



# The future of manufacturing with generative AI

Enhanced designs, better products,  
faster time to market

This ebook is for business and technology decision makers in manufacturing organizations interested in leveraging generative AI to improve machine availability, maintenance, product quality, and design.



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## INTRODUCTION

# Harnessing the power of generative AI in manufacturing

Generative artificial intelligence (AI) is rapidly transforming the business world, as virtually all industries are discovering ways to leverage it to improve productivity and accelerate time to value. A brief six-month period alone saw the release of multiple large language models (LLMs) and generative AI applications with powerful processing capabilities and features.

With mounting pressure to design products faster and reduce costs, manufacturing organizations stand to achieve significant benefits from adopting generative AI. For years, companies have leveraged AI services and machine learning (ML) tools from Amazon Web Services (AWS) to improve product design, optimize operations, increase supply chain visibility, and save millions of dollars.

In many ways, generative AI represents a leap forward in AI technology, and adopting it is the logical next step for manufacturers that want to stay innovative. Generative AI can improve every stage of the manufacturing value chain by expediting the delivery of more transformative, cost-effective products to market.

From the office floor to the factory floor, generative AI has the potential to deliver transformative results for manufacturers.

## With generative AI, manufacturers can achieve benefits across:

### Operational excellence

Generative AI can create training content, streamline and track supply chain processes, decrease downtime, and reduce waste.

### Quality improvement

With generative AI, manufacturers can automate testing, improve factory equipment maintenance, and maintain compliance with greater ease.

### Product engineering

Manufacturers can use generative AI to create, test, and refine product designs, implement personalization, develop prototypes, and accelerate proofs of concept to shorten their time to market.

# Examining the challenges of adopting generative AI

There are a few perceived challenges around adopting generative AI, including:

- **Finding and accessing high-performing foundation models (FMs)**
- **Modifying base FMs with internal data to build differentiated applications**
- **Protecting data and controlling how it is shared**
- **Seamlessly and cost-effectively integrating generative AI applications into tech stacks**

Read on to explore manufacturing use cases that illustrate how AWS can help your organization quickly realize the benefits of adopting generative AI technology to keep pace with or surpass the competition.

## Terms to know

### **Artificial intelligence (AI):**

The field of computer science dedicated to solving cognitive problems commonly associated with human intelligence, such as learning, creation, and image recognition.

### **Generative AI:**

A type of AI that can create new content and ideas, including conversations, stories, images, videos, and music. It is powered by large models that are pretrained on vast amounts of data, commonly referred to as foundation models (FMs).

### **Machine learning (ML):**

The science of developing algorithms and statistical models that computer systems use to perform tasks based on patterns and inference rather than explicit instructions. ML is a subset of AI and the foundation of generative AI.

### **Foundation model (FM):**

An ML model that is pretrained on large amounts of data—and may contain billions of variables that enable it to learn complex concepts—to power generative AI applications.

### **Large language model (LLM):**

An ML model that is trained on trillions of words so it can recognize, translate, predict, and generate text, images, music, and other content. Some LLM examples are BERT, GPT, PaLM, BLOOM, Llama, and Chinchilla.



# How to start your generative AI journey

Successfully adopting and unlocking the benefits of generative AI requires the right strategy. The following steps can help your organization get off to a good start:



## 1 Define your objectives

Do you need to streamline operations? Increase supply chain resiliency? Digitally transform your smart factory? Set a clear goal from the start to keep your efforts focused and help track progress along the way.

## 2 Identify specific real-world use cases

Identify and use manufacturing best practices to decide the best place for generative AI within your organization before implementing the technology.

## 3 Select FMs that best fit your application

Should you build with existing models? Customize from the ground up? Or something in between? Answering these questions will help guide you to the ideal FM for your needs.

## 4 Collaborate with experts

Working with an expert like AWS can help keep you focused on your goals instead of managing technology. AWS continues to build on a 20-year track record of AI investment and innovation, employing thousands of ML engineers who help develop and implement generative AI strategies, including infrastructure considerations and ethical implications.

AWS is democratizing generative AI so that manufacturing organizations of any size can reinvent their products, processes, and experiences.

## USE CASES

# Putting generative AI to work for manufacturers

The following sections explore three use cases that illustrate how generative AI can improve product design engineering, enhance production, and optimize manufacturing supply chains.



