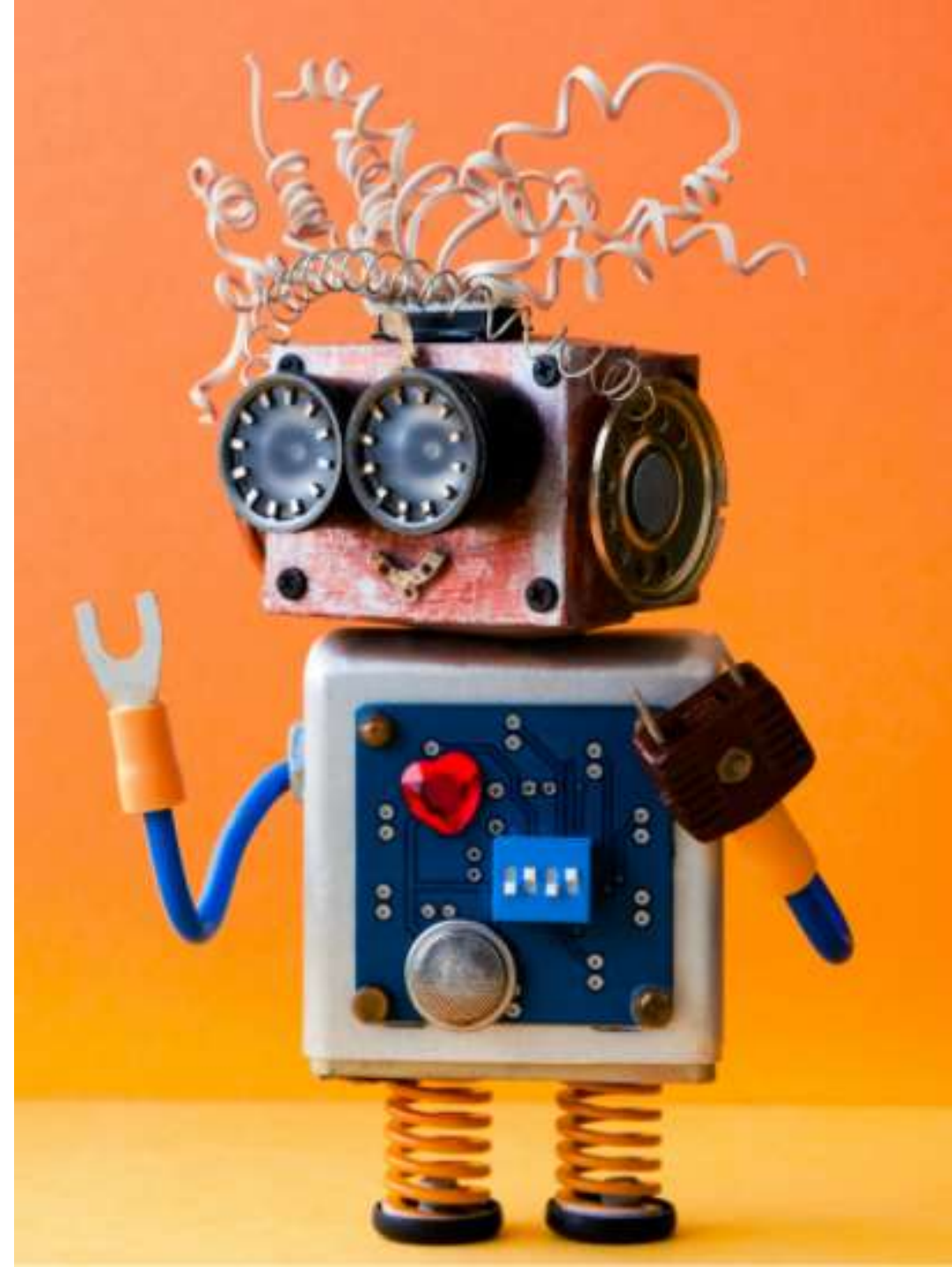
