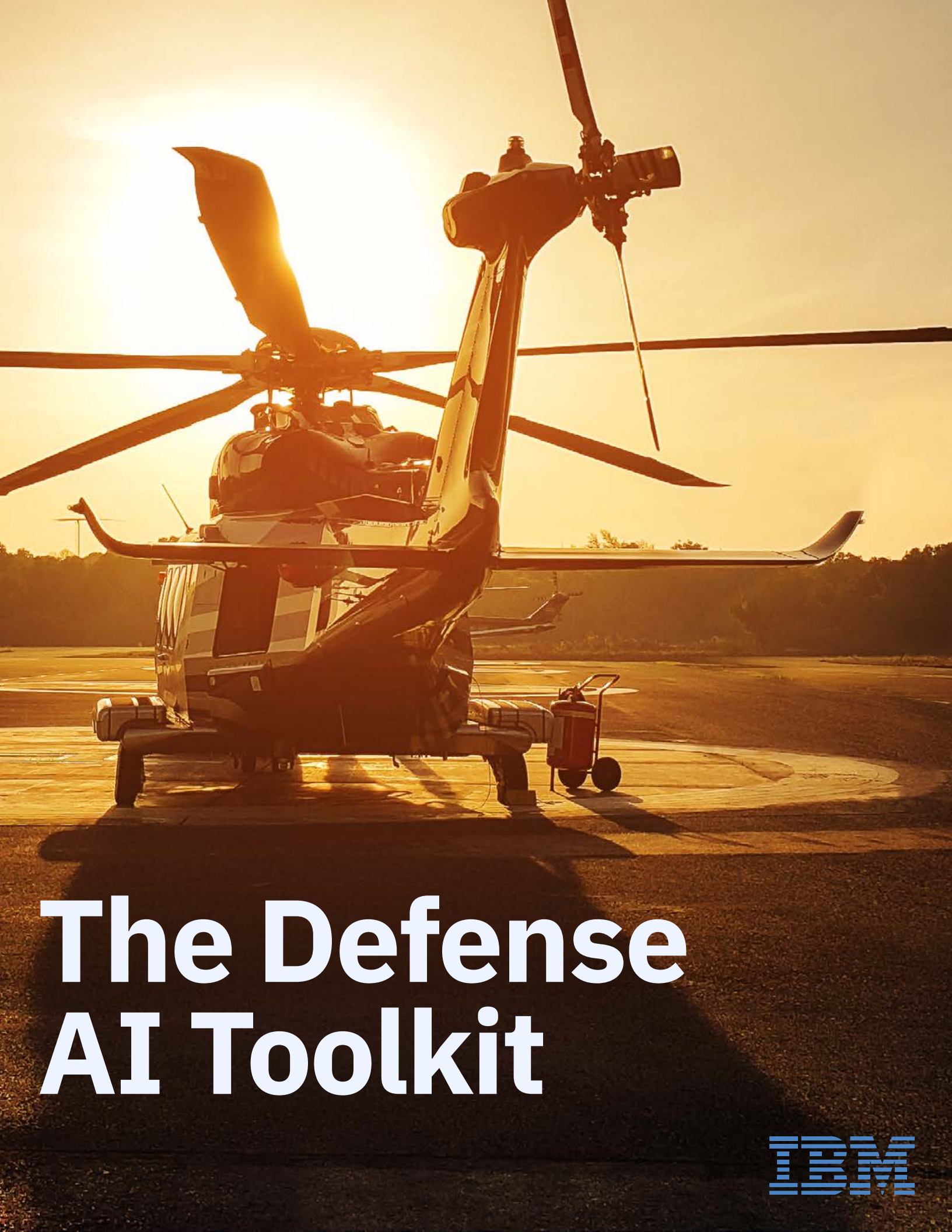


The Defense AI Toolkit

IBM

The Defense Department's foray into AI brings with it promises of a new dawn for military readiness, but getting started isn't always easy. This toolkit will enable DoD agencies to identify the steps to embark on an automation journey — it provides tips and strategies for harnessing data through high-powered data analytics and automation to help complete the mission.

