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SUPERHUMAN SERVICE

How Federal Agencies can perform smarter, better, and faster with the help of artificial intelligence.

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Introduction

It was a very different world back in 1956 when John McCarthy coined the term “artificial intelligence.” He had a clear vision for what it was, defining it as “the science and engineering of making intelligent machines.” But the tools and technologies available to him to create such machines were limited.

Much has changed since then. Transformative technologies like the internet, mobile devices, and cloud computing have made AI a reality of our everyday lives, from the Uber that arrives curbside with a touch of your smartphone, to the Alexa that recommends playlists that perfectly jive with your musical tastes.

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At the same time, greater processing power, vast amounts of available data, and a tremendous drop in computer costs have rapidly catapulted AI from a far-flung fantasy into an incredibly exciting opportunity for government today.

In the following pages, we’ll explore the basics of what AI is and how it works, as well as why it’s enabling Federal agencies to achieve levels of performance and contribution that were previously impossible.

Part I: What Is AI?

Machines Behaving Like People

They understand language. They learn, reason, and make decisions. They solve problems, and adapt their actions to increase the likelihood of success. Sound like human beings? That's the idea. But we're not talking about human beings. We're talking about AIs, the powerful technologies already transforming government in major ways, including:

- **Predicting future outcomes.** AIs are capable of analyzing huge historical data sets, and surfacing insights from that data. That could mean anything from forecasting natural disasters to recognizing potential security threats to flagging instances of tax evasion.

- **Automating manual tasks.** These range from the more glamorous (self-driving cars), to the more mundane (sorting through job applications). Several federal entities already use chatbots to answer basic questions and leave more nuanced responses to a human.

- **Helping make decisions.** AIs can literally scan, screen and sort documents, making decisions that quickly reduce backlog and help Federal employees get the information they need faster. For example, the US Postal Service uses handwriting recognition to sort mail by ZIP code, processing 18,000 of pieces of mail an hour.

As you might imagine, AI doesn't function in a vacuum. On the contrary, well-executed AI initiatives are a thoughtful assimilation of people, processes, and technology. That's why it's so important for you to approach AI initiatives strategically, with a clear road map for how you'll integrate these powerful new capabilities into your existing programs workflows step by step.

We'll touch on more details about how that happens later in this paper. For now, let's take a deeper dive into how AI works.

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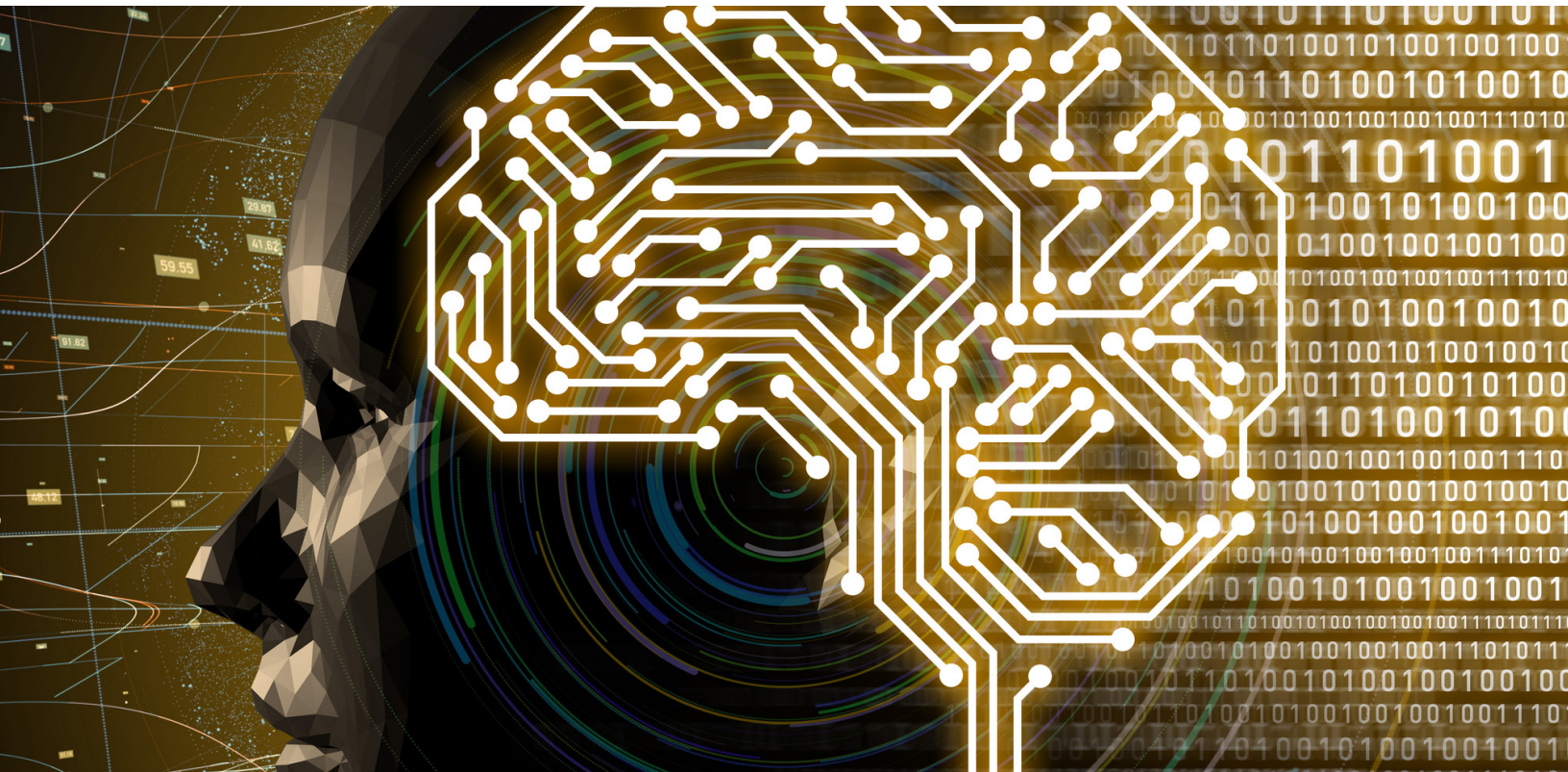
Part II: How does AI work?



