better.

Machine learning in practice is reduced to an iterative process with the following steps:

1. Provision of relevant data for solving a given problem
2. Preparation of data for analysis by machine learning, with the aim of working only with quality and reliable data
3. Selection of the appropriate ML algorithm
4. Algorithm training, which can be supervised, unsupervised and substantiated, is necessary to form a quality model
5. Evaluation of the model, to select the algorithm with the best performance on the specific problem
6. The created model is distributed to users in the form of an application
7. Users solve the problem based on their data, which the model has not seen before
8. Assessing the validity of the problem solution and then returning to the beginning of the process until a sufficiently good solution is achieved.

Machine learning algorithms are different from standard algorithms that are encountered in computer science, because instead of the algorithm starting with data input, in ML data create a model.[9] The main advantage of this approach is that it eliminates prejudices and erroneous assumptions from the model. Choosing the right algorithm is not easy and it takes a lot of experience to make a good enough choice, which will give a model tailored to the specific problem. Most often, algorithms are written in one of the following programming languages: Java, Python and R.

Deep Learning

[9] Pereira, D. (2019). A New Generation of Artificial Intelligence, 2020-us.semantics.cc

The most advanced branch of machine learning is Deep Learning. Deep learning involves creating neural networks inspired by biological neurons in our brain. By structuring algorithms in layers, this model creates an artificial neural network that can learn and make intelligent decisions on its own. What makes this model particularly challenging to design is ensuring that it does not draw the wrong conclusions. Like other examples of artificial intelligence, deep learning requires a lot of training to make learning processes right. When it finally works as intended, deep learning is often treated as a scientific miracle that many consider being the backbone of true artificial intelligence.

Deep learning is a driving force for many applications in artificial intelligence such as object recognition, speech and language translation, playing computer games and self-driving car control. A great example of deep learning is Google's Alpha Go. Google has created a computer program with its neural network that has learned to play the abstract social game Go, which is known for requiring high intellect and strong intuition. Playing against professional Go players, Alpha Go learned how to play at a level never before seen in artificial intelligence.

Recommender systems, based on deep learning, are a much-exploited area of artificial intelligence that created a virtual world vendor. Companies like Google, Netflix and Amazon rely heavily on an intelligent recommender system. This mechanism takes into account previous user preferences, similar person preferences and trends to create models for predicting the next purchase and thus make an effective recommendation.

Computer Vision

Computer Vision deals with the study of how a computer visually perceives the world around it. Ironically, computers are good at performing huge tasks such as finding the tenth root of a 100-digit number, but they struggle in simple tasks such as identifying and distinguishing objects. Significant advances in deep learning, the availability of huge marked datasets as well as high processing power have enabled computers to outperform their human counterparts for some of the narrowly defined tasks such as the classification of visual objects. The area of detection and the area of object recognition are sub-areas of computer vision that most often rely on machine learning or deep learning. Object detection is applied in many areas of computer vision, including image retrieval, security, surveillance and autonomous vehicle control.

Neural Networks

Neural Networks are the brains of artificial intelligence. They are computer systems that replicate neural connections in the human brain. Artificial neurons that correspond to brain neurons are known as Perceptrons. A set of different Perceptrons, which are connected and trained by processing different training examples, form an artificial neural network in machines. In deep learning of neural networks, each layer is trained to manipulate a unique set of attributes, based on the output characteristics of the previous layers. The more you enter the neural network, the node gets the ability to recognize more complex attributes because they predict and recombine the outputs of all previous layers to produce a more accurate final result.

The main challenge that AI is struggling with is solving the handling and management of unlabeled and unstructured data widespread everywhere, in all areas and countries. Now neural networks have the ability to handle the complex characteristics of these subsets of data. Deep learning in cooperation with artificial neural networks classify and characterize unnamed and raw data in the form of images, text, audio, etc. into an organized relational database with appropriate marking.

