



Artificial Intelligence and its Potential Effect on Rural LECs

Presented by:

Bob Gnapp

Director – Member Training and Network Analysis

ragnapp@neca.org

Agenda

- Introduction
 - What is artificial intelligence?
 - Components of AI
- Common AI applications
- Potential effect of AI on RLECs
- AI concerns
- Summary

What is artificial intelligence?

- **Artificial intelligence** – the ability of a computer or a computer-controlled device to perform tasks commonly associated with intelligent beings
- AI combines computer science with big data
- AI consumes big data, applies algorithms and statistical methods and produces outcomes
 - **AI algorithm** – a set of instructions or rules that enable computers and machines to perform tasks, learn, analyze data and make decisions



Source: Lifewire.com

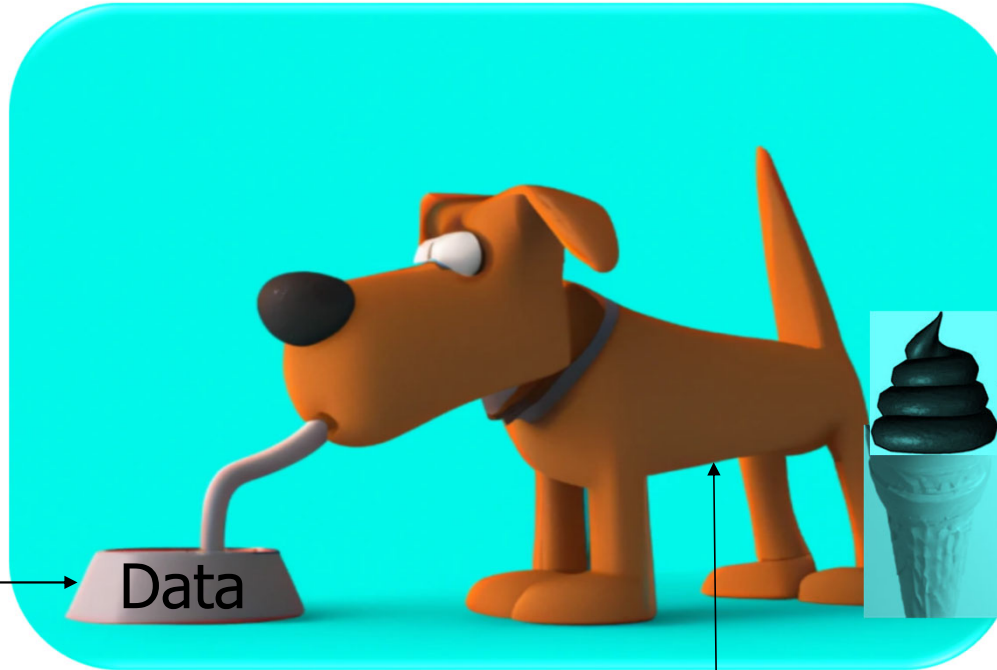
What is artificial intelligence?

The AI process

Source: Bob Gnapp using DALL-E

Data sources (1)

- Text
- Speech
- Images
- Sensor data
- Large data sets
- Many others



Outcome and assessment (3)

- Success or failure
- Analysis
- Discovery
- Feedback

Data Processing (2)

- Algorithms and rules
- Machine and deep learning
- Natural language processing
- Computer vision

Adjustments (4)

- Data
- Algorithms and rules

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What is artificial intelligence?

Stages of AI development

	Weak AI (a.k.a. artificial narrow intelligence)	Strong AI (a.k.a. artificial general intelligence)	Super AI (a.k.a. artificial super intelligence)
AI stages	Executes specific focused tasks without the ability to self-expand functionality	Performs broad tasks, reasons, and self improves capabilities	AI that can manifest cognitive skills and develop thinking skills of its own
Timing	Today	2030-2060?	Sometime after strong AI
Implications	Outperforms humans in specific repetitive functions.	Competes with humans across all endeavors. Will understand any intellectual task, think abstractly and learn from its experiences	Outperforms humans across all endeavors. IQs could range anywhere from hundreds of thousands to millions

