A research review: AI and data science applications in the telecom industry

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Abstract

This research is about the study of the telecom sector is becoming more digital, as is the case with other sectors in the modern economy. In the modern telecommunications sector, digital transmission of voice conversations is standard, data services often outnumber voice services in significance and income, and an increasing percentage of the underlying infrastructure is now digital and software-driven. In addition, customer service and back-office processes in the telecom industry are experiencing digital transformation. The importance of data science and artificial intelligence to the industry continues to grow. Massive volumes of data are produced by the network operations, customer service activities, and infrastructure operations of telecommunications businesses. That's why there's so much focus on data science in the telecommunications industry today. With the help of data science and AI, telecom operators may be able to better understand their data and use it to do things like make their networks more reliable, save money on operating costs, and improve customer service. The use of AI in the network industry might help cut down on setup and maintenance fees, boost efficiency, provide better assistance for customers, and pave the way for the creation of brand new offerings. This document catalogs and evaluates the many AI applications that already exist and are planned for the near future. As a result of studying the existing literature's worth of applications,

Due to the exponential growth of data being produced by the sector, artificial intelligence (AI) and data scientists are in high demand in the telecom business. In terms of big data expansion, Analytics Insight reports that the telecom and IT sectors account for 33% of the market.

According to the forecast, expenditure on big data in telecom would increase from $59 billion in 2019 to over $105 billion in 2023. Additionally, by 2023, more than four million positions will be vacant in the industry, requiring the expertise of skilled candidates.

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Keywords: data science, artificial intelligence, skill, telecom, customer service.

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1. Introduction

COVID-19: Catalyzing Growth in the Telecom Industry's Need for Data Science and Artificial Intelligence, The need for data science in telecom was already high due to factors like the IoT, the introduction of 5G, and rising expectations of individualized service, but the COVID-19 epidemic has accelerated the trend significantly. There has never been a more pressing time for all sectors dependent on digital communications, such as education, healthcare, pharmaceuticals, government, and the global supply chain, to have constant and secure access to the internet. Telecom companies are increasingly turning to data science, AI, and automation to guarantee that crucial communications in this new distant world continue to run smoothly throughout the crisis, despite fewer employees and restricted access to infrastructure like contact centers and data centers. Also, without COVID as the main engine, telecom companies can use data analytics to quickly adapt to the changing world and needs of today.

Telecom: Leveraging Data Science and AI for Competitive Advantage.

It is impossible to list all the ways in which data science and AI might be used in a telecom company, but here are a few examples.

1. The Safety of Computer Networks:

Cybercriminals see the telecom industry as a very attractive target. After all, they link us to the whole of the interconnected digital world via their sophisticated systems of worldwide communication. Additionally, they hold reams of secret information. With the use of data science, businesses can monitor events as they happen, spot security abnormalities, and use predictive analysis to pinpoint potential weak spots and devise preventative measures.

Machine learning can also be used in telecommunications to analyze threat trends, which lets organizations stop them before they do a lot of damage.

2. Prevention of Fraud:

Customers of telecommunications companies are just as at risk as the companies themselves when it comes to cybercrime. And it's becoming worse as the epidemic continues. According to the Communications Fraud Control Association (CFCA), fraud cost the global telecom sector $29 billion in 2018. Big data can be used by telecom companies to analyze real-time data, find the source of fraudulent transactions, and find correlations with past behavior in order to stop these kinds of forgeries from happening in the future.

3. Enhancing Performance in a Network

Telecommunications companies have a responsibility to maintain optimal network speed and performance as the number of people who depend on the internet grows, particularly during COVID-19 outages. To do this, they are using data science, artificial intelligence, and machine learning algorithms to find and predict abnormalities before they have an effect on how customers feel.

4. The Customer's Perspective

Important factors include tailoring services to each individual and responding quickly to problems that may arise. Data science, artificial intelligence, and analytics help telecoms anticipate consumer needs by analyzing past behaviors and preferences. Using self-service menus, chatbots, and natural language processing (NLP), which is made possible by machine learning, telecoms use AI to provide quick and effective customer service.