The formation of the neural network can be compared to young children. When they're born, they don't know anything about the world around them, but as they age and learn from their life experiences and mistakes, they can eventually become intellectuals. The network architecture in the coarsest lines is shown by the following mathematical expressions:

input * weight coefficient = prediction
realistic facts – prediction = error
error * weight contribution of error = adjustment

The input data set will be mapped with certain initial coefficients to obtain multiple predictions. In the next step, the prediction is compared with the basic facts taken from the scenario in the real world. Facts are compared with expectations to find the error rate. Adjustments ultimately serve to reduce error and redefine the contribution of weighting coefficients. These three functions are the three basic building blocks of neural networks that describe input, estimate loss and apply this to model upgrades.

Cognitive Computing

Cognitive Computing is an area of artificial intelligence that aims to initiate and accelerate the development of human-machine interaction when performing complex tasks and solving problems. While working with people on different kinds of tasks, machines learn and understand human behavior and feelings in

different characteristic conditions. This area is trying to recreate the thinking process of people in a computer model. Applying this knowledge, the machine acquires the ability to understand human language and image reflection. So cognitive thinking along with AI can produce a model that mimics human actions. It is developed by analyzing natural language and evidence-based learning. Cognitive computing is capable of making accurate decisions in the event of complex problems. It is often applied in the area that needs to improve business solutions at optimal costs. A good example of a successful project in this area is Google Assistant.

Natural Language Processing

Natural Language Processing is a branch of artificial intelligence in which computers can interpret, identify, locate and process human language and speech. The concept behind the introduction of this component is to make the interaction between machines and human language seamless. In this way, computers will become capable of generating a logical response to human speech or inquiry. The focus of natural language processing can be on the verbal or written part of human languages. This means that the way of using algorithms can be both active and passive. Natural Language Generator processes and decodes sentences and words of spoken language (verbal communication) while Natural Language Understanding deals with written dictionaries to translate the language in the text. Different types of translators that convert one language into another are examples of natural language processing systems. The practical application of research and development in this field are chatbots, speech-to-text converters, grammar correctors as well as Google voice assistant and voice search engine function.

Robots and Artificial Intelligence

Often the understanding of robots and artificial intelligence mixes up and intertwines so that there are some points of view that this is the same area, unlike those others who consider these to be completely different disciplines. These are indeed the two branches of technology that can best be represented by Venn diagrams. Each area is a separate set where they have one segment where they coincide. Robotics is a branch of technology that deals with physical robots. Robots are programmable machines that are usually able to perform a series of operations autonomously or semi-autonomously. They communicate with the outside world through a system of sensors and the actions they perform are pre-programmed. Unlike them, artificial intelligence is a branch of computer science that involves the development of computer programs to perform tasks that would otherwise require human intelligence. AI algorithms can address the

learning, perception, problem solving, language comprehension and logical reasoning. Where these two areas overlap is the world of artificial intelligence robots. Intelligent robots are robots that are controlled by intelligent programs. Adding artificial intelligence adds perception and instincts to the robot, so it becomes able to make decisions. For example, a camera can add a perceptual vision to a robot. In this way, the robot that performs certain programmed actions will be able to move in space additionally and the camera and the software that controls the movement will prevent it from colliding with different elements of exterior. In addition to physical intelligent robots, this includes software robots. A software robot or bot is a computer program that performs a task itself using one of the models of artificial intelligence.

APPLICATION OF ARTIFICIAL INTELLIGENCE IN INSURANCE

The daily growth of data generation is a fundamental driver of the use of artificial intelligence. Companies, institutions organizations and natural persons generate over 2.6 million terabytes of data per day.[10] The processing of this data enables the application of AI in various activities, including insurance. Numerous projects based on artificial intelligence have already been implemented in the insurance industry in the world.

