Overview of Artificial Intelligence (AI) Technologies

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What is AI and Why is it Important?

- **Definition -** Artificial Intelligence (AI) is the intelligence exhibited by machines or the creation of computers and computer software that are capable of intelligent behavior. Major AI researchers and textbooks define this field as "the study and design of intelligent agents"[1], in which an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success.

- **Importance -** The central goals of AI research include reasoning, knowledge, planning, learning, natural language processing (communication), perception and the ability to move and manipulate objects. General intelligence is still among the field's long-term goals.

[1] Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach (3rd Edition) (Essex, England: Pearson, 2009)

How is AI Evolving?

Advances in computing power and software capabilities have changed the requirements of tasks once considered to require human level intelligence to understand and process.

- **Many common technologies have come to be used without the need for AI** such as optical character recognition or simple GPS mapping.

- **AI technologies have been redefined to be necessary for complex tasks** such as understanding human speech, high level strategy games, self-driving vehicles, intelligent network routing, scenario simulations, and the interpretation of large data sets.

Why does AI Matter?

AI technologies are becoming increasingly useful to the market, and many enterprises are increasing investment and adoption of new systems.

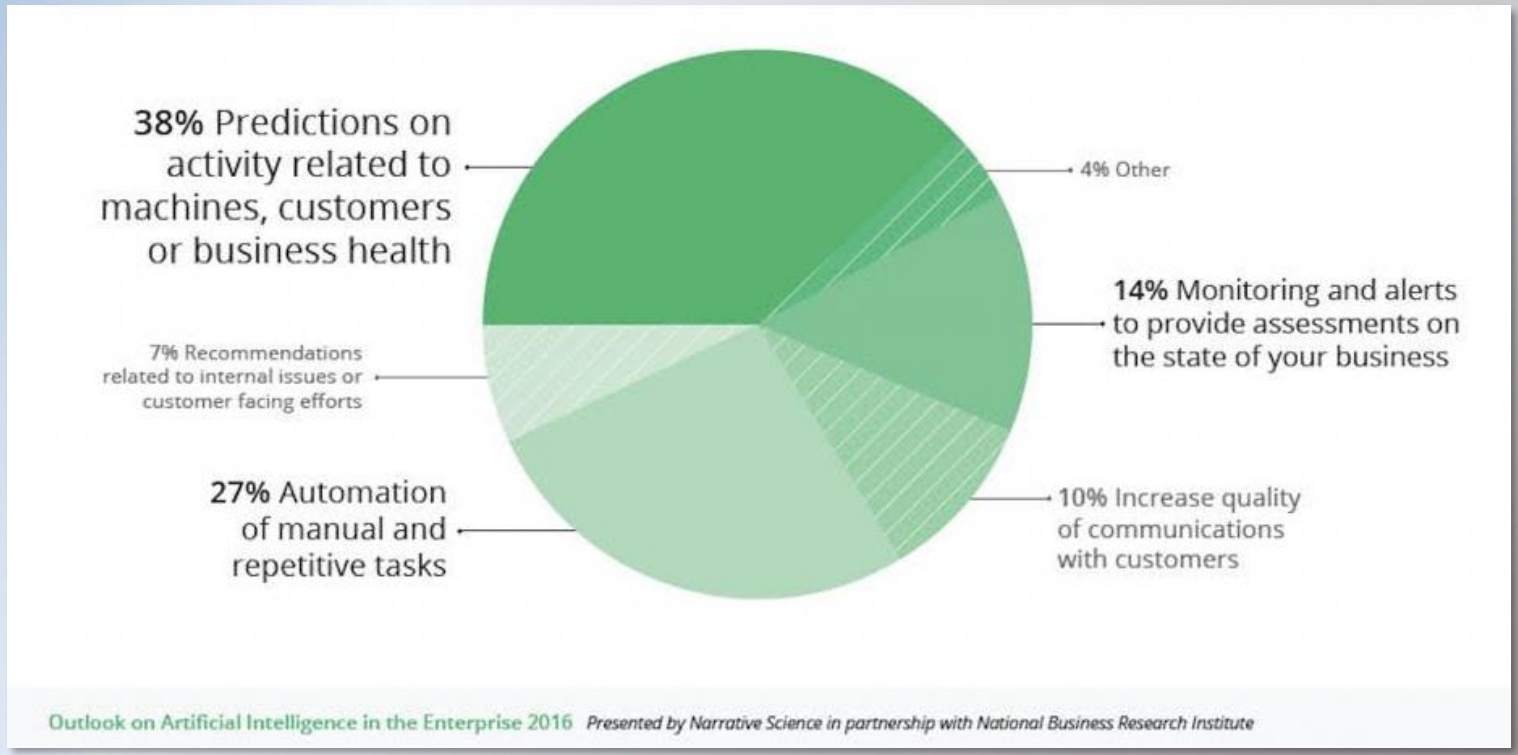
According to a recent report from Narrative Science in partnership with National Business Research Institute[2], 32% of enterprises are currently using and 62% of enterprises will use AI technologies by 2018.

