GETTING STARTED WITH AI IN THE CLOUD

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There is no doubt that Artificial Intelligence (AI) is a game-changer for businesses. The ability to take millions of records, isolate patterns, and predict future outcomes enables organizations to make data-driven decisions. In this ebook, you will come to understand the value of leveraging AI, why it makes sense to run AI in the cloud, explore what Amazon's AWS and Microsoft's Azure cloud businesses are delivering to make it easy for you to build AI solutions, and, finally, what skills you need to develop AI solutions on cloud platforms.

Why AI is important

The importance of artificial intelligence to business has been celebrated by many people in the past few years. This means that the first wave of big data technologies is now entering the second machine era.

As more companies consider building AI into their products, they face questions about what kinds of analytics to use, how to set up their AI systems, and the optimal environment to implement such systems in.

The corporate world needs to keep pace with today's rapidly changing technologies. Artificial intelligence is already replacing workers in warehouses or factories, and now businesses must also start training robots and AI to be part of the company's everyday operations.

The goal of this eBook is to illustrate how to get started with AI in the cloud. There is a specific focus in the text on tools that enable quick success. Often, these tools do not require programming skills. These tools are a gateway that opens up the power of AI. When you are comfortable with the technology, you can then roll up your sleeves and start coding with Python.

Why it makes sense to run AI in the cloud

The purpose of AI is to analyze patterns in data and then make predictions based on those patterns. At the same time, the earliest cloud technologies have been leveraged to store extensive amounts of data. It is for this reason that it makes so much sense to have AI running in the cloud. If your data is in the cloud, why not have your AI scripts also running in the cloud? The closer your programs are to the data, the more efficient your scripts will run.

At its core, there are three levels of AI:

- Artificial Intelligence
- Machine Learning
- Deep Learning

AI is a general term used for computer learning. You can consider it a blanket term when talking about tracking patterns and practices with a computer.

Machine learning (ML) uses mathematical principles and data analysis to extrapolate the behavior of unknown, unstructured data to make predictions about what the future will bring. ML is a group of methods that help systems become better at answering complex questions over time. It is a set of techniques that not only can gather and analyze large amounts of data but can also use

these data to make predictions.

Deep learning (DL) is a way of having multiple computers learn how to think through problems using statistics. In a sense, DL mimics human intelligence. There are now two major players in the game—Google, with its recent acquisition of DeepMind; and Microsoft, through its acquisition of several startups over the past few years, including Maluuba and Lobe.

Each of these approaches to AI can be easily applied to cloud services to solve various problems. For example, Google uses DeepMind, a deep learning solution, to manage the heating and cooling for all of its data centers worldwide.

AI in AWS

Amazon's AWS is arguably the largest cloud provider and growing at an exponential rate. However, AWS does provide leading AI solutions. AWS breaks out the following services you can use to build settlements in their cloud:

- ML Services: Build, train, and deploy ML fast
- AI Services: Easily add intelligence to your applications
- Frameworks: Choice and flexibility with broad framework support
- Compute
- Analytics and Security
- Learning Tools: Dive deep on ML with AWS DeepRacer and DeepLens

The Power of Machine Learning on AWS

Machine learning on AWS is a high-performance computing service. This service enables Amazon EC2 instances with 16 cores (up to 2TB for each center) and enough memory (256GB) to store up to 14 petabytes of data at a time.

Similarly, each machine is connected to one or more Amazon's EC2 Instances with up to 16 cores. You can deploy a fleet of these machines, called a cluster, on AWS's network. When used on AWS, a machine learning cluster only needs one IP address, so you can be sure that all the machines will work together as one.

AWS EC2 instances use the TensorFlow library. This is useful for building machine learning algorithms on AWS servers. It can be used to create models of hierarchical data structures and feed the models with sample data. AWS is currently running a massive amount of RAM for TensorFlow on their Elastic Compute Cloud (EC2), but that's just the tip of the iceberg—it has more than 8 Terabytes of data on its AWS S3 (filesystem) cluster. The AWS costs start at $0.05 a month for the essential S3 bucket. They don't let you access the data directly (this is one of their big selling points), but they do have a read/write filesystem.

AI Services running on AWS

AWS pre-trained AI Services provide ready-made intelligence for applications and workflows. AI Services integrates with requests to address standard use cases such as personalized recommendations, modernizing a contact center, improving safety and security, and increasing customer engagement. Because AWS uses the same deep learning technology that powers Amazon.com and ML Services, developers get quality and accuracy from continuously-learning APIs.