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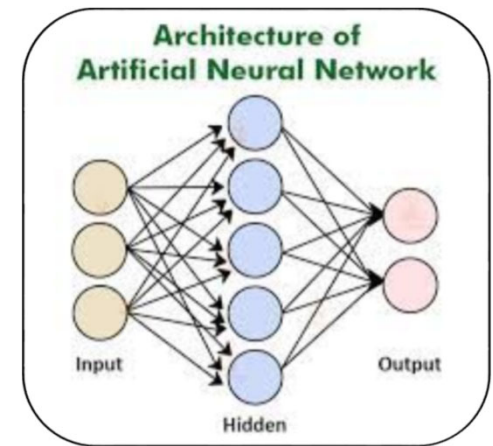
Components of artificial intelligence

Learning

- **Machine learning** – A field of study that gives computers the ability to learn without explicitly being programmed
 - Let's computers learn to program themselves through experience
 - Learning may be supervised or unsupervised
- Trial and error – like trying multiple moves in chess to find a solution
- Rote learning – memorizing of individual items, data points and procedures
- Generalization – applying past experience to new situations

Components of artificial intelligence Learning

- **Deep learning** – a class of machine learning that uses rudimentary neural networks to extract higher-level features from the raw inputs
 - **Artificial neural networks** – a network of artificial neurons (nodes) programmed in software that attempt to simulate the human brain, albeit very far from matching its ability
 - Nodes are arranged in layers and interconnected
- Deep learning eliminates some of data preprocessing typically involved with machine learning
- Deep learning has been applied to fields including computer vision, speech recognition, natural language processing, machine translation, drug design, medical image analysis and climate science

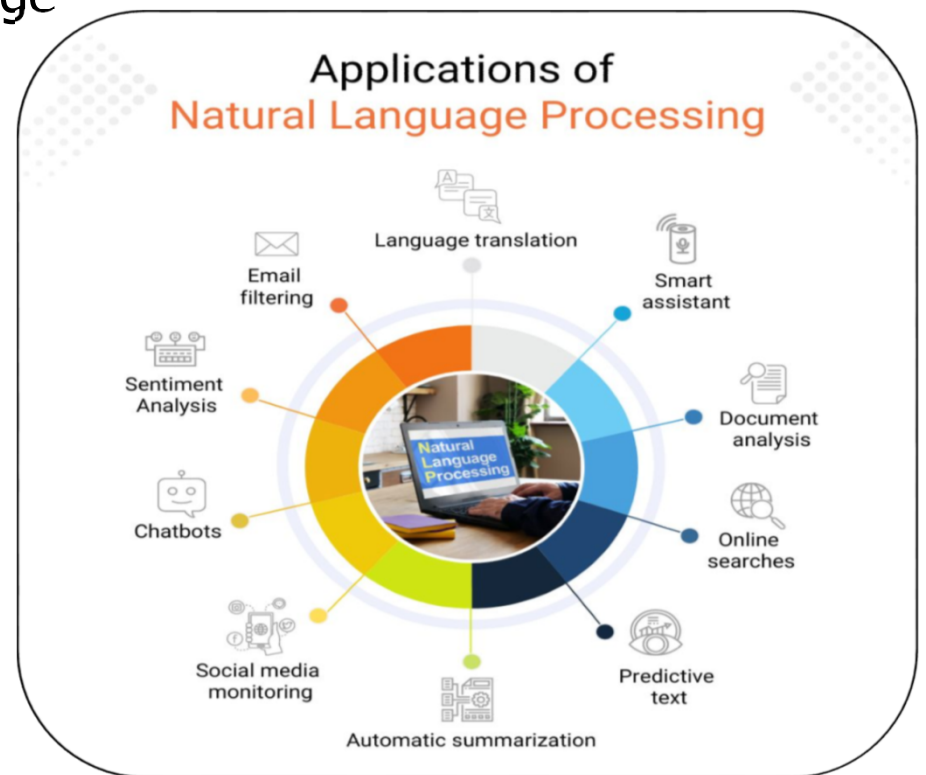


Source: TechVidvan

Components of artificial intelligence

Other

- **Natural language processing** – the ability of a computer system to understand and interpret human language
 - Text understanding
 - Speech recognition
 - Sentiment analysis
 - Text generation
 - Summarization
 - Translation