5. Robotics Process Automation (RPA) With Artificial Intelligence

In the telecom industry, robotic process automation (RPA) may be used to automate mundane jobs, therefore lowering operational costs, increasing efficiency, and reducing the likelihood of human error. In order to better serve their customers, telecom firms may benefit from RPA in various ways, as detailed by CustomerThink, an online community of business and thought leaders who routinely share their opinions on customer-centric initiatives. Controlling a

network

Payables management (invoices) and sales (orders)

Acquiring and releasing clients

successfully addressing partners' concerns

Procedural Mechanics of Handling Sales Orders

Changes in the data

Spending Restraint

Resolution on the first try

Receipt of Debts

6. Managing the Supply Chain

At first, those who were forced to stay inside because of the COVID-19 epidemic were blamed for the widespread scarcity of toilet paper. The disturbance in the worldwide supply chain was the root cause of the crisis, to which hoarding may have contributed. Telecoms, the global supply chain's backbone, had to adapt to this change. Using big data analytics, data science, artificial intelligence, and automation, telecommunications companies were able to deal with the sudden rise in demand.

7. "The Workings of a Business"

In today's digital economy, clients depend heavily on telecommunications, and as a result, telecom businesses are increasingly using data science and AI in their own internal operations. These firms have stepped up to the plate to provide remote education for students across the world during the shutdown, and now they must do the same for their staff. Many organizations are realizing the need to keep their staff up-to-date on the newest technological developments by providing them with access to online upskilling opportunities. This helps to ensure that the global community remains connected and secure. Get back to using data science and AI in the telecommunications industry.

2. Literature Review

To begin, [1] presents the various advantages of cloud computing that accrue to the telecommunications industry, including savings in capital, cost, time, marketing, customer relations, service delivery, customer happiness, and profitability. Without having to worry about computers, which are really a means to an end for most businesses, they are able to devote all of their efforts into providing excellent service to their clients. In conclusion, cloud computing is an improved method for reaching organizational objectives.

New digital technologies are having far-reaching effects on the corporate world, and research [2] shows that the old ways of thinking about strategy are becoming more inadequate. To keep up with the advances in AI, digital reengineering, and cognitive computing, traditional methods for developing strategies will need to be updated. Excellent IT infrastructure, government backing for innovation, enough funding, and widespread e-participation among both citizens and businesses all contribute to Dubai's thriving e-government [3].

Telecommunications firms may benefit greatly from AI because of its ability to profile customers and tailor recommendations to their specific wants and requirements. In addition, AI helps the operations team by foreseeing when a system will break and acting immediately to fix it [4]. Additionally, AI may be used to customer care; TOBi, for instance, is a chatbot launched by Vodafone to assist customers in solving issues and answering questions online [5].

There has been a rise in the number of CC and AI users, as well as the expansion of communications networks, as reported in [6]. Consumers' requirements and tastes have varied over the industry's history. As the need for specialized networks grows, companies in this sector can no longer function without the assistance of AI (AI). Since the advent of widespread internet access and the proliferation of robust cloud computing services, cloud robotics has been fast evolving [7]. Humanoid, industrial, mobile, and other classes of robots have all benefited from the technology, which has been implemented via close partnerships between robot makers and big IT firms.

There are a number of problems in the communication business, including design, maintenance, and management, that might be alleviated with the help of artificial intelligence. In order to

keep up with the constantly shifting demands of their customers, communication companies must make sound judgments. In order to examine massive volumes of data acquired by data mining, robots may now use existing training data in industry using deep learning. Decisions in this sector will be more precise as a result of AI's mastery of pertinent facts, such as traffic patterns [6].

Due to the rising frequency with which compromised networks and losses occur, the telecom industry may benefit from AI and cloud computing by focusing more on security. The use of AI has improved system security by making it possible to automatically identify assaults using machine learning. Users and businesses alike have benefited as a consequence, since there have been less assaults [8].

As the number of telecom industry customers continues to rise, it has become difficult for people to effectively process the massive amounts of data needed for accurate forecasting. Artificial intelligence (AI) and cloud computing have made it feasible to analyze massive amounts of data for traffic classification, improved prediction and anomaly detection, and ultimately, optimized network performance. As a consequence, the telecom industry is now better managed and more efficient, which benefits customers in the long run. Only with the combination of AI and cloud computing will it be feasible to provide consumers individually tailored service plans and networks in the future [9].

Algorithms constantly monitor today's networks for any signs of suspicious behavior that might indicate an impending cyber attack. Anticipating network attacks using AI and CC is quicker and more reliable. [10] . Even while the move to the cloud for AI is inevitable, there are still obstacles to overcome, the most important of which is training enough people to work with AI in the cloud. Companies in the telecommunications industry who use this system will need to invest heavily in their workforce to ensure its success by providing them with the necessary knowledge and skills [11].

Predictive analytics aided by artificial intelligence is another area of research that has to be done. In order to acquire useful, actionable insights, they are employing cloud services to

construct and train machine learning models. On the other hand, these models can only be of use if they are given access to massive volumes of information. Therefore, industries must ensure they have adequate security measures in place to secure sensitive data and are in full compliance with all regulations before to launching a cloud-based AI service [12].