There is a broad selection of AI tools you can use, including the following:

- Recommendations: Personalize experiences for your customers with the same recommendation technology used at Amazon.com
- Forecasting: Build accurate forecasting models based on the same machine learning forecasting technology used by Amazon.com
- Image and Video Analysis: Add image and video analysis to your applications to catalog assets, automate media workflows, and extract meaning
- Advanced Text Analytics: Use natural language processing to extract insights and relationships from unstructured text
- Document Analysis: Automatically extract text and data from millions of documents in just hours, reducing manual efforts
- Voice: Turn a book into lifelike speech to give voice to your applications
- Conversational Agents: Easily build conversational agents to improve customer service and increase contact center efficiency
- Translation: Expand your reach through efficient and cost-effective translation to reach audiences in multiple languages
- Transcription: Easily add high-quality speech-to-text capabilities to your applications and workflows
- Enterprise Search: Add natural language search capabilities to your apps so your end users can more easily find the information they need
- Fraud Detection: Identify potentially fraudulent online activities based on the same technology used at Amazon.com
- Code: Automate code reviews and identify your most expensive lines of code.

AWS wants to make it easy for you to get started with their AI services. For this reason, their AI tools do not require programming experience.

Frameworks running on AWS

The most popular framework running on AWS for AI is TensorFlow.

AWS also supports the following frameworks:

- PyTorch
- Apache MXNet
- Chainer
- Theano
- Gluon
- The Microsoft Cognitive Toolkit
- Horovod
- Keras

Even the best AI developers are challenged when it comes to building solutions on AWS. For this reason, AWS has developed Amazon Machine Image (AMI) to accelerate implementation. Essentially, an AMI is a container configured for your AI needs. There are two AI AMIs you can choose from:

- CONDA AMI: The Conda-based AMI is available in Ubuntu, Amazon Linux, and Windows 2016 versions for developers who want pre-installed pip packages of deep learning frameworks in separate virtual environments

- BASE AMI: The Base AMI is available in Ubuntu, and Amazon Linux versions for developers who want a clean slate to set up private deep learning engine repositories or custom builds of deep learning engines

AWS provides step by step instructions for installing AMIs here

AWS AI and ML Learning Tools

The best way to learn is through gaming. To this end, AWS has two tools you can use that let you learn and play with AI at the same time. They include:

- AWS DeepComposer: AWS DeepComposer MIDI-compatible keyboard to compose melodies as input for your ML generated compositions
- AWS DeepRacer: AWS DeepRacer is a fully autonomous 1/18th-scale race car designed to help you learn about reinforcement learning through autonomous driving
- AWS DeepLens: AWS DeepLens is a deep learning-enabled video camera for developers. Integrated with Amazon SageMaker and many other AWS services, it enables you to get started with deep learning in less than 10 minutes through sample projects and practical, hands-on examples

You can sign up to signup for DeepComposer here, buy DeepRacer here and buy DeepLense here

All three come with great “how-to” guides, setup videos, sample code and connection with additional AI enthusiasts.

AI in Azure

The ultimate goal of AI is to help replicate human-driven activities. It may sound scary—like the movie Terminator (and Elon Musk will have you think that AI will take over the world)—but, there is an optimistic side to AI. Today, AI is being used to filter junk email, correct your grammar in Word, collect together your favorite images, and to automate tedious tasks. What AI is doing is freeing up time for you to work on other, potentially more exciting topics.
In this article, you will learn about the tools and services Microsoft Azure offers to help accelerate AI adoption.

Microsoft Azure AI Services

AI is not new to Microsoft. If you use Office 365, then you have seen AI appearing in tools such as Outlook (the "Focus" tab for email), Word (grammar check-in now powered by AI), and PowerPoint (AI fuels the new design recommendation action). Indeed, Microsoft was the first company to reach human parity for image recognition, voice-to-text recognition, and translation.

The challenge for many developers is getting easy access to AI tools and adding AI functionality into their apps. Microsoft's Azure AI services help to reduce these barriers. Azure Services focus on three key areas:

- Cognitive Services: Core tools that offer human-like activities such as image recognition, speech-to-text services, voice services, and search
- Frameworks: Support for the most popular AI frameworks including Pytorch, Tensorflow, Keras, scikit-learn, and Onnx to train data models
- Azure Services: Building block services that accelerate support for AI solutions including Azure Data Bricks, Azure Machine Learning, and Machine Learning VMs

An overview of the services for Azure can be found here.