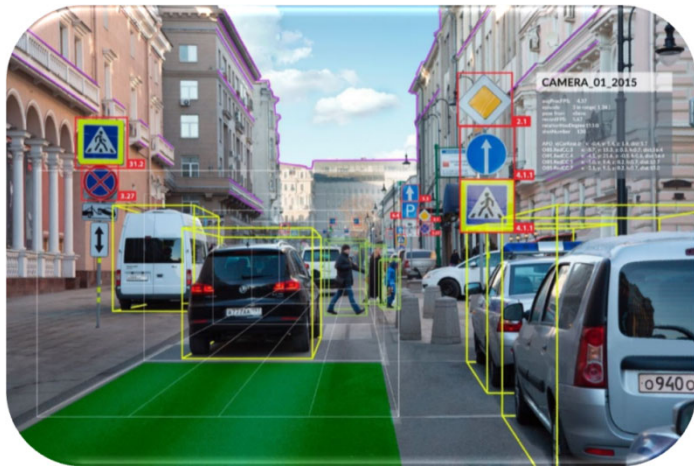
Source: Pdatasciencedojo.com

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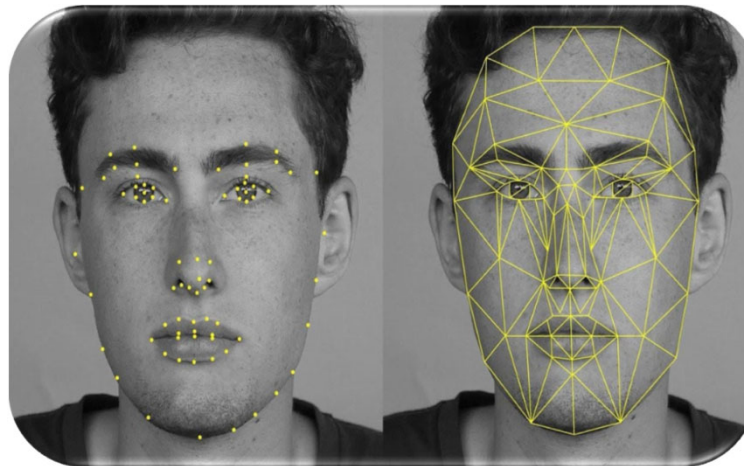
Components of artificial intelligence

Other

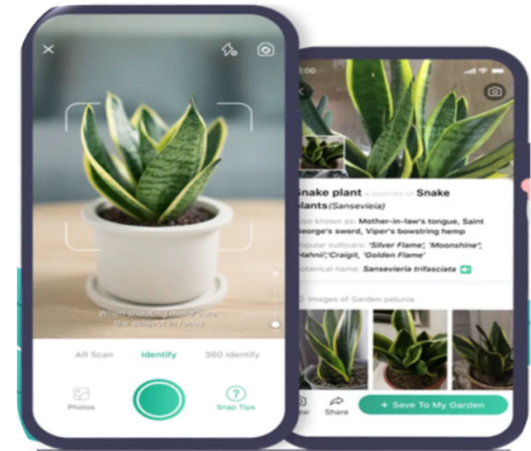
- **Computer vision** – the ability of a computer system to interpret and understand visual information from the world, such as images and videos
 - Includes tasks like image recognition, object detection and facial recognition