The term "AI technologies" covers a wide range of specific technologies that include Machine Learning, Deep Learning, recommendation systems, trends and corrective analytics, as well as automated reporting and query understanding and responses.

[2] "Outlook on Artificial Intelligence in the Enterprise 2016", Narrative Science in partnership with National Business Research Institute, Page 6, retrieved from http://www.datascienceassn.org

AI Solutions Predict the Future

According to the report "Outlook on Artificial Intelligence in the Enterprise 2016"[3], due to the growing availability of big data and the capability to track, store and manage information, organizations primarily want to leverage AI for its predictive analytic capability – using AI-powered solutions to deliver projections on the future:



[3] "Outlook on Artificial Intelligence in the Enterprise 2016", Narrative Science in partnership with National Business Research Institute, Page 7, retrieved from http://www.datascienceassn.org

Examples of the Uses of AI

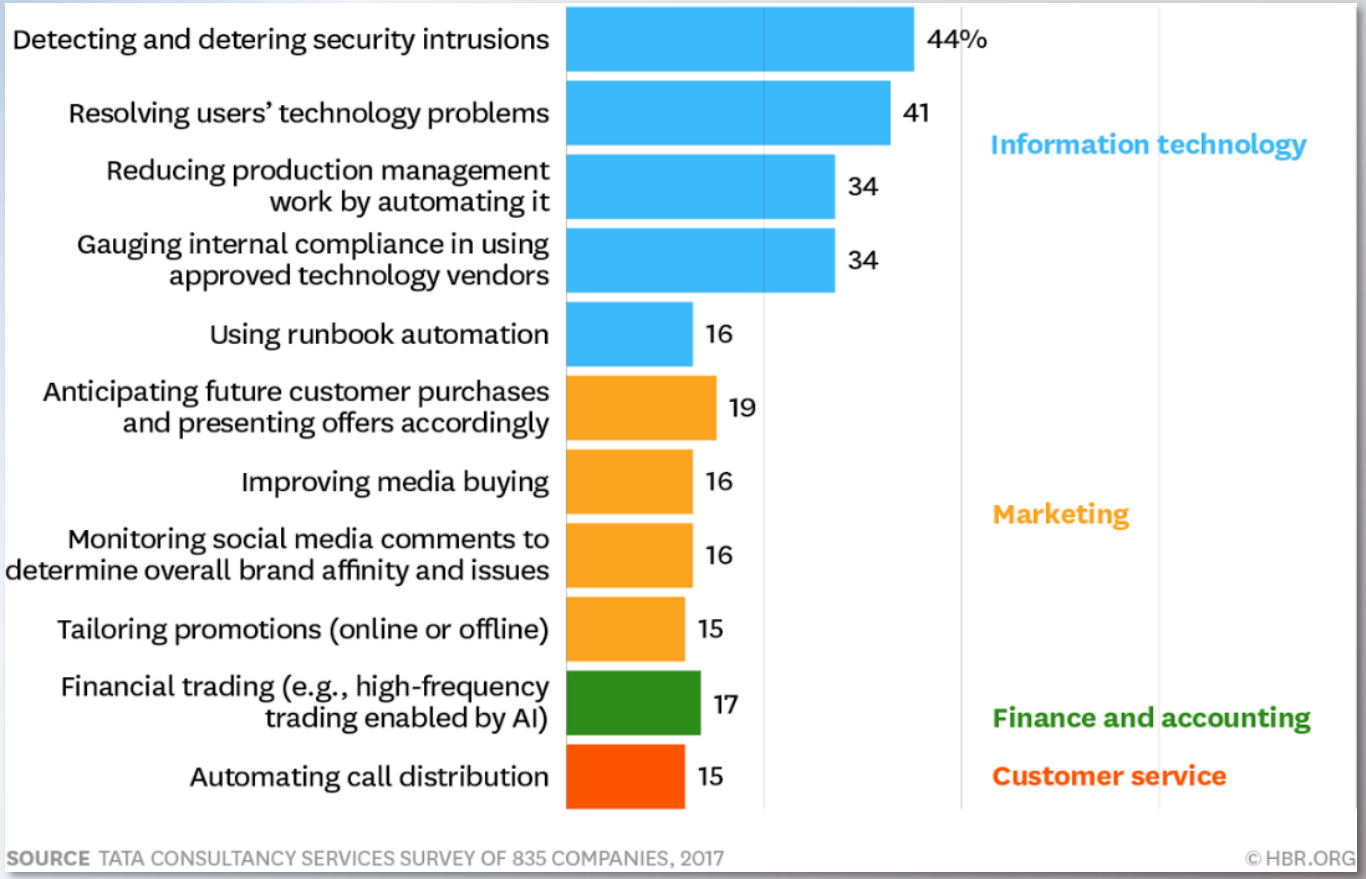
- Natural Language Generation. Reports and summaries generated from the analysis of computer data.
- Speech Recognition. Transcriptions of human speech into formats usable by computer applications.
- Virtual Agents. AI Applications combining both natural language generation and speech recognition to create agents that can understand human requests and provide them with relevant responses.
- Machine Learning. Applications that assist in the design, training, and modeling of other applications and machines.