Where to use Azure AI Services

The power of AI comes through training models to identify patterns. In many ways, AI is really only about solving complex pattern recognition. The data used to train AI often consists of documents, images, video, audio, and handwritten notes. Many companies that are more than ten years old will likely have vast archives of paper content. Sorting through the material to find patterns is of extreme value.

An example scenario that Microsoft has developed is an AI tool that can help sort through the paper documentation of the recently released 34,000 pages from the investigation of the assassination of US President John F. Kennedy (JFK). The website

where you can search through the content can be found here.

The JFK example provides a demonstration in which AI can be used to search typed letters and facial recognition for images, and convert handwritten notes into searchable terms. Also, the demo includes a graph to visualize how related terms are connected.

It is evident when looking at the JFK AI Demo site that the same tools used on the website can provide a benefit to many businesses. For instance, an insurance company that often has millions of scanned policies can now quickly detect if fraud is occuring if relationships between documents can be rapidly identified. To kick start your work, Microsoft has made the code available for the JFK site on GitHub

To understand how to use the GitHub files, check out the 1-hour class that explores how to implement the JFK demo.

Training your AI

To achieve success with AI, you need to educate the tool to identify patterns. Training AI can be a daunting task if you are new to the technology. To help guide you, the Azure team introduced another tool that you can use to train your AI correctly. The tool is available at www.customvision.ai

The following example will train your AI to identify the difference between a cat and dog. To do this, follow these steps:

1. Go to www.customvision.ai and create an account.
2. After creating your account, you will be taken to a page that lists all of your projects. If the account is new, then there will be no projects. Let's go ahead and create the first project.
3. Select the "New Project" button. Give your project a name (CatDog) and a description (identifying the difference between Cats and Dogs).
4. At this time, you do not have a Resource. Resources are used in Azure to monitor and manage the service you are creating. Select "Create New" and fill out the fields as follows:
    a. Name: CatDog

b. Subscription: Free

c. ResourceGroup: SimplilearnResource

d. Kind: CustomerVision.Training

e. Location: South Central US

f. Price Tier: $0

5. All of the data you enter will be used to manage the service in Azure Cloud.

6. The next screen will ask what tags you want to create to train the AI. Create labels for Cat and Dog.

7. Now, you will begin to train the AI. You will need ten images of cats and ten pictures of dogs to do so. Upload each image and, as you upload the image, select whether tag to determine if the image is a cat or a dog.

8 After you have trained the AI, you can now start to upload images and have the AI tell you if it believes the image is a cat or a dog.

Behind the scenes, all of the work you are doing with the customvision.ai tool is integrated with Microsoft Azure. You can view the Azure Portal and see the new services you have created.

Wrapping Up

The tools listed above are here to kick start your ability to be successful with AI. The next step is to start building solutions that are more complicated and have practical value to you. This may be for your business, community work, or simply a hobby. The bottom line is that AI is now accessible to many more people due to cloud tools and services.to support them.

A common misconception is that more web workers will require more resources. However, this isn't the case at all. With several

websites being hosted on Azure, there are very few resources being used to run them all. Rather, you are using only the resources necessary to run the backend, creating a highly available and reliable architecture. This provides more resources to the front-end developers in terms of modules and components, which makes framework deployment efforts much easier.

In short, what you can expect is that Azure Functions will continue to expand in scope and capability as developers explore the full potential of serverless applications.

Getting Started

If this eBook has piqued your interest in developing more advanced skills—and really get your career going—Simplilearn's comprehensive Artificial Intelligence Engineer Master's Program will provide you with everything you need to know to become an expert in this exciting and rapidly growing field. Co-developed with IBM, this program is a blend of Artificial Intelligence, Data Science, Machine Learning, and Deep Learning. It enables the real-world implementation of advanced tools and models, while providing in-depth knowledge of AI concepts, including Data Science, Python Programming, and Deep Learning with tools like Keras and TensorFlow. The seven-course Blended Learning program wraps up with an AI Capstone Project, giving you the opportunity to apply the skills and knowledge you have gained to solve an industry-aligned problem with dedicated mentoring sessions from experts. Upon completion, learners will receive a Master's Certificate which will help you stand out to existing or potential employers in the exciting field of Artificial Intelligence.

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