Accenture commissioned a study to assess the economic impact of AI across 16 sectors by [13], and their findings suggest that AI can boost labor productivity by performing low value-added or supporting tasks, freeing up human workers to focus on higher-value activities. This suggests that companies across all sectors should consider AI as a potential change agent in their investment, innovation, and human capital development strategies.

The artificial intelligence-based technologies, as stated by [14], need changes in numerous areas of law, while the interface technologies demonstrate the difficulties and complexity of regulating multidisciplinary sectors. Recent years have seen the introduction of cloud computing and artificial intelligence technology throughout the telecom industry in an effort to boost efficiency, productivity, and customer happiness. There is a significant barrier in training and implementing CC and AI technologies in the telecom industry [15]. Nevertheless, using CC and AI will boost performance and efficiency across the board, save expenses, raise sustainability, and boost user happiness, retention, and loyalty. Security, privacy, legal issues, and reputational harm are just some of the additional dangers that may arise from its misuse.

The potential applications of AI in the telecommunications industry

To identify and anticipate network irregularities, telecoms may turn to AI, which utilizes sophisticated algorithms to mine data for trends. Using AI in telecom allows CSPs to deal with problems before they affect customers in a bad way.
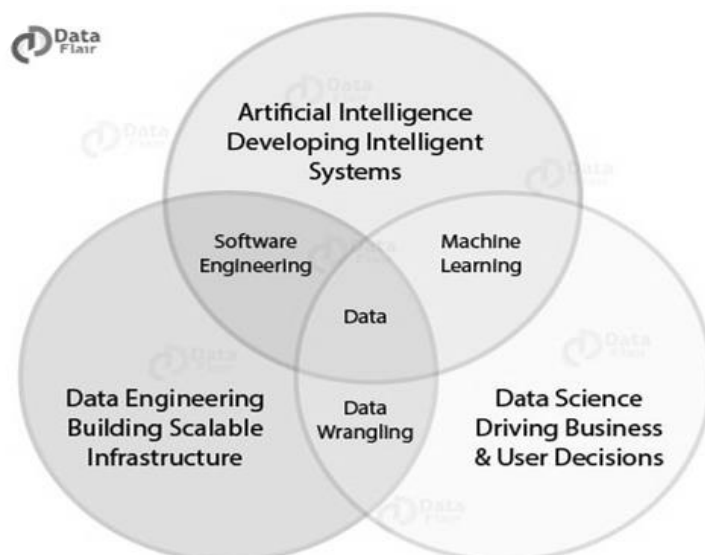
Figure 1: Artificial Intelligence's Role in Data Science

Artificial intelligence is crucial in improving Data Science skills. The following points describe the role of AI in data science:

Machine Learning is a supervised version created by combining Data Science and Artificial Intelligence, in which a little quantity of data is fed into the system to forecast the probability. Machine Learning methods such as Regression and Classification are needed for accurate Predictive Analysis.

Understanding the Role of Artificial Intelligence in Data Science although the terms Data Science and Artificial Intelligence are used interchangeably because of how they function, Artificial Intelligence is a tool for Data Science. Data Science does not fully reflect Artificial Intelligence since it primarily works with predictive analysis and employs Machine Learning technologies. Machine Learning is only a subset of Artificial Intelligence, and AI may give much more complicated analytical tools.

Data Science and Artificial Intelligence Comparison: Data Science was developed with the goal of uncovering hidden patterns in massive amounts of data. This field is important for obtaining a deeper knowledge by collecting raw data, processing it, and analyzing it. This manner, the massive amounts of data may give meaningful insights from which to make critical business choices. On the other hand, Artificial Intelligence may be used to handle data

independently. This suggests that you may eliminate human reliance from your job and fully automate it. This section contrasts Data Science with Artificial Intelligence based on three criteria to offer you with a full understanding:

- Goals
- Primary Technologies
- Case Studies

Goals:

The primary purpose of Data Science is to establish an acceptable issue definition, record business needs, and design a workable solution using Data Analytics and Machine Learning models. Additionally, Data Scientists use Data Visualization to highlight the insights created by their suggested solution. The primary objective of artificial intelligence is to mimic human intellect using computers so that robots can make intelligent judgments in difficult settings. AI Professionals seek to design new algorithms, refine current neural networks, and execute data automation for processing large amounts of data to reach this aim.

Data Science employs a variety of statistical approaches to handle and alter huge datasets. This domain applies Machine Learning models to source data in order to uncover actionable insights. Data scientists use technologies such as Tableau, Python Programming Language, MATLAB, TensorFlow Statistics, Natural Language Processing (NLP), and many more to accomplish their objectives.