Insurance is an activity with weak and rare interaction with clients. In addition to the very nature of the process, at the beginning of the contract, the policy is bought and paid and then during the term of the contract there is no communication with the insured persons if there are no claims. There are also brokers, who often take over complete communication with clients, as well as weaker digitalization than in other industries, which otherwise enables more intensive interaction with clients. One of the biggest challenges of the insurance industry that AI could solve is more intensive communication with existing clients and communication with potential clients at the right time when they need insurance services. In addition, artificial intelligence can ensure the design of appropriate products that meet customer needs, accelerated and efficient claim settlement for loyal customers, recognition of false claims and prevention of insurance fraud, processing of large amounts of data and reduction of administrative costs.

[10] Kumar, N., Srivastava, J. And Bisht, H. (2019). Artificial Intelligence in Insurance Sector, Journal of The Gujarat Research Society

The application of AI techniques in insurance ensures that the clients can obtain accurate and prompt information at any time regarding the product they want to buy or have. However, for insurers to be able to predict client behavior, they need to have adequate and orderly client data. Then, machine learning algorithms can learn from the data and give insurers the possibility to offer insurance services tailored to their clients.

Areas of application of artificial intelligence in insurance

Artificial intelligence can be used in almost all areas of insurance to provide numerous benefits for the insured and the insurance company.

The development of new products is an obvious field in which AI can help a lot by introducing products based on the use of a particular resource (e.g. driving a vehicle), adapting services to the needs of an individual insured person, support for new types of insurance (e.g. cyber insurance and micro-insurance), etc. It also provides appropriate incentives for customers to accept new products and services.

Tariffing and underwriting can be significantly improved by the application of artificial intelligence methods and tools. Improved risk assessment, the introduction of new additional factors for calculating the price of the policy, predictive models for claims in the function of determining the optimal price for each individual insured, modeling the behavior of the average client regarding the cancelation of the policy, analyzing a large amount of diverse data from different sources in a short time, etc. bring a crucial comparative advantage over the competition.

Sales can record better results by introducing automated consulting, removing brokers from the policy sales process, establishing a sophisticated Customer Relationship Management system, increasing the number of interactions with insured persons, implementing virtual assistants to assist agents in following sales procedures, etc.

After-sales is a very wide field for AI application. Smart mobile applications, 24/7 customer service, chatbots, automatic notifications of hazards such as floods or storms, as well as similar activities can help to create added value for existing customers to increase loyalty and reduce policy termination rates.

Claim handling can cause client dissatisfaction due to a slow process or inadequate amount payment, as well as losses to the insurer due to poor quality liquidation. With the help of artificial intelligence, all or parts of the claim

settlement process can be automated, the system of prediction can assigned more complex claim to more experienced employees, the so-called leakage or systematic payment of higher amounts of claim can be analyzed, the process of claim assessment on vehicles by recognizing the forms of claim in photos can be maximized, automatic recognition of invoices and their payment can be implemented, e.g. from vehicle repair services, etc. Also, using advanced analytics in the prevention of insurance fraud, by identifying anomalies in the claim report, templates used by fraudsters and unusual client behavior can bring huge savings to insurers.

Lead Management can be strongly supported by AI. By supplementing their customer databases with data from social networks and other publicly available sources and comprehensive analysis with artificial intelligence methods, a very reliable assessment can be obtained of potential future customer insurance needs and their contacts can be delivered to the sales network according to a predefined allocation system.

Marketing in all activities, including insurance, can be significantly improved using AI. Data which can be used for marketing campaigns are available on social networks, sensors, home devices connected to the Internet, public databases, etc. Due to the size of the data and the absence of structure, its processing is only possible by tools that use artificial intelligence methods. Deloitte claims that successful segmentation and personalization in marketing can increase the profit of the insurance company by almost 10%.[11] Particularly useful is the application of machine learning to increase the possibility of cross sale and up sale, as well as to improve the system of recommending appropriate products following the recognized current needs of clients.