Simulating the Human Brain

What is the human brain, if not the most elegant and sophisticated machine known to man? It transmits signals. It synthesizes information. It crunches algorithms. So it makes sense, then, that the human brain's dense network of neural processing power is the model upon which AIs are built.

Similar to the human brain, AI technologies produce automated outputs via a simple four-step process:

1. Collecting large data sets
2. Mining key elements
3. Deciding on a method of analysis
4. Writing code to perform the analysis

To put it in more human terms, different types of AIs can learn, think, see, and comprehend, respectively. And while an individual AI can be used on its own, multiple AIs can be combined with one another to produce an AI capability platform with exponentially more processing power. Let's explore a few of these more common types of AI technologies now.

AI LEARNS

Machine Learning enables computers to learn on their own.

At some point, some very astute computer scientist had an epiphany: it's more efficient to teach computers how to learn than to continuously teach them how to perform more and more individual tasks. Thus, machine learning was born.

Machine learning starts with historic data. That data is inputted into the computer, and processed using a series of rules and decision trees, or perhaps even more sophisticated clusters of neural networks. With those guiding engines in place, machines can then learn by ascending through any one of these analytics groups:

- **Descriptive Analytics: What happened**
- **Diagnostic Analytics: Why did it happen**
- **Predictive Analytics: What could happen**
- **Prescriptive Analytics: What should we do**
- **Cognitive Analytics: Cause something to happen**

In a nutshell, with strong AI processing power, machine learning capabilities enable

computers to rapidly highlight or find patterns in big data. As we'll show later in this paper, Federal agencies can use this to detect fraud, optimize marketing campaigns, decrease risk, and more.

AI THINKS

Deep Learning uses neural networks to synthesize information.

Deep learning is a subfield of machine learning that more closely approximates what we humans experience as thinking, or synthesizing different pieces of information to reach a given conclusion. The algorithms that power deep learning directly mirror the structure and function of the brain.

Specifically, these structures are called Artificial Neural Networks (ANN). The neurons have distinct layers and connects to other neurons. Each layer selects a specific feature to learn—such as curves or edges in an image recognition. Together, the layers produce a deeper understanding of a given concept or idea, hence the name deep learning.

To understand how these networks function, let's look at how one neural network could process images for steering a self-driving car. Each layer processes something different:

- **Neural Layer 1: Detects edges for side of the road**
- **Neural Layer 2: Detects land lines in the image**
- **Neural Layer 3: Detects other cars**

Each neuron assigns a weight to its input: How correct is it relative to the other inputs, and the task being performed. From there, a final output is generated.

AI SEES

Computer Vision enables machine to identify images like humans do.

From the bar code scanners that "sees" a group of strips in a UPC to the Apple Face ID that can tell whether or not the face looking in the camera is actually yours, computer vision is already a part of our everyday life. It's what enables computers to see, identify, and process images like humans do.

Importantly, computer vision does not inherently understand what it sees in the physical universe. But can be paired with neural works that help it do just that. These neural networks comprehend each pixel of an image by consuming as many pre-labeled images in order to "teach" them how to identify similar images.

AI COMPREHENDS

Natural Language Processing enables computers to derive meaning from human language.