### PRODUCT ENGINEERING

Unlock new, innovative engineering and design possibilities beyond human capabilities.



### PRODUCTION

Keep complex production operations running efficiently by using generative AI with your industrial data.



### SUPPLY CHAIN

Increase supply chain visibility, plan accurate inventory, and find alternate vendors to reduce supply chain headaches.



## USE CASE 1: PRODUCT ENGINEERING

# Develop new and better designs faster

Today's manufacturing companies are challenged by on-premises equipment limitations, remote system access, and the need to stay innovative. Generative AI enables manufacturers to quickly and effectively explore design options that can minimize costs, mass, materials, design time, and production time.

### Design potential

By combining AI with high performance computing (HPC), generative AI reimagines discrete product components, uncovering new and innovative designs that a human may not have considered.

### Dataset analysis

Generative AI analyzes large datasets quickly, which can help your organization identify opportunities to improve products, manufacture or machine products faster, and accelerate time to market. It can also create synthetic datasets to run accurate simulations that inform product design.



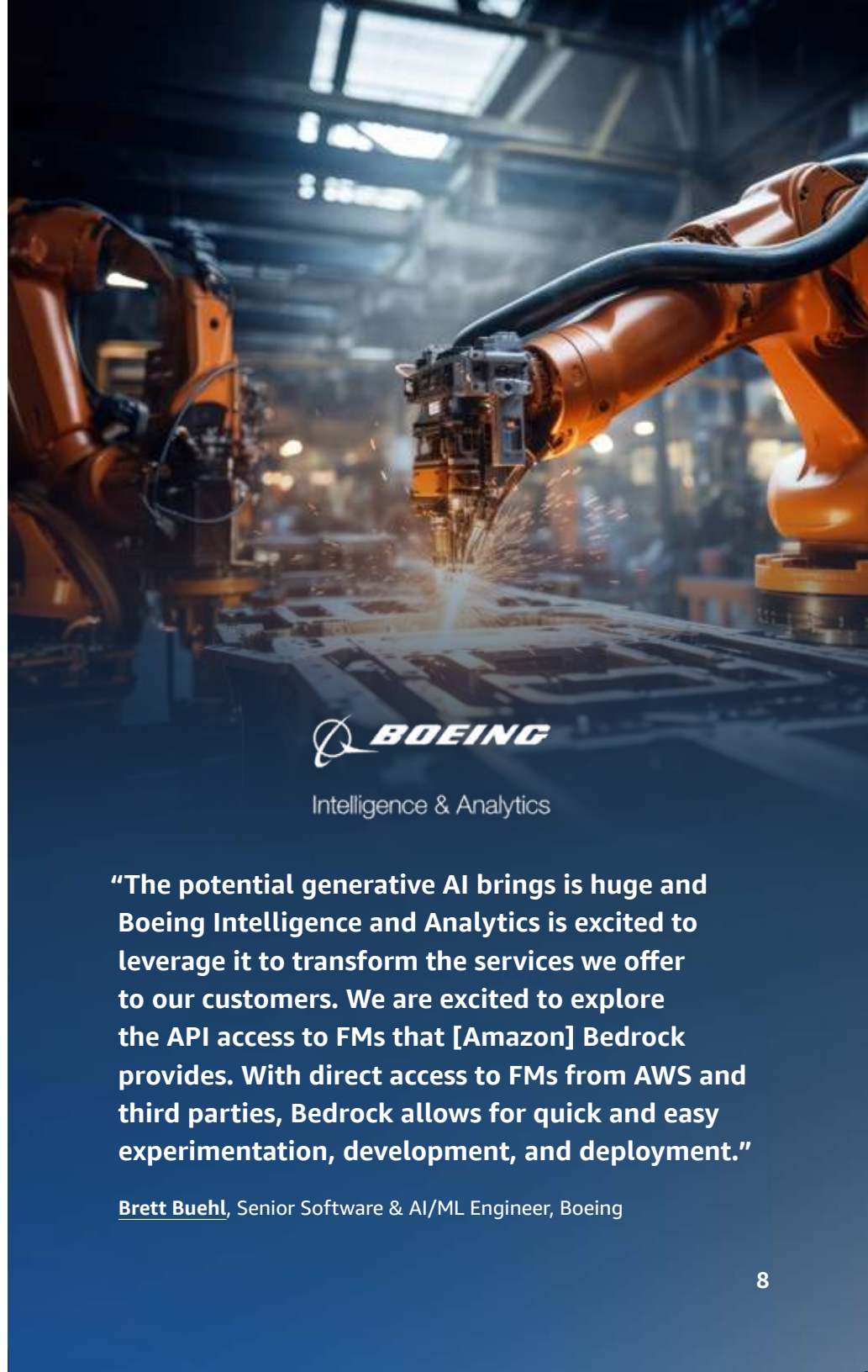
## USE CASE 2: PRODUCTION

# Minimize downtime and optimize production

An effective data strategy has long been the cornerstone of efforts to improve production in the manufacturing sector. By properly managing, analyzing, and acting on data, manufacturers can predict optimal production speeds, reduce losses, and more.

Unfortunately, manufacturers have struggled with disconnected and siloed data sources that were often not designed to work together. This can limit their ability to make data-driven production improvements and make it difficult to gain access to the high-quality datasets needed to leverage generative AI.

Another challenge manufacturers face is the attrition of institutional knowledge. As experienced workers retire, their expertise is lost. Manufacturers must constantly find ways to equip new workers with the knowledge to keep complex operations running efficiently while maximizing production, quality, and machine availability.



Intelligence & Analytics