Source: Welker Media

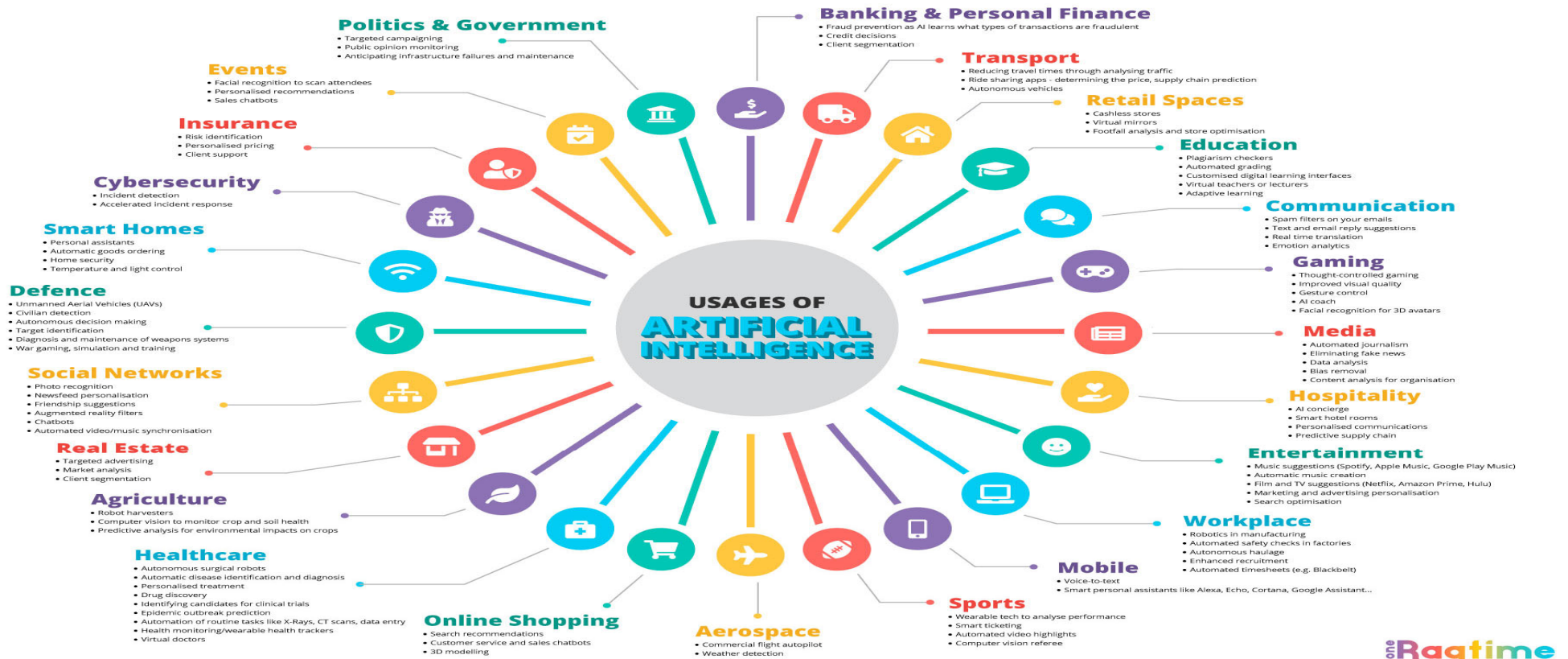


Source: Vox



Source: Picture This

Common AI applications



on Ragtime

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Common AI applications

- **Robotics** – the ability of a computer system to control and interact with physical devices
 - Allows AI to function in the physical world
 - Can perceive, move, manipulate or destroy objects
- **Agriculture** – provides farmers and agricultural development companies assistance in improving agricultural yields and quality
 - AI can be used to identify nutrient deficiencies in the soil and help harvest crops at a faster pace than human laborers
- **Health care** – the ability of a computer system to diagnose illness, provide disease predictions, utilize health tracker data, facilitate treatment planning and discover new drugs



Source: Honda



Source: US News and World report

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Common AI applications

- Facial recognition – AI that can recognize images of human faces

- Analyzing the unique ratios of a face's features, like the eyes and nose using computer vision
- Used in public safety, access and authentication and retail
- Often raises privacy concerns



Source: Analytics insight

- Self driving cars – Uses deep learning and computer vision to perceive the world and make decisions about where to go

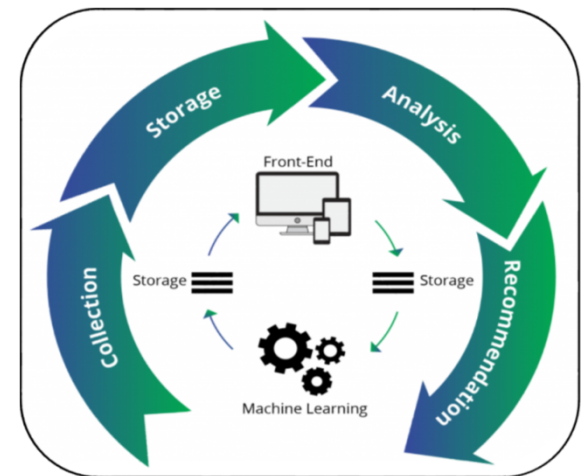
- Several cities are currently allowing testing of driverless taxis
- Classified in levels - levels 0-2 are considered driver support and levels 3-5 are considered autonomous



Source: cnet.com

Common AI applications

- Social media – artificial intelligence technologies are used to automate or improve various activities related to social media
 - AI can assist with customizing user content and advertising, spotting harmful posts or bots, fact checking and assisting users with image/content development
- Recommendation systems – applies AI to user data to provide customized recommendations to users to help them find what they are looking for
 - Used in entertainment websites, social media, e-commerce and video sharing