Raise your hand if you've had a conversation with Siri (or some other smart device). Most of us have by now. Natural language processing is the technology that enables Siri and other technologies like it to understand what you're saying, and respond intelligently.

Through this natural language processing technology, AIs are able to evaluate, understand, and derive meaning from human language. With it, computers can read text, hear speech, interpret it, and measure sentiment.

Already, the Federal government is using natural language processing to do the following:

- **Search and index document**
- **Parse themes in text collections**
- **Identify the mood within large bodies of text**
- **Mine average sentiment and opinion**
- **Transform voice commands into written text and vice versa**

In all of these scenarios, the principle goal is to take raw language input and use linguistics and algorithms to convert or augment text in such a way that delivers greater value.

Part III: Why Is AI So Valuable to Government?

Smarter, Better, Faster Performance

Now that we've covered what AI is and how it works, let's look at a few specific examples of how it can create value in the Federal government by driving smarter, better, and faster performance.

AI Use Case #1: Grants Management

For our first example, let's see how AI could be applied to the grants management process. Typically, the process follows four steps: 1) create the funding opportunity, 2) collect and review applications, 3) make award decisions 4) implement and track the award.

How could AI make this highly-manual process more efficient?

FASTER: Rapidly analyze and sort applications.

Reviewing incoming applications is incredibly time-consuming. AI can help. For starters, AI could automatically determine which applications are likely to be accepted or rejected, which would save employees a whole lot of time in the review process. It could also provide insights into the incoming grant applications, surfacing trends and providing a better understanding of what works, what doesn't, and why.

BETTER: Improve success rates by reducing risk.

How risky are the beneficiary organizations receiving the grants? AI could provide answers by generating risk ratings based on the the history of beneficiary organizations, and their previous results. That means Federal programs could hold them accountable for the funds used, as well as identify and correct problems with receiving organizations early in the process.

SMARTER: Flag poor performance before it's too late.

Grant officers are inundated with thousands of progress and status reports. Often problems that need to be addressed can remain hidden in this deluge of paperwork, languishing before grant officers have a chance to evaluate them. Using natural language processing, AI could summarize these reports can be summarized, flag problems, and enable grant officers to quickly distinguish which reports to review with attention to detail

In all of these cases, AI can significantly decrease the amount of human error and effort required to analyze applications and reports--so they can effectively administer a greater quantity of grants at a higher standard of quality.

AI Use Case #2: Human Resources Management

The U.S. government is the largest employer in the world. And like any other talent organization, it struggles to find, hire, and retain great talent. Not only that, but the process of staffing a team is often slow and cumbersome, and the cost of turnover is high and rising.

How might AI improve the talent management process?

FASTER: Streamline the talent sourcing process

Evaluating large amounts of resumes by hand is inefficient. Even after months of sorting through applications, qualified potential candidates can still get misplaced. An automated resume parser that's powered by AI can rapidly analyze each resume, map skill sets, previous roles, and level of expertise to specific positions, and rank candidates against peers.

Additionally, it can also help keep track of ever-changing metrics that can influence a hiring decision like new technologies, popular schools to recruit from, and the most common skills possessed by applicants for a certain type of job.

This gives HR departments more time to focus on the human aspects of the job like interviewing, reading personality, gauging fit, and building relationships.

BETTER: Sharpen how you attract talent

Hiring talented individuals is critical to any program's success. But recruiting is challenging due to the bevy of decisions that must be made, including who to target, what message to convey, and how to staff recruitment efforts.

Furthermore, if this process isn't performed accurately, it results in poor performing recruitment efforts like unqualified job applicants, lack of diversity, and declined job offers.
AI can help. Machine learning can analyze large amounts of HR data to understand what candidates are most likely to succeed in a role, how they can be incentivized, and ultimately entice them to apply.

AI can also evaluate resume data objectively and omit bias based on age, gender, race and religion. This would promote diversity in hiring and mitigate unconscious bias.

SMARTER: Detect and address attrition patterns

Attrition is a reduction in the workforce caused by retirement or resignation that leaves a program with no plan for replacing that vacant position. If you don't have a plan in place for this turnover, it can be costly. Companies lose productivity and knowledge, especially when departing employee is an SME.

AI can build predictive algorithms to determine the most typical reasons that cause employee attrition based on data including:

- **Age**
- **Education**
- **Marital Status**
- **Number of companies worked at**
- **Total working years**
- **Monthly income**

These AI predictive models generate a score for each employee based on the calculated probability of them leaving the organization

Conclusion

Artificial intelligence is here. And the power and possibilities it presents for the U.S. government has only just begun. Helping Federal agencies understand what AI can do, and how it can help improve performance is what we do best. Let's talk about how your team can work smarter, better, and faster to deliver truly superhuman service on behalf of your constituents.

Get in touch with us today at 1.800.517.1925 or info@longevityconsulting.com