**“The potential generative AI brings is huge and Boeing Intelligence and Analytics is excited to leverage it to transform the services we offer to our customers. We are excited to explore the API access to FMs that [Amazon] Bedrock provides. With direct access to FMs from AWS and third parties, Bedrock allows for quick and easy experimentation, development, and deployment.”**

**Brett Buehl**, Senior Software & AI/ML Engineer, Boeing





## USE CASE 2: PRODUCTION (CONT'D)

### It all starts with data

**Industrial Data Fabric (IDF)** solutions on AWS harness and unite disparate data to create scalable, unified, and integrated mechanisms. This allows you to build the foundation for industrial digital transformation and generative AI adoption by offering economical, secure, and easy access to high-quality datasets. Further, these high-quality datasets can help you improve quality, maintenance, materials management, and process optimization.

### Transform data into business value

Manufacturing organizations have used AI solutions on AWS for years to optimize overall equipment effectiveness (OEE), reduce loss, maximize resources, and make other data-driven production improvements.

### Upgrade production with generative AI

While AI solutions on AWS can help you transform production, generative AI allows you to take these improvements even further. For example, generative AI could drive applications that equip new workers with institutional knowledge, preventing decades of expertise from being lost when experienced engineers and operators retire.

Workers could query historical machine maintenance logs, equipment manuals, and maybe even data from other manufacturers. Generative AI could also provide high-probability suggestions on equipment input adjustments, required maintenance, or spare parts to buy, allowing the manufacturer to reduce downtime and achieve consistently high production levels even as workers come and go.

## USE CASE 3: SUPPLY CHAIN

# Increase supply chain visibility and minimize risk

Supply chain uncertainty continues to be an area of concern for manufacturers. Disruptions are difficult to plan for, and finding alternate vendors can be a time-consuming, costly, and risky endeavor.

### Save time and reduce costs with artificial intelligence

AI has helped manufacturers plan for shortages and reduce supply chain headaches. As a cloud-based application that unifies data and offers ML-powered actionable insights, built-in contextual collaboration, and demand planning, **AWS Supply Chain** can connect to existing enterprise resource planning (ERP) and supply chain management systems without re-platforming, upfront licensing fees, or long-term commitments.