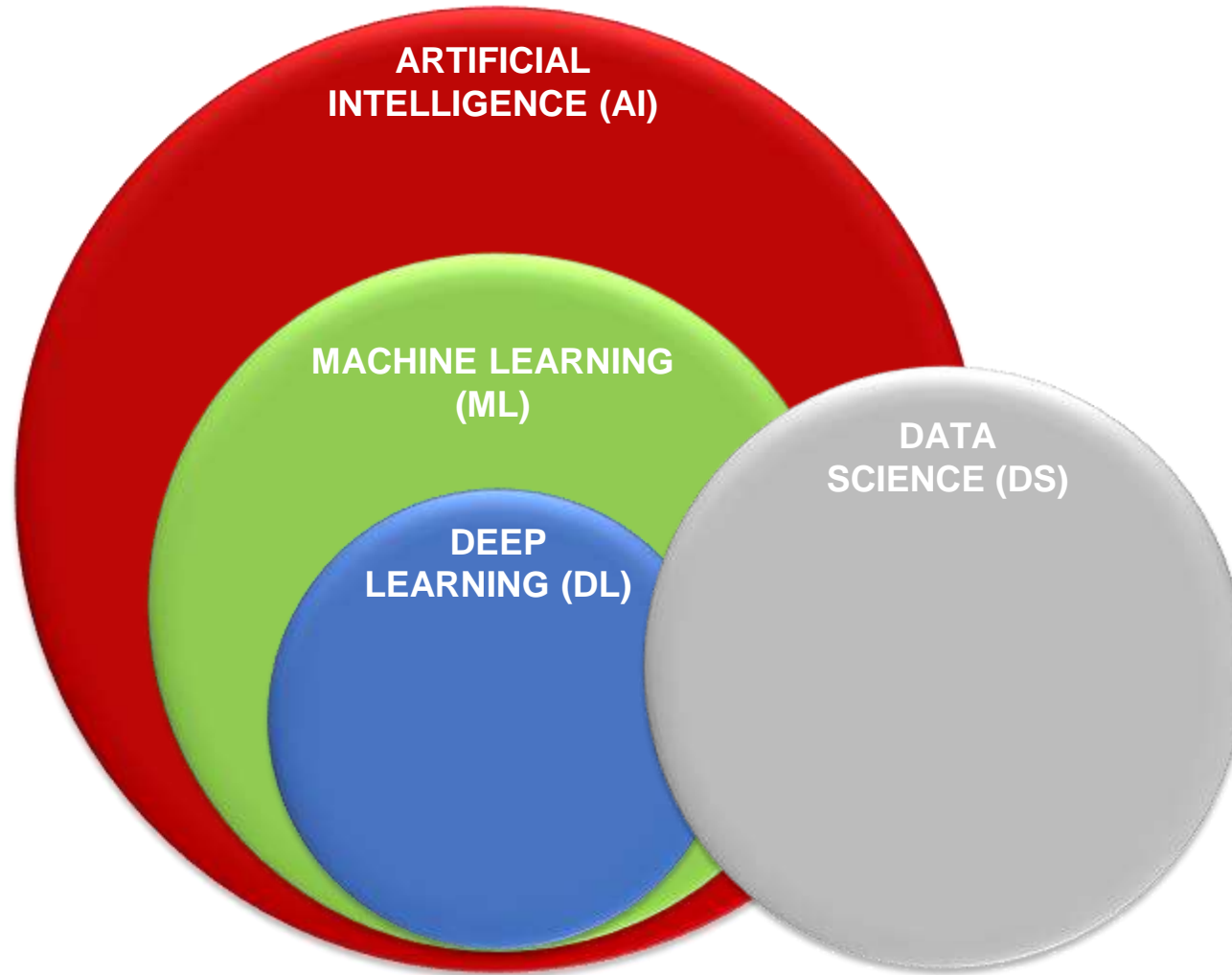