Part 1

Organize Your Data for AI

Understand

An automation journey starts with the "why." Understanding the business process you want to streamline or the key question you're trying to answer with the data is crucial.

"We just can't collect data blindly for no particular reason than to just check the box," says Travis Edwards, an IBM predictive asset optimization application developer. "If we're not specifically trying to solve a problem and answer our question with our data, then we're not accomplishing anything."

Organize

This stage involves figuring out which data to collect and how to collect it, and then auditing the data periodically after that. It also entails making sure all necessary fields are populated, and that the maintainer is inputting the right values. Defense agencies should ask themselves: Are the values reasonable? Are we collecting values? And for how long are we collecting them?

The organize stage involves taking a good, long look at the data you have — and what you don't. By classifying and categorizing data early on, you help create an analytics-ready foundation. Examine the data to see if it's unstructured or structured. Where does it come from?

Defense agencies also need to know whether they're working with good data and then figure out how they can find the data sets they need to do the intended analysis. Consider how good the data is and who owns it. Can the user understand the patterns in that data and be able to predict what happens?

Analyze

"Once we have the data organized and set up, we can break it into two chunks depending on who the data scientist is or what they're trying to accomplish," Edwards says.

Then, use something like Python for SPSS to start developing your machine learning model to accomplish and detect the type of fault or failure you're looking for. After you've found the right combination of things or pieces of data you're looking for, evaluate it further against that other piece of data or other set of data and test it out against that.

An additional step is ensuring you'll catch the faults and failures you were seeking before you actually deploy it in the field, Edwards says.

As with any new technology, make sure not to get distracted by the so-called shiny object syndrome, says Andrew Edmondson, principal architect of the U.S. Army account at IBM.

"There's still a lot of magic bullet mentality out there," he says. "As people learn and become experienced and exposed to the technologies and they take on some of these projects, they're learning."

> "If we're not specifically trying to... solve our question with our data, then we're not accomplishing anything."
>
> Travis Edwards, Predictive Asset Optimization Application Developer, IBM

Modeling

Now, it's time to manage expectations for the output. Traditionally in systems engineering, Edmondson says, this phase of the process would involve the defense agencies issuing rigid requirements that the system shall, or the system will perform some task. But with machine learning, you have to be a bit more flexible: We expect this particular outcome. Setting expectations is all based on the data and method you use. However, the expectation and reality often differ, so the difficulty of the modeling is managing expectations for that output.

Transparency

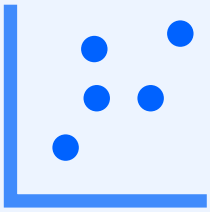
With AI data-based models and simulations, analysts will have a better grasp of what's coming down the pike — and will know how to mitigate negative outcomes or take action before an issue becomes a problem.

But with AI getting the right answer or the desired result isn't all there is to it. Defense agencies will need to understand how a decision was made. That's transparency. It helps avoid bias in data models and makes data core to what defense agencies do every day.

Part 2

Common Pain Points to Overcome

> “If you wait around for perfect data, you’re never going to start.”
>
> Andrew Edmondson, Principal Architect of the U.S. Army Account, IBM



Don’t wait for perfect data

If you’re waiting for the perfect data to start your automation journey, Edmondson has one piece of advice: don’t. “I typically like to personify things to help support explanations,” he says. “Understand that bad data is more likely misunderstood data. They’re not bad; they’re just misunderstood.”

If the data doesn’t conform to your worldview, take a deeper dive into those data sets, examine them forensically. “What you do need to accomplish or need to execute is to just start,” Edmondson says. “Identify the business objectives and get going. If you wait around for perfect data, you’re never going to start.”

Be clear about deployment

Understanding how the rollout will happen is critical: Will you expose this result to the end users, and how are you going to do that? Is it a software feature in a current application? Is it a whole new application? Is it on desktop? Is it on mobile?

How do you expose the magic that’s been created through this analytics process to people to really make an impact? “There’s a lot of different schools of thought on that,” Edmondson says.