### Taking control with generative AI

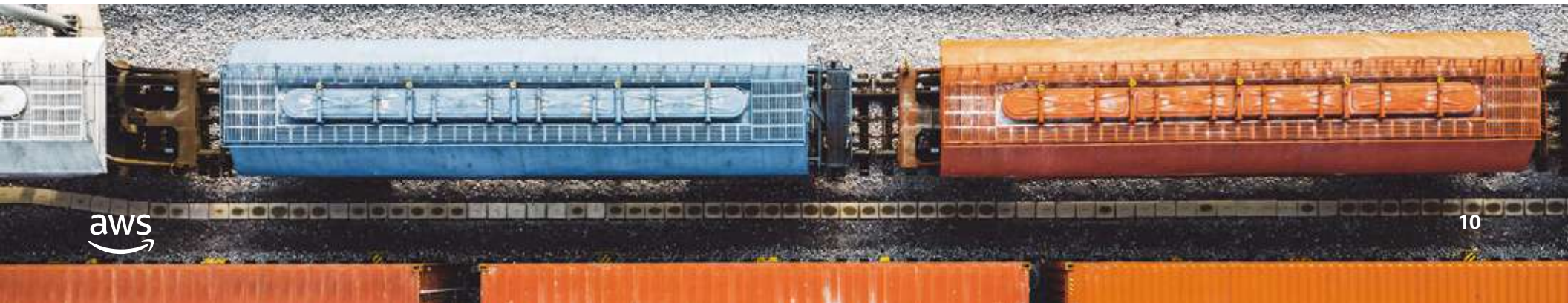
Generative AI can further optimize manufacturing supply chains, reducing costs and risks. For example, generative AI could be used for sourcing alternate vendors when a shortage occurs. By training an FM on information about suppliers, their capabilities and offerings, and your requirements, an application could use generative AI to quickly recommend your top options—saving your organization time and helping you resume operations faster.

Generative AI could also power an application that serves as a supply chain control tower, proactively assessing risks related to shipping challenges, natural disasters, strikes, or geopolitical events to provide enhanced visibility across your supply chain. This application could make recommendations or even take actions to properly allocate scarce resources and mitigate disruptions.

Further, questions about the supply chain that normally require interacting with third parties could instead be directed to this application, which could then provide highly accurate answers in seconds rather than hours or days.

**“Amazon Bedrock enabled us to quickly innovate on industry use cases with generative AI. AWS’s generative AI capabilities are the platform for our future Technician AI Assistant, which will leverage complex technical documentation and case libraries to speed customer service in the field.”**

Amy Chen, CIO, KONE







## GENERATIVE AI ON AWS

# Transform your future using generative AI on AWS

There are several ways AWS allows manufacturers to drive productivity and transformation with generative AI:

### 1. Easily build and scale generative AI applications

**Amazon Bedrock** is a scalable, reliable, and secure AWS managed service that lets you access a powerful range of FMs from Amazon and leading providers. You can also customize FMs with your own data on Amazon Bedrock with confidence that its advanced privacy and security features will help protect your intellectual property (IP) and sensitive information.

### 2. Control costs while maximizing performance

AWS delivers the most price-performant infrastructure for ML. We've invested in our own silicon over the last five years to push the boundaries on cost-efficiency and performance for demanding ML workloads.

### 3. Spend more time innovating and differentiating

AWS services empower your developers with greater capabilities and more time to build. **Amazon CodeWhisperer** generates code suggestions for developers in real time, helping them deliver value faster while reducing risks. And, with **Amazon QuickSight**, your organization can share ML-powered business insights to speed up and improve decision making.

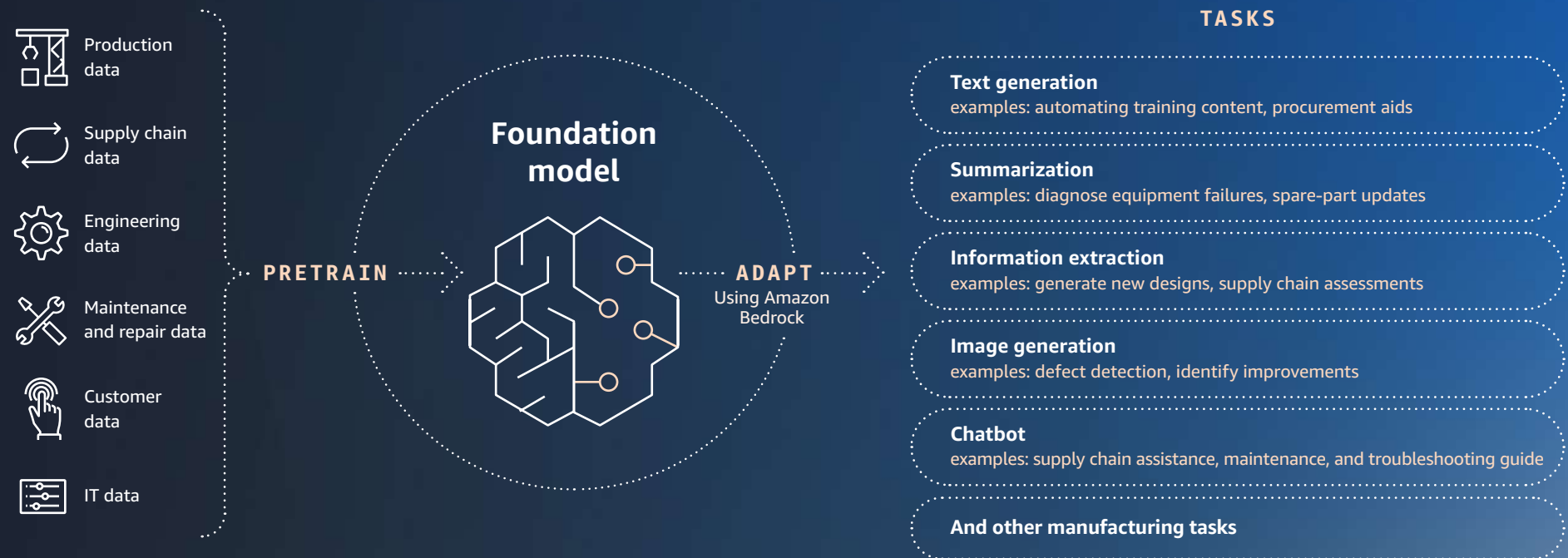
## GENERATIVE AI ON AWS (CONT'D)