The user experience in interaction with the administration of the insurance company can be significantly improved. AI can speed up administrative processes, automate certain claims settlement procedures, provide support to clients in various processes using a chatbot and provide additional benefits for clients based on their driving data from telematics or a healthy lifestyle from a smartwatch.

Investing the assets of the insurance company can be of better quality by including artificial intelligence in the process of analyzing available securities and other investment opportunities on the financial market. Of course, the time has not yet come to fully automate the investment, but the detailed technical

[11] Deloitte (2017). From Mystery to Mastery: Unlocking the Business Values of Artificial Intelligence in the Insurance Industry, Deloitte Digital Issue 7/2017

analyses that prepared by AI could serve as an extremely useful guide for portfolio managers.

Data input management is a useful application of artificial intelligence because it significantly facilitates and speeds up the manual work of employees, by automatically filling in certain fields in the offer, policy or claim report based on their databases, publicly available data and recognized data entry templates.

Other applications of AI and ML in insurance mainly relate to predicting the outcome of litigation, assistance to consumers through automatic devices and assistants, driver performance monitoring, insurance market analytics, etc. For example, RiskGenius[12] has created an algorithm that makes it possible to compare customer options across commercial insurances and to detect potential gaps in coverage. It instantly recognizes the key provisions of the insurance terms and conditions and allows insurers to insert generic terms from the library of terms and clauses so that they can adapt the wording of the new insurance terms.

Application of AI methods and techniques in insurance

Speech recognition - identifying, understanding and interpreting the words and phrases of the spoken language of clients and especially the emotions that clients express in their speech when addressing the contact center by phone, can help to determine the characteristics of products that irritate clients and need to be improved, which is a valuable data for the products development sector.

For marketing, this analysis of the speech and emotions of the client who addresses the contact center is also extremely useful, because in this way it is possible to segment the target group and better adapt the way of addressing each segment. At the contact center, customer support can be significantly improved by introducing chatbots that understand and can generate human speech. This eliminates the annoying possibility for users that all agents are busy and that it is necessary to wait for someone to come forward. Also, modern chatbots can understand almost all questions about products, branch locations, procedures for reporting claims, statuses of payments, debts and claims, etc. and provide adequate answers to them. In the claim sector, the efficiency of employees' work can be increased, primarily by automatically filling in the reporting claim form based on the recognized text that tells the injured party in the claim reporting procedure. Also, by analyzing the voice in the process, an attempt at insurance fraud can be recognized in a large number

[12] www.riskgenius.com

of cases, thus significantly facilitating the work of the insurance fraud sector. Modern use of chatbots in the claim sector is in making recommendations to clients about healthier life style and a safer way of driving a car with the aim of preventive action and preventing claim.

Analysis of images and videos showing the reaction of potential customers to proposed new products can be very useful. Their emotions can provide a good guide to improving initial proposals for new products.

The marketing sector can receive significant help in the formulation of messages sent to the public when artificial intelligence analyzes a large number of promotional video messages from the competition from different insurance markets that have been displayed over a long period and proposes potential solutions. Underwriting can be significantly facilitated if AI analyses images of the subject of insurance. For instance: the US IT company Lapetus Solution[13] has developed software to automatically prepare a life insurance offer based on the analysis of the photos of the insured and only nine additional questions. Similarly, with claim assessment, a well-trained AI system based on photos of damaged parts and a large database with photos of vehicles' claims from the past can determine the amount of claim of almost any vehicle that has suffered claim with a high degree of reliability.[14]

The mechanism for recommending includes interpreting the results and proposing appropriate action based on data analysis.