ARTIFICIAL INTELLIGENCE Vs. MACHINE LEARNING Vs. DEEP LEARNING

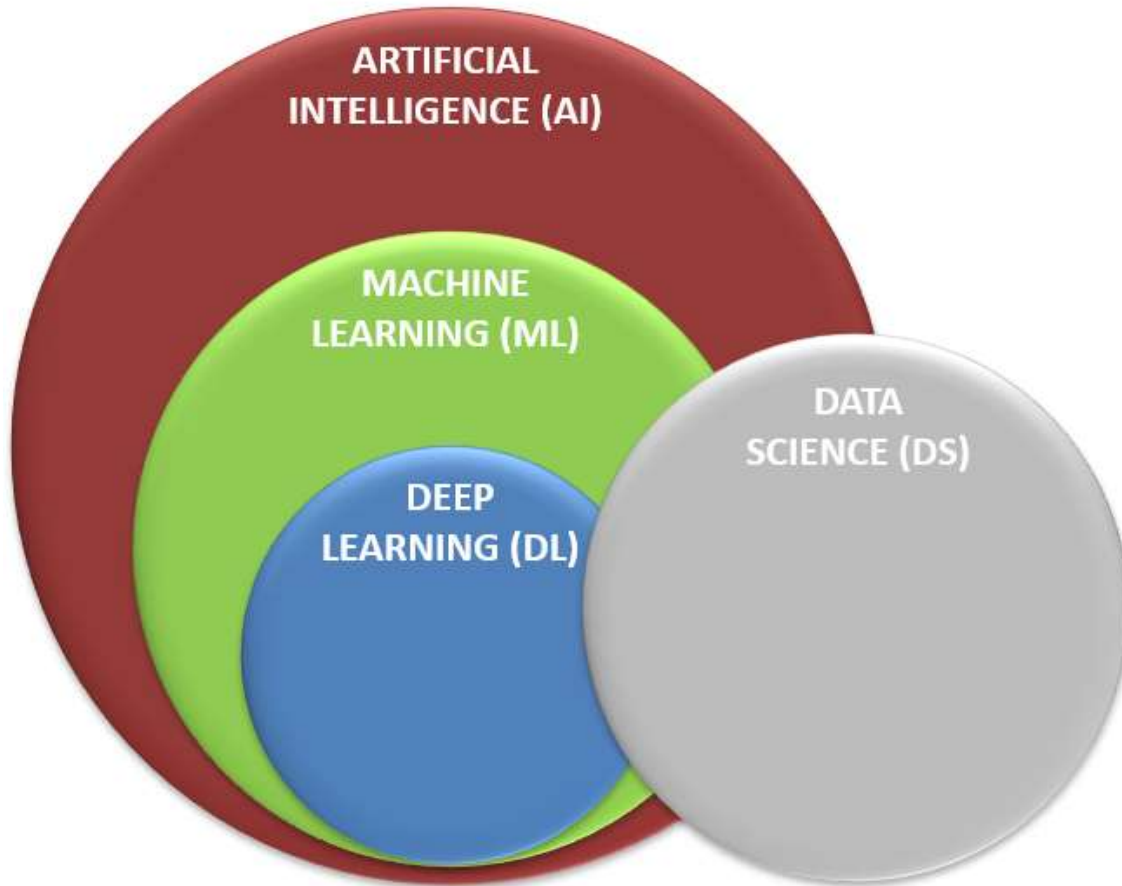


ARTIFICIAL INTELLIGENCE Vs. MACHINE LEARNING Vs. DEEP LEARNING Vs. DATA SCIENCE



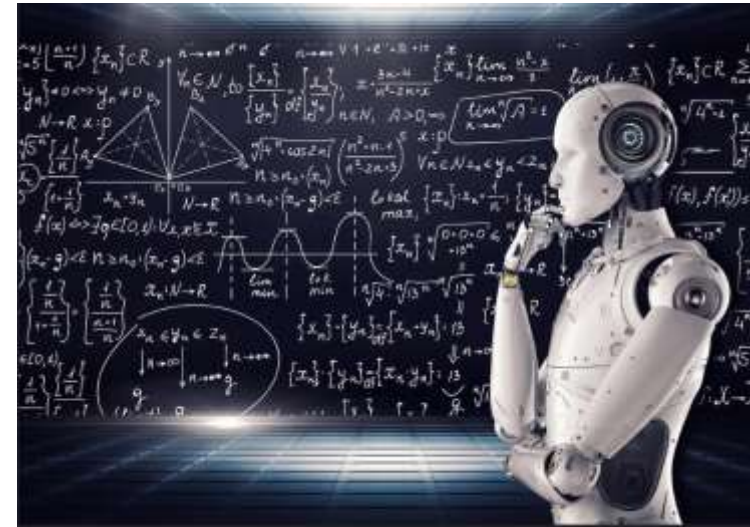
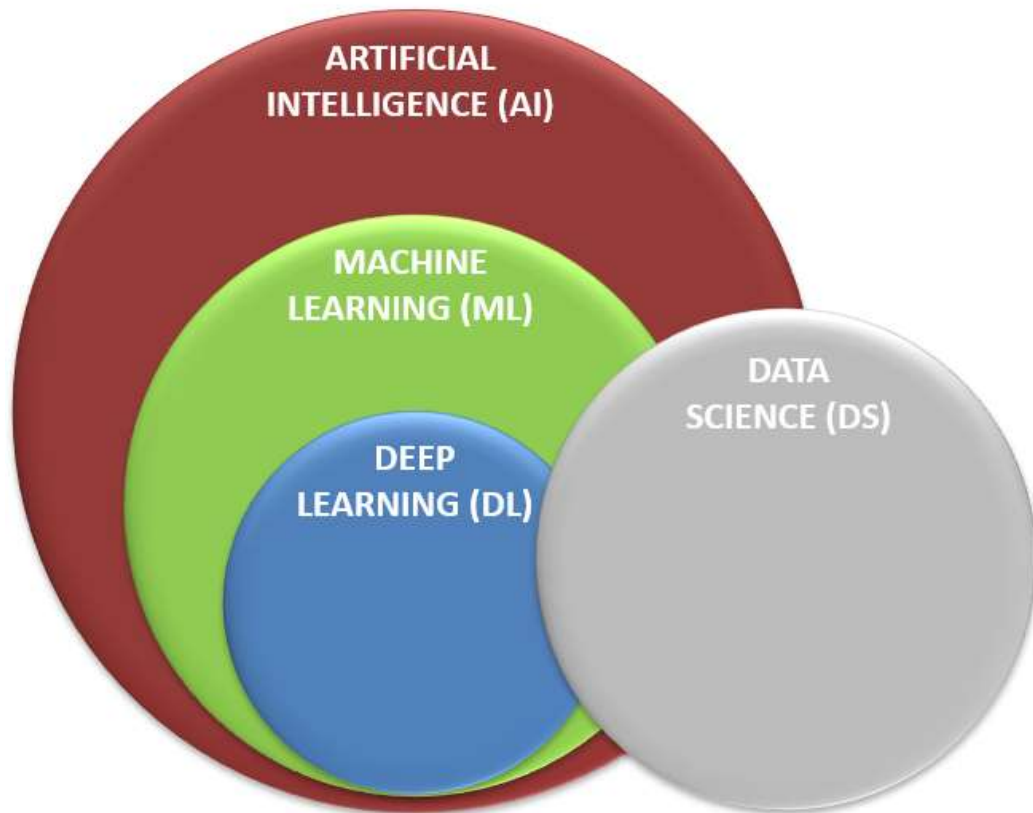
ARTIFICIAL INTELLIGENCE (AI)

- AI is the science that enable computers to think like humans.
- AI allows computers to imitate human intelligence and do things that humans do!
- AI can make decision (Example: buy/sell stocks), understand text (Example: read articles), and detect faces.