Artificial intelligence is mostly based on machine learning-powered algorithms that are built for certain objectives. AI professionals use a number of methods to improve the process of training computers to make decisions. the procedure for learning All AI work is done using technologies like Keras, Spark, Tensor Flow, Scala, Scikit Learn, and others.

3. Case Studies

The application cases of Data Science and Artificial Intelligence are crucial in comparing the two. The following application cases are advantageous for using Data Science methodologies:

- Identifying market patterns and popular trends.

- Developing Statistical Insights to Aid Decision-Making

- To do exploratory data analysis (EDA) for your company.

- High-speed mathematical processing is required.

- Predictive Analytics-related work.

Artificial intelligence may be used to deploy complicated Machine Learning models in the following scenarios: Precision is required for business data. You must expedite the decision-making process.

Separate the emotional and rational parts of decision-making. For repeated activities, businesses demand automation. You must do a thorough risk assessment.
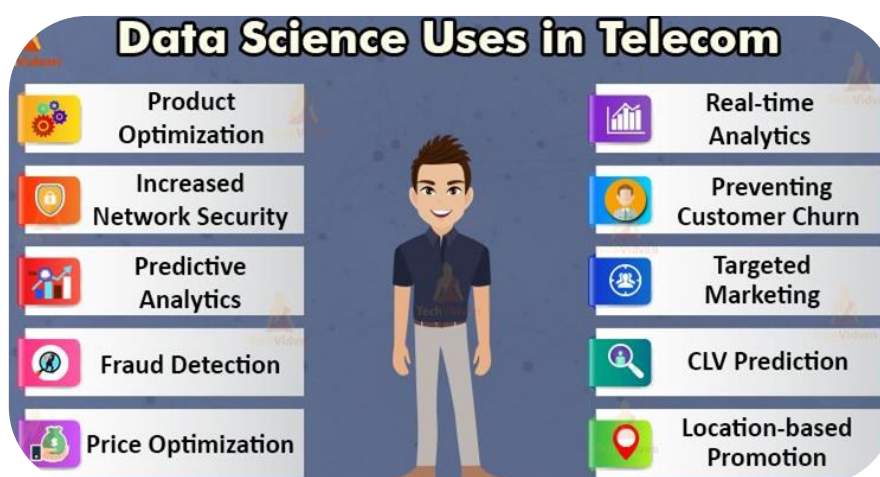

Source: techvidvan.com

Data Science Applications in the Telecommunications Industry

Today, technological innovations have brought the globe closer together. In a matter of seconds, individuals may communicate with loved ones and strangers seated across the room. With increased connectivity comes an increase in data. We generate a massive quantity of data with our everyday calls, texts, and so on. So it comes as no surprise that data science in the telecom industry is assisting in the management of such massive amounts of data.

The telecom industry can no longer use old strategies and processes to handle the data that is expanding by the minute. As a result, businesses are turning to modern data science tools and

big data technology to make use of this data. However, the telecom industry employs the insights acquired via data science for a variety of goals, including: profit maximization; developing effective company and market strategies; data transfer, for example.
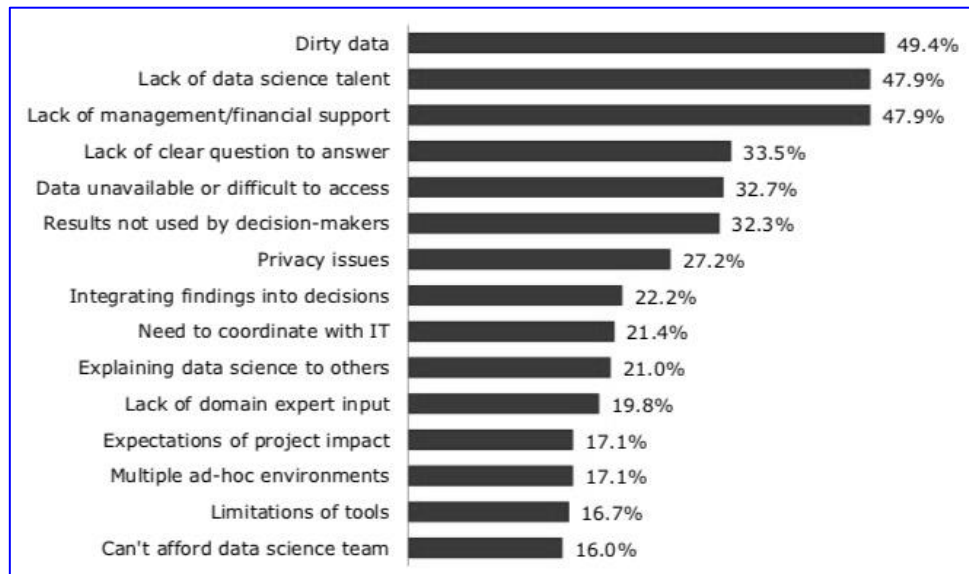
Source: Kaggle