Optimizing product recommendations to customers for cross sale and up sale, artificial intelligence can be very successful based on the sales success data of the existing recommending system. Also, by analyzing the behavior of social network users, an AI-based system can single out a group of potential users who are likely to be interested in certain insurance products and forward their contact information to the sales network. This mechanism can also help underwriters to categorize client risks, based on the client's claim history and any other events in which clients participated and whose data are publicly available. In addition to accelerating the work of the underwriters, this way human error in the categorization of client risks is prevented. By using historical data on the causes of claim, this mechanism can also help clients by proposing preventive actions and procedures that reduce the possibility of claim. Finally, the recommending mechanism can be included in the

[13] www.lapetussolutions.com

[14] Eling, M., Nuessle, D., Staubli, J. (2021). The impact of artificial intelligence along the insurance values chain and on insurability risks. *The Geneva Papers on Risk and Insurance – Issues and Practice* (2022) 47, p. 205-241

management of the investment of the insurance company's assets and funds used to cover technical reserves. Based on daily market analysis, the mechanism may suggest buying new attractive securities or selling securities that the insurance company has in the portfolio.

Conversational bots whose conversational history with customers and potential customers can be analyzed could help a lot in developing new and improving existing products because it unmistakably points to the painful points of existing products and customer needs that are currently not met. Insurance products can be sold more successfully if the process carried out by the seller is managed by a virtual agent. In this way, the sales procedure will be fully complied with and no details will be skipped or misinterpreted, the creativity of the seller will not be compromised and what is the most important in the sale of insurance, human contact will not be absent. In the process of reporting standard claims, if a chatbot communicates with the client instead of an employee, it can increase the efficiency of work due to the certainty that the prescribed procedure will be followed, but also the possibility of chatbot to use historical data about the client who reports the claim and thus ask fewer questions to the client. In complicated cases, at some point in the application process, it is necessary to involve a person, but even in these cases, a chatbot can help by doing at least one part of the work. Although it is not only specific to insurance companies, virtual assistants with communication skills can provide a high-quality organization of meetings and scheduling of meeting rooms for employees.

Predictive analysis that as a result provides a prediction of future results based on statistical processing of Big Data can be particularly well applied when taking risks and personalizing the premium of modern innovative products for clients who use connected devices such as telematics in vehicle insurance, wearables in health and life insurance, etc. Predictive analysis can help the marketing sector to understand the values that are important for an individual user and adapt the campaign for the promotion of insurance products accordingly. Also, by predicting the behavior of users in different situations, a proactive strategy of communication with clients can be made, which can avoid potential problems that can lead to the insured's dissatisfaction or cancelation of the policy.

Physical robots, including drones, whose functioning is controlled by artificial intelligence-based systems, can make the claim assessment process much easier since they can easily access inaccessible points for humans and withstand possible extreme weather conditions more easily than humans. They can also be used in underwriting and tariffing for better risk assessment of the insured.

Software robots or Robotics Process Automation, can take over a large part of the activities performed by employees of companies nowadays. Employees at lower levels of the company hierarchy perform a large number of tasks daily that require accuracy and speed and do not require decision making. The software robot can help employees and the company a lot because it never sleeps and makes mistakes. Employees get rid of routine activities and the company gets much better results. Software robots are easily configured and integrated into any IT system.

EXAMPLES OF APPLICATION OF ARTIFICIAL INTELLIGENCE IN INSURANCE IN PRACTICE

The most famous example in the world of using advanced cognitive technologies, which will be specifically described in this paper, is the American insurance company Lemonade. The largest insurance companies in the world use artificial intelligence in various business processes, while in Serbia the Association of Insurers of Serbia uses AI algorithms in the fight against fraud, which will also be given due attention in this paper.