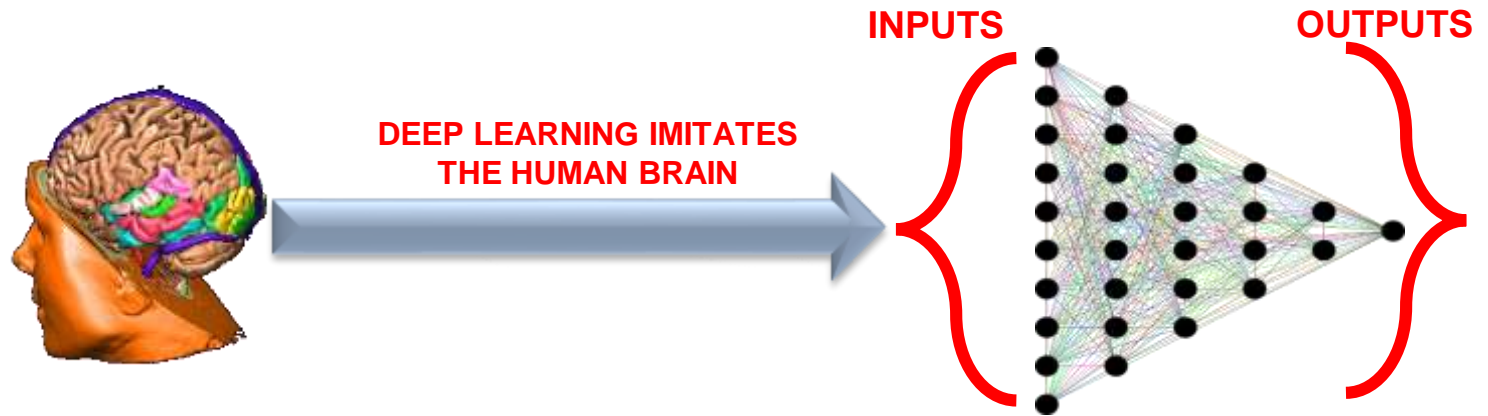
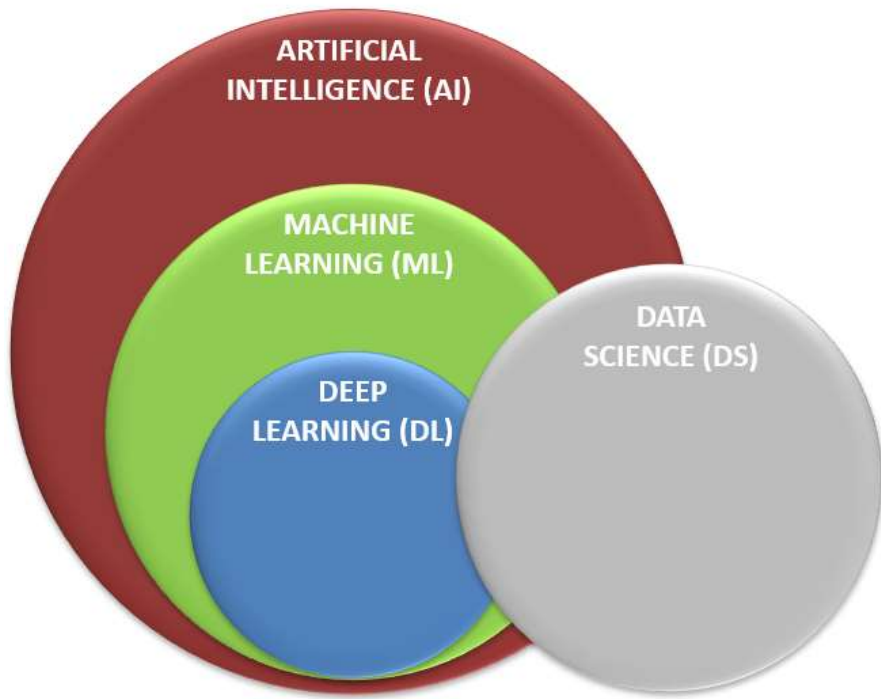
MACHINE LEARNING (ML)

- Machine Learning is a subfield of Artificial Intelligence that enables machines to improve at a given task with experience without being explicitly programmed.
- Note that all machine learning techniques are classified as Artificial Intelligence. However, not all Artificial Intelligence could count as Machine Learning since some basic Rule-based algorithms could be classified as AI but they do not learn from experience therefore they do not belong to the machine learning category.