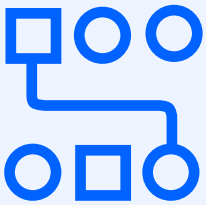
Encourage collaboration

If you don’t already have a dedicated AI team, it’s time to stand one up. The benefits are twofold: a team promotes collaboration and expedites lessons learned as people work together to solve similar problems for their teammates, Edmondson says.

Plus, you start to establish and refine your practices and standards in the governance around this technology. “If you’re not constraining your organization and your automation projects with the correct processes or appropriate processes for your organization, you will go off the rails,” Edmondson adds. “It’s not a question of if — it’s a question of when.”

Start small

Pilot projects have become increasingly common in the Pentagon as a way to trial-and-error new technologies. “Pilots are huge and I think that’s pretty universal whether in commercial or government,” Edmondson says. “You can’t eat the elephant at once. Take a tiny piece, carve it out and see if you can solve it.” Launching a pilot will help you prove out the capabilities and overcome and address some of your challenges.



Develop a strategy

Now that you have a pilot project aiming to solve a particular problem, what’s next? And then, what’s after that? And after that? That’s why you need to develop a strategy to understand what your end in mind should be or will be as a result of walking down this road of implementation. A long-term strategy will help you focus on the problems you need to solve with AI Edmondson says.

Part 3

Use Case: Marines Force Management

Over 200,000 Marine Corps troops stand ready to deploy all around the globe — at a moment’s notice. The average length of deployment is 12 months; whenever a move of military personnel and materials extends beyond that, Congress has to green light it. That process is often tedious and wastes time, so completing deployments in a timely manner is key.

The challenge

Planning, scheduling and sending troops to all corners of the world require an enormous amount of data. Traditionally, deployment planning relied on basic tools such as whiteboards and spreadsheets. These tools lack the ability to help connect the dots. They don’t have the ability to provide planners with more forward-looking capabilities such as predicting a recruiting need of new Marines who are years away from being deployment ready.

The solution

The Marine Corps needed a method to capture natural language and unstructured text. Enter a custom force management dashboard that uses the same Watson predictive analytical capability that diagnoses the health and readiness of military vehicles. Powered by augmented intelligence, the tool leverages NLP and data science and processes real-time and historical data to help with smarter decision-making.

The dashboard, which runs on the Secret Internet Protocol Router Network, includes SPSS, which offers statistical analysis, and Watson Explorer for natural language processing that can read and analyze commanders' notes. It can also help evaluate where Marines might need additional training and can send out an alert if additional troops need to be recruited.

The outcome

Planners can now use the custom dashboard to select the right units to deploy for each situation. Commanders are able to see unit readiness levels on a single pane of glass, helping them plan deployments faster and more efficiently. The dashboard also allows them to balance the need to allocate forces for future missions while minimizing impacts to future readiness.

Part 4

Cognitive Equipment Advisor

Watson also had a starring role in increasing military asset readiness by tracking maintenance of over 350 Army vehicles in a proof-of-concept. Watson's primary task was to consume and correlate vast amounts of data, including technical manuals, technical maintenance work history, and sensory readings.

"We set out to see whether we could take the data the Army had, fuse it with additional data sources and uncover some insight to help them to understand if a piece of equipment will be available in a certain timeframe," Edmondson says.

Put to the test, Watson's cognitive capabilities predicted and diagnosed equipment component failures, and then prescribed maintenance actions for technicians. Commanders could view the status of a unit so they could make better-informed decisions — and alerting them up to 60 days before a vehicle would break down. Additionally, Watson helped technicians and logisticians see which parts to order and what to keep in stock.

The idea is that as Watson learns more, the Pentagon will expand its use across the services and include other equipment and weapons systems.

"Imagine the ability of a soldier or end user in the Department of Defense to be able to take their phone and just hold it out and then look at it and say, 'Oh, OK, I need to change the alternator,'" Edmondson says.

Based on that predictive failure, a soldier could then comb through reams of unstructured data to understand what he or she is going to do about this prediction. Do they need to get a whole new vehicle? What maintenance procedure or what troubleshooting steps are needed? What do they need to do to resolve this?

The result of that proof-of-concept was a competitive bid to be able to do this for more vehicles, Edmondson says, but more importantly, "it was an opportunity for the Army to explore the realm of the possible."