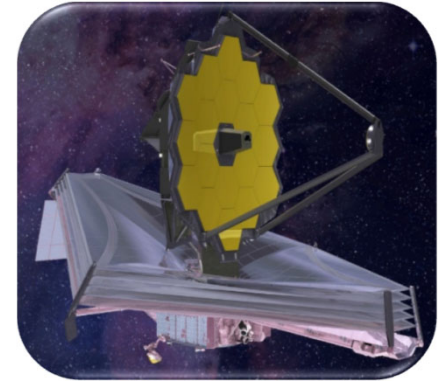


Source: becominghuman.AI

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Common AI applications

- Astronomy – AI is applied to large data sets to identify patterns, make predictions, identify exoplanets and advance our understanding of the universe
 - Makes more accurate forecasts, like the likelihood of a comet hitting the Earth
- Ride sharing – using big data to enhance profitability and ease-of-use
 - Estimates ride times, including anticipated traffic, demand, trip costs and pickup locations



Source: NY Times



Source: Forbes

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Common AI applications

- Art generation and creativity – AI can create stunning, unique pieces of art

3D render of a cute tropical fish in an aquarium on a dark blue background



Source: Dall-E

A 3D render of a rainbow colored hot air balloon flying above a reflective lake



Source: Dall-E

A van Gogh style painting of an American football player



Source: Dall-E

- Music composition - AI can compose music in various styles, including classical, jazz, and even generate entirely new genres
- Language translation - AI-powered translation apps can provide instant translation for spoken or written language
- Weather predictions – AI can be used to analyze vast datasets, including historical weather patterns, satellite images, and real-time sensor data

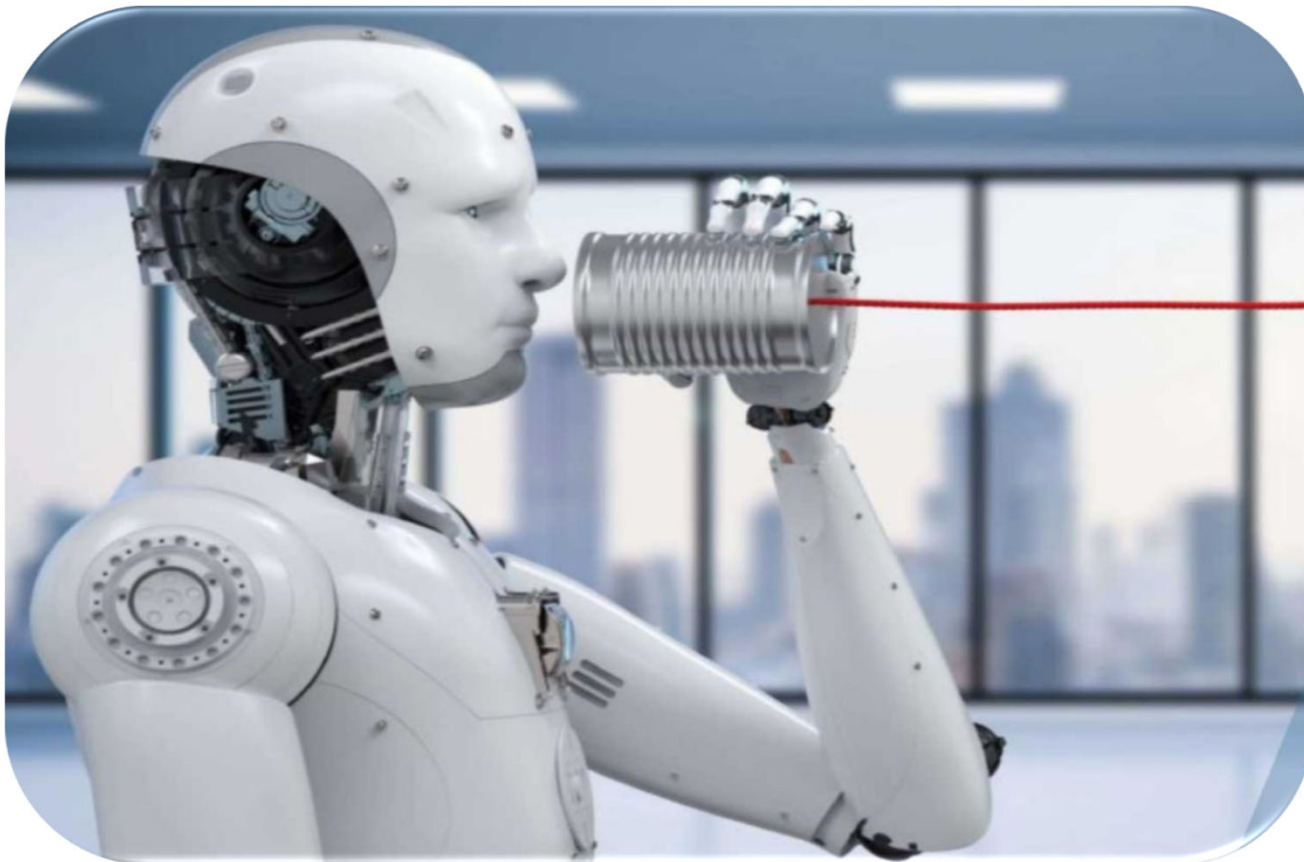
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Common AI applications