DEEP LEARNING (DL)

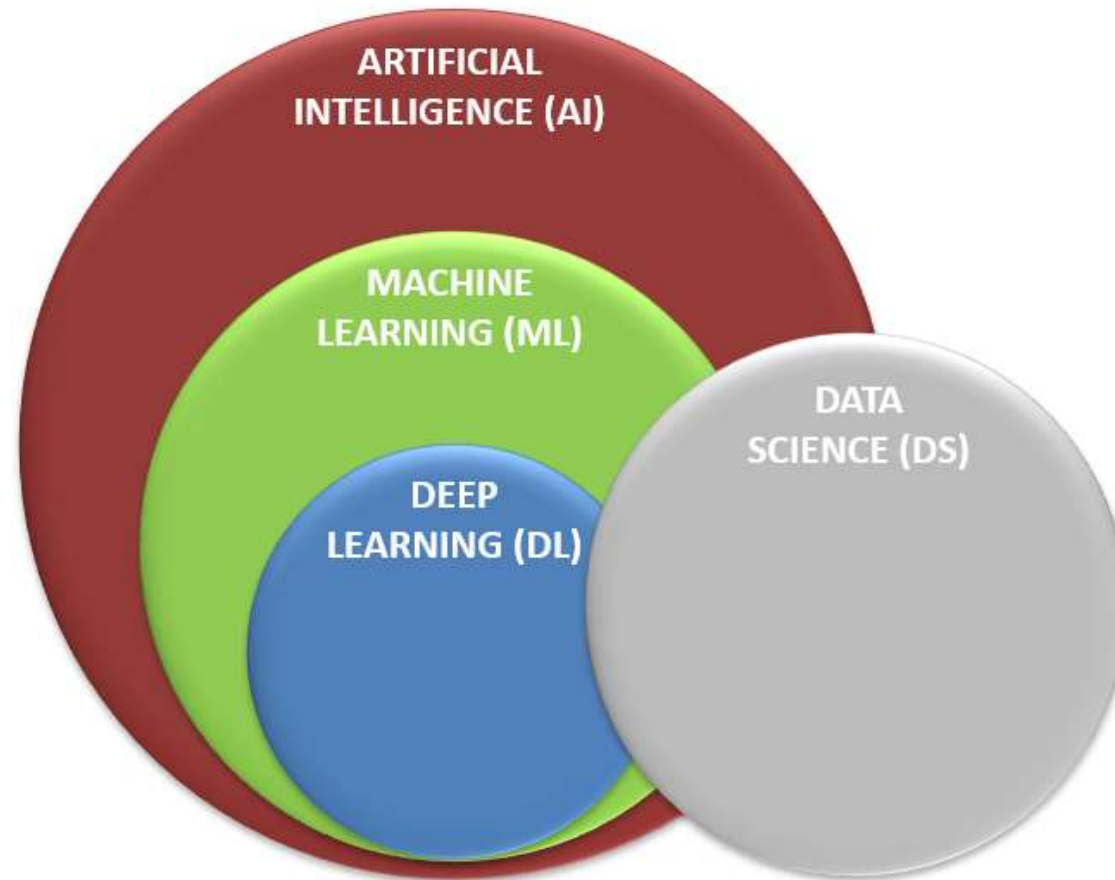
- Deep Learning is a subset of machine learning that aims at imitating the human brain using mathematical equations.
- The human brain consists of billions of neurons that communicate to each other and enable humans to see, think and make decision.
- Features from input data are automatically extracted.



- Photo Credit: <https://pixabay.com/en/neural-network-thought-mind-mental-3816319/>
- Photo Credit: <https://commons.wikimedia.org/wiki/File:Voxel-man-brain.jpg>

DATA SCIENCE (DS)

- Data science is a science that aims at gaining useful information from the data.
- Data science can help companies make better decisions.
- For example, a bank can analyze customer data and identify which customers have high credit score and tailor products/services to meet their needs.