Lemonade[15]

The famous American startup insurance company that deals in non-life insurance, Lemonade was found six years ago. A company that promised to revolutionize the insurance market with digital transformation and boldly wrote a slogan on its website, which faithfully reflects the company's philosophy: “Lemonade - Forget everything you know about insurance!” Revolutionary changes in operations in the world insurance market have been introduced. No paper is used when interacting with clients, so they do not issue material policies. Claims are reported exclusively through the application by recording a video clip explaining the case. The sale of policies and claims reporting is done through its website (www.lemonade.com) and the mobile app for iOS and Android (Lemonade Insurance) using a chatbot named Jim that works on machine learning principles. Broker services are not used, sales are purely direct. Premium payment is only possible by credit and debit cards. The time it takes for the client to purchase the policy is less than 5 minutes, while processing and payment of most claims are completed in less than a minute. The record was reached in 2016 when they paid off the claim for the stolen coat in 3 seconds. Artificial intelligence checks a large number of parameters

[15] www.lemonade.com

through 18 algorithms, which point to possible insurance fraud, before claims are paid. The profits remaining under the individual policy at the end of the year are channeled to a charity, an organization chosen by the policyholder. In this way, the rule was introduced that the insurance company does not earn from the deduction of claims, because it will still give that money to charity and thus avoid a conflict of interest of the company's management. Profit for the company is the difference between the premium loading expenses which for all policies is 25% of the premium and the operating costs of the company. Digital access allows for great flexibility during the term of the insurance contract, clients can terminate the policy at any time with a refund of a proportionate part of the premium, increase or decrease coverage. Finally, one traditional recipe for success was applied - the prices of policies are lower than with other insurance companies.

Thanks to its groundbreaking approach to insurance, its great popularity among millennials and its highly successful marketing performance, Lemonade has achieved great success in attracting investors. Also, in addition to investors, one of the most famous reinsurance companies in the world, London Lloyd's has accepted to be their reinsurer.

Swiss Re[16]

The Swiss company Swiss Re has been using the IBM Watson tool for several years to process large amounts of data in the life and health insurance underwriting sectors. For example, they use prediction methods to determine a potential insured's preference for smoking without the need for any laboratory testing or making a statement that affects the insured. In this way, they can take a sufficiently reliable view of the potential client's health risk for determining an adequate insurance premium.

AXA Japan[17]

The Japanese branch of one of the world's largest insurance companies, AXA, using the Google TensorFlow tool to work with neural networks, analyses large amounts of data about its clients and thus relatively successfully forecasts their potential claims, intending to determine the optimal price for each client in motor insurance. AXA Japan has achieved 78% reliability in the forecasts, which is a great success that on the one hand enables an increase in profit and on the other hand accelerates underwriting at the point of sale by automation,

[16] www.swissre.com

[17] Kumar, N., Srivastava, J. And Bisht, H. (2019). Artifical Intelligence in Insurance Sector, Journal o The Gujarat Research Society

which is a comparative advantage compared to competing insurance companies that traditionally take a risk at the premises of the insurance company.

Association of Serbian Insurers[18]

Almost all Serbian insurance companies have established organizational units for fraud prevention. To combat vehicle insurance fraudsters as effectively as possible, the Association of Serbian Insurers provided insurance companies with a powerful tool for combating fraud in 2015. FROPS (Fraud Risk Operational Performance Solution) software of British company "Salviol",[19] for fraud prevention, is an analytical tool used in insurance and other financial sectors. The main goal of FROPS is to collect, compare, investigate and analyze large amounts of data. It searches for anomalies of discrepancy or inconsistency in data to detect fraudulent actions that lead to loss of revenue. FROPS analyses the widest range of information to provide the most efficient analytical environment with maximum precision of key fraud indicators. It performs indexing of data from which it calculates the risk of fraud. It functions independently of other programming environments. It uses predictive analytics and machine learning to identify new types of insurance fraud.

Key indicators of fraud are claim parameters that very likely indicate the existence of fraudulent activity. By identifying unstructured data, text files, scanned documents, etc. FROPS enables their search, analysis and categorization. Thus prepared data give the analyst the necessary breadth for the investigation process. Also, FROPS analyzes social networks with a quantitative technique that combines organizational theory with mathematical models. Based on these algorithms, the analyst can better understand the dynamics of groups, networks and organizations.

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