Further examples of the Uses of AI

- Decision Management. Systems using rules and logic to assist with or perform automated decision making.
- Deep Learning. Specialized machine learning utilizing artificial neural networks to recognize patterns and classifications in large data sets.
- Process Automation. Using scripting and robotics to automate human actions for more efficient processes.
- Natural Language Processing (NLP). Analytics of text by machine learning to understand sentence meanings to provide human understandable information and data analysis.

Current AI Use

A recent survey of global companies in Harvard Business Review revealed that AI's most popular use was to in cybersecurity.[4]



[4] Ramaswamy, Satya. "How Companies Are Already Using AI", *Harvard Business Review,* April 14, 2017, Retrieved from https://hbr.org/2017/04/how-companies-are-already-using-ai

Why Does AI Matter to Government

In 2016, the White House released the report,

"Preparing for the Future of Artificial Intelligence".

Its key points for social direction include:

- Virtual Agents will enhance many job functions and create new jobs.
- Increased automation may encourage the manufacturing industry to bring production back to the United States.
- Many low and medium skill jobs may be displaced by automation.
- AI will play a large role in cybersecurity to detect and defeat cyberattacks.[5]

[5] Executive Office of the President, National Science and Technology Council Committee on Technology (2016), Preparing for the Future of Artificial Intelligence, Washington, DC.

AI and Government Research

In 2016 the National Science and Technology Council released the "The National Artificial Intelligence Research and Development Strategic Plan" with seven strategies and two recommendations for research direction[6]:

- Strategy 1: Make long term investments in AI Research.
- Strategy 2: Develop effective methods for human-AI collaboration.
- Strategy 3: Understand and address ethical, legal, and societal implications of AI.
- Strategy 4: Ensure safety and security of AI systems.
- Strategy 5: Develop shared public dataset and environments for AI training and testing.

[6] National Science and Technology Council, Networking and Information Technology Research and Development Subcommittee (2016), The National Artificial Intelligence Research and Development Strategic Plan, Washington, DC

AI and Government Research, Cont.

"The National Artificial Intelligence Research and Development Strategic Plan" recommendations for research direction[5] continued:

- Strategy 6: Measure and evaluate AI technologies through standards and benchmarks.
- Strategy 7: Better understand the national AI R&D workforce needs.
- Recommendation 1: Develop an AI R&D implementation framework to identify opportunism to support AI R&D investment consistent with strategies 1-6.
- Recommendation 2: Study the national landscape for creating and sustaining a healthy AI R&D workforce, consistent with strategy 7.

Current Government Needs of AI

AI will continue to play an important role in the Federal sector[7]:

- CyberCom– Improved cybersecurity threat detection.
- Justice Department – Automated document discovery.
- NASA – Large volume data collection and processing.
- Patent Office – Automated patent processing.
- Department of Energy – Better weather prediction.
- All agencies will benefit from documentation and administrative work reduction as AI speeds up those functions.
- Government inquiry chatbots will lead users to relevant data.
- Several agencies have expressed interest in Quantum computing for better encryption and smarter AI.

[7] Eggers, William D. (May 2017) 5 Ways Artificial Intelligence Is Already Changing Government. Retrieved from http://www.govtech.com/computing/5-Ways-Artificial-Intelligence-Is-Already-Changing-Government.html

Contact Information

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