Difficulties in applying AI/ML to networking:

Generic AI applications, such as marketing and chatbots, are applicable to a wide range of sectors, not simply telecommunications. When it comes to applying AI/ML to networking, the industry is still in its infancy, partly because these difficulties are unique to communications and partly due to a dearth of public data sets on which researchers may experiment. The authors of the study Big Data Analytics, Machine Learning, and Artificial Intelligence in Next-Generation Wireless Networks talk about the problems with using big data analytics and AI in next-generation communication systems:

- Managing and harnessing massive amounts of data, developing algorithms for dynamic and effective processing of large data sets, and then leveraging data analytics insights in networks can all be difficult.

- The primary issues for MNOs stem from the amount of effort, expertise, and labor required to maintain and run a big data platform.

- However, the most significant and challenging obstacle is expected to emerge from the MNOs' continued direct control over the wireless network. When automation and real-time operations are used together in the big data analytics framework, direct control is lost.

- In addition, a significant investment is required. Below, we talk about some of the problems that need to be solved before data science and machine learning can be used in telecom (see Figure 1).

Some of these are applicable to any sector, while others are particularly exclusive to telecom. Channel modeling and estimation, cognitive communications, interference alignment, mobility management, resource allocation, network control and management, network tomography, multi-agent systems, and prioritization of network ultra-broadband deployments are just a few of the fields that stand to benefit from advancements in artificial intelligence, machine learning, reinforcement learning, and network data analytics. Our networks and the user experience as a whole will be completely transformed by these new analytic platforms. Through the intelligent collection, processing, learning, and control of huge amounts of data, future networks will be able to automate and optimize in new ways.

Key AI applications in telecommunications include:

With the rise of virtualization and cloud computing, the networking industry is starting to see the application of artificial intelligence and machine learning to the monitoring and control of networking operations. The demand for more network automation and flexibility is being driven by the rising complexity of networking and networked applications.

A 2017 study of CSPs by Heavy Reading indicated that predictive maintenance was the most popular use of ML in the telecom industry.

• Fraud protection: The Heavy Reading poll found that detecting and preventing fraud was the sixth most favored use. The yearly cost of fraud to the telecom sector is estimated to be $38 billion by the Communications Fraud Control Association.

The second most common use we found was for ensuring network security, or cyber security.

There is some cautious optimism over the use of AI in the automation of CSP security, according to Heavy Reading's Telecom Security Market Tracker.

One of the most prominent uses of AI/ML in the telecommunications industry so far has been the use of chatbots to supplement or entirely replace human contact center operators. Of the 10 CSPs profiled, seven talk about how they're using AI in their support strategies.

Intelligent customer relationship management (CRM) uses AI in areas like targeted advertising, spotting new upsell/cross-sell opportunities, and predicting and preventing customer defection.

• Customer Experience Management (CEM): With the proliferation of digital touchpoints, analytics and AI have emerged as indispensable resources for communications service providers (CSPs) in gaining insight into network performance, the customer journey (customer care, billing, etc.), and real-time service quality.

4. Conclusion

This article provided a summary of popular technologies such as data science and artificial intelligence. It also discussed the link between data science and artificial intelligence. Furthermore, it examined the functions of AI in data science and gave a comparison of the two technologies. Artificial Intelligence is important in Data Science because it provides enhanced tools for appropriate predictive analysis as well as correct parameters for data engineering to be applied to software. We may conclude that data science offers significant potential for the telecom business to intelligently exploit the massive quantity of accessible data. Various data science and big data technologies are assisting the telecom industry in reshaping their business strategy in the most lucrative and efficient manner feasible. This also assists them in keeping the clients at the forefront. All forms of data sources and data applications in manufacturing settings are covered by the data ecosystem, making it applicable to more than just AI. It's important to remember that our real-world observations served as the basis for generalizing the data ecosystem components for use by manufacturing businesses. We recommend more research to fine-tune and validate these details. In the process of bringing the manufacturer's data ecosystem to life on an enterprise scale, we've run across a number of problems that point

to the need for further investigation. Creating a corporate data marketplace as a new kind of data platform is an important area of research for the future.

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