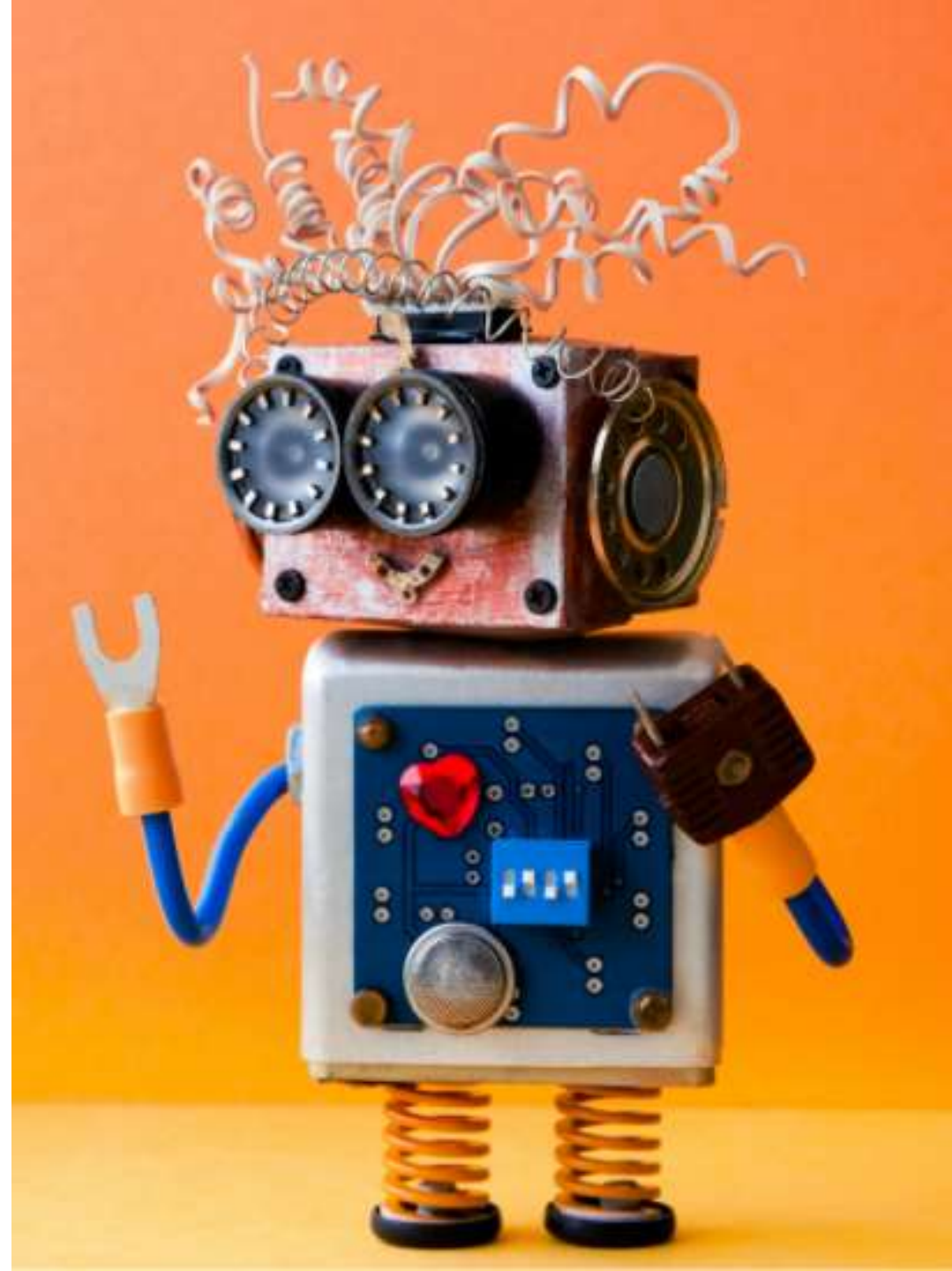


EXAMPLE

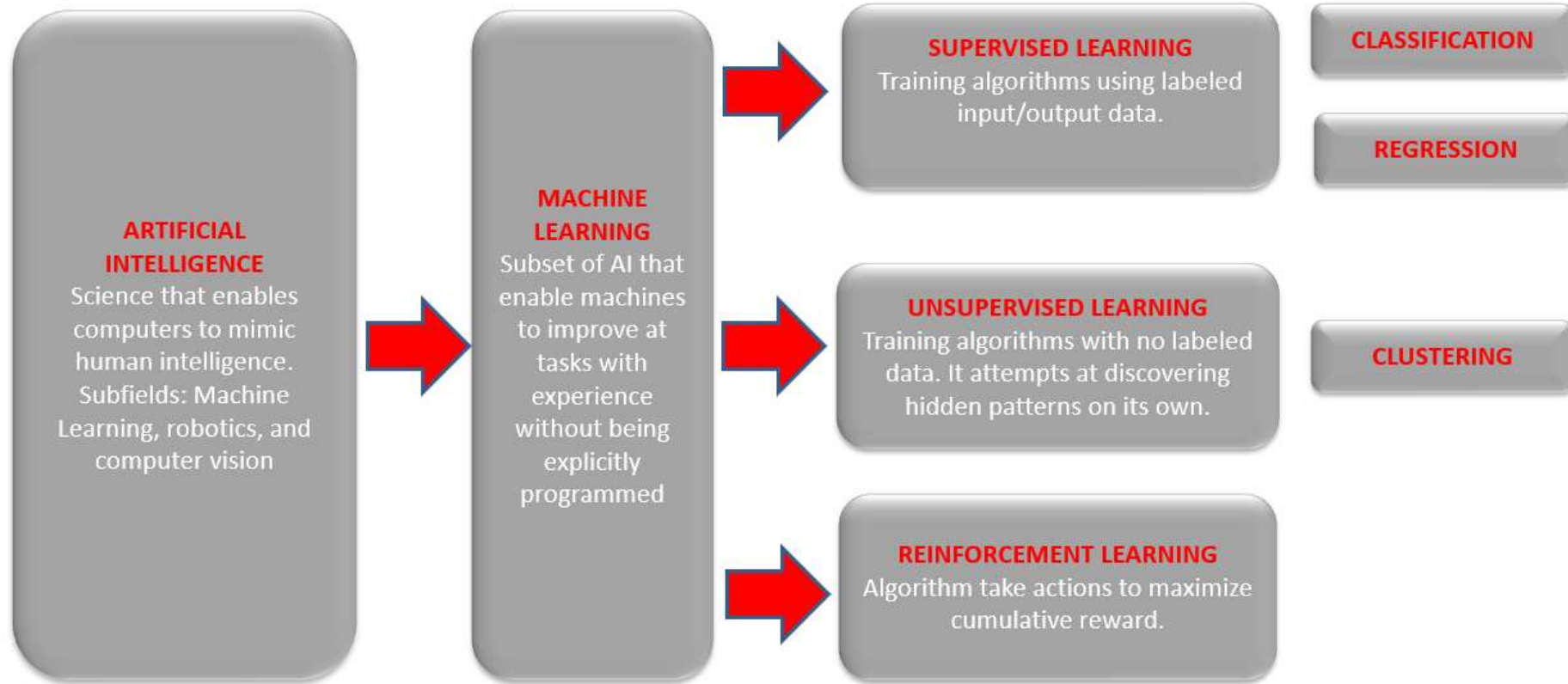
- “Understanding The Difference Between AI, ML, And DL: Using An Incredibly Simple Example” by Gavita Regunath
- Link to blog: <https://www.advancinganalytics.co.uk/blog/2021/12/15/understanding-the-difference-between-ai-ml-and-dl-using-an-incredibly-simple-example>



MACHINE LEARNING: THE BIG PICTURE