Less known applications

- AI in flavor and recipe creations
- AI in fashion design
- AI in art restoration
- AI in brewing beer
- AI in mental health support
- AI in designing perfumes
- AI generated humor

Potential effect of AI on RLECs



Source: TechSee

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Potential effect of AI on RLECs According to ChatGPT

What is the effect of artificial intelligence on telecommunications providers?

Network Management and Optimization: Telecommunications companies use AI algorithms to monitor and manage their networks. AI can predict and prevent network outages, optimize bandwidth allocation, and ensure efficient use of network resources. Over time, these AI-driven processes become integrated into the standard operations of the telecom industry, and the AI effect may make them seem routine rather than groundbreaking.

Customer Support and Chatbots: AI-powered chatbots have transformed customer support in the telecommunications sector. These chatbots can handle a wide range of customer inquiries, troubleshoot common issues, and provide assistance 24/7. As customers become accustomed to interacting with chatbots, the AI effect might lead them to see this technology as a normal part of the customer service experience.

Predictive Maintenance: Telecommunications infrastructure, such as cell towers and data centers, can benefit from AI-driven predictive maintenance. By analyzing data from sensors and equipment, AI can predict when maintenance is needed, reducing downtime and improving overall network reliability. As predictive maintenance becomes standard practice, the AI effect may diminish the perception of it as a cutting-edge AI application.

Network Security: AI is used to detect and respond to security threats in real-time. It can identify patterns indicative of cyberattacks or unauthorized access and take immediate actions to safeguard the network. With the widespread adoption of AI for network security, the technology may become a routine component of telecom security measures.

Data Analysis and Insights: Telecommunications companies gather vast amounts of data, including customer usage patterns, call quality, and network performance. AI-driven data analytics helps extract meaningful insights from this data, leading to better decision-making. Over time, as data-driven insights become a standard part of business operations, the AI effect may lead to their normalization.

Personalized Services: AI enables telecom providers to offer personalized services to customers. This could include personalized content recommendations, tailored service plans, and targeted promotions. As customers become accustomed to receiving personalized experiences, the novelty of AI's role in providing these experiences may diminish.

Potential effect of AI on RLECs

Marketing

- AI marketing – data collection and analysis to determine consumer behavior and to learn what drives customers to a service provider and what drives them to leave
 - AI analyzes consumer data to gain insights into their preferences
- Results can be used to segment customers and predict consumer behavior
 - Can provide recommendations for making upselling and cross-selling offers to the right users at the right time
- Insights that will create personalized marketing, enhanced digital advertising, email automation and social media marketing
- AI can provide a means of filtering out fake reviews

Potential effect of AI on RLECs

Customer service

- Solve frequently asked questions, up to 50%, using chatbots
- Identify needs of the customer and provide personalized recommendations
- Identify customer frustrations and sentiments
- Predict customer behavior and needs using predictive analytics
 - Allows agents to be more proactive and deliver the appropriate response and/or cross selling recommendations
- Provide automated email responses
- Identify poor customer service



Source: kmslh.com

Potential effect of AI on RLECs

Managing networks and predictive maintenance

- AI applications can affect broadband usage
 - Increases usage - content recommendations, internet of things devices and cloud-based services
 - Decrease usage – Improved video compression, proactive caching and adaptive movie streaming
- AI can predict network congestion and can provide network optimization solutions when congestion occurs
- AI can prevent system failures and disruptions by predicting the best possible maintenance times
- AI can provide network security