### 4. Enjoy flexibility and scalability

Take generative AI solutions even further with **Amazon SageMaker JumpStart**, an ML hub where your developers can discover, explore, and deploy FMs that aren't available on Amazon Bedrock. Plus, AWS is continuously adding more models at unprecedented scale and velocity—so your organization can continue enjoying a wide range of options for years to come.

### 5. Build and deploy your own FMs at scale

AWS even provides solutions for building your own FMs. **SageMaker** provides managed infrastructure and tools to accelerate scalable, reliable, and secure building, training, and deployment of ML models. On SageMaker, you can train your own FMs, quickly correct performance issues with debugging tools, automate and standardize processes across the ML lifecycle, and create high-quality datasets while aligning model outputs with human preferences.





## CONCLUSION

# Next steps

From aiding machine maintenance to improving new product designs and more, generative AI is delivering transformative results.

AWS helps manufacturers leverage the power of this technology, improving production, optimizing supply chain management, and creating better products faster. For manufacturing organizations looking to innovate beyond the competition, the time to adopt generative AI is now.

Start your generative AI journey today:

[Explore AWS services for generative AI ›](#)

[Learn more about AWS for Industrial ›](#)

[Contact us to get started ›](#)

## Tools to accelerate your generative AI journey

- **Amazon Bedrock:** Build and scale generative AI applications with this fully managed service that makes FMs available from leading AI startups and Amazon through an API
- **Amazon SageMaker:** Build your own FMs with managed infrastructure and tools to accelerate scalable, reliable, and secure model building, training, and deployment
- **Amazon SageMaker JumpStart:** ML hub that provides access to algorithms, models, and ML solutions so you can quickly get started with ML. With SageMaker JumpStart, ML practitioners can choose from a broad selection of publicly available FMs
- **Amazon CodeWhisperer:** Enjoy 57 percent faster application development<sup>1</sup> while helping to ensure security with this AI coding companion, which is at no cost for individual use
- **Amazon Titan:** Leverage this collection of powerful general-purpose FMs for text summarization, generation, classification, open-ended Q&A, information extraction, embeddings, and search
- **AWS Trainium:** Train models faster with up to 50 percent cost savings<sup>2</sup> using this ML model accelerator
- **AWS Inferentia2:** Run high-performance FM inference with up to 40 percent lower cost per inference<sup>3</sup> using this accelerator
- **Amazon QuickSight:** Transform traditional multistep business intelligence (BI) tasks into intuitive and powerful natural language experiences with generative BI capabilities in Amazon QuickSight

<sup>1</sup> Data collected from a "productivity challenge" conducted by Amazon during the Amazon CodeWhisperer preview

<sup>2</sup> AWS Trainium delivers up to 50 percent cost-to-train savings over comparable Amazon EC2 instances

<sup>3</sup> AWS Inferentia delivers up to 40 percent cost per inference over comparable Amazon EC2 instances