Potential effect of AI on RLECs

Supply chain management

- Can assist with supplier selection
- Can assist with customs and compliance
- Can reduce waste in the supply chain by providing more accurate demand forecasting
- Can predict problems in advance and proactively prescribe solutions to manage such disruptions



Source: Logisticsbureau.com

Potential effect of AI on RLECs

Cybersecurity

- AI systems can recognize cyberattacks and cyberthreats by monitoring patterns from a variety of data sources
 - Threat and anomaly detection – can detect suspicious activity and unusual traffic patterns
 - Endpoint security – endpoints, such as laptops and smartphones, are often targeted by cybercriminals
 - While traditional antivirus software relies on detecting known malware variants, AI can detect unknown malware variants by analyzing user behaviors and biometrics
 - Automated incident response – responds to threats by isolating affected systems, blocking malicious traffic and initiating remediation procedures



Source: authx.com

Potential effect of AI on RLECs

Digital assistants

- **Digital assistants** – an advanced type of chatbot that can handle complex interactions
 - Manage emails and maintain calendars
 - Plan and reserve business travel
 - Retrieve information
 - Assist with regulatory compliance
 - Provide legal assistance



Source: Dreamstime

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Potential effect of AI on RLECs

Human resources

- AI can be used in HR departments
 - Hiring
 - Resume screening
 - Candidate sourcing
 - Chatbots for initial screening
 - Social media screening
 - Employee engagement and retention
 - Regulatory compliance

AI concerns

Job displacement

- Job displacement – industry experts are concerned that AI, robotics and related technology could displace many existing jobs while creating others
 - A 2023 Goldman Sachs study found AI tools could impact 300 million full-time jobs worldwide, which could lead to a "significant disruption" in the job market
 - In a TEC survey, 47% of respondents said they think AI technologies will create more jobs than they destroy. But another 27% said it will destroy more jobs than it creates, while 26% said it is too soon to know
 - Susceptible occupations include computer programming, media jobs, legal industry jobs, finance jobs, accountants, customer service agents and taxi/ride share jobs, medical jobs (e.g., radiologists) and teachers

AI concerns

Misinformation

- AI-generated content can contribute to the spread of false information and the manipulation of public opinion
 - Online bots may represent the most powerful tools for spreading misinformation
 - Deepfakes – falsified videos, images and voices made using deep learning
 - While there are benefits of this AI advancement, it can be used to encourage misinformation
 - AI can create fake reviews
 - Existing technologies to fight against misinformation also rely on artificial intelligence



Source: Trymaverick.com

AI concerns

- Privacy concerns – as more personal information is gathered on every facet of our lives, and as AI analysis of that information expands, privacy issues will expand exponentially
 - One example is facial recognition
 - Privacy legislation is already being written and adopted
- Algorithm bias – anomalous results due to biased assumptions made during algorithm development and/or biased training data
 - Algorithms can be designed to discriminate based on personal attributes such as skin color, sexual identity and national origin

AI concerns

- Autonomous weapons – any weapon that selects and applies force to targets without human intervention
- Once a person activates an autonomous weapon, they do not know specifically what it will strike
 - There are widespread concerns over ceding life-and-death decisions to sensors and AI software
- Cybersecurity threats – while AI can improve a company's cybersecurity abilities, it can also help cybercriminals enhance the sophistication of their attacks
 - Includes highly personalized spear-fishing, deepfake voices that impersonate high ranking executives and tampering with system data



Source: Sputnik

AI concerns

- Some believe AI could fail in unpredictable ways
 - **Self-driving cars** can cause deadly accidents like how humans can
 - Medical diagnoses can have serious and sometimes deadly consequences if the AI or the underlying data is faulty
- AI may get out of its creator's control as it surpasses human intelligence
 - The prospect of strong and super strong AI could lead to unintended and potentially catastrophic consequences
 - Steps will likely need to be taken to avoid this possibility



Source: TurboSquid

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Summary

- Artificial intelligence provides the ability of a computer or computer-controlled device to perform tasks associated with intelligent beings
- Components of AI include big data, algorithms, machine learning, language processing and computer vision
- Common uses of AI include robotics, agriculture, health care, self-driving cars, social media and recommendation systems
- Uses by RLECs include marketing, customer service, supply chain management and cybersecurity
- Concerns related to the use of AI are real and will need to be addressed

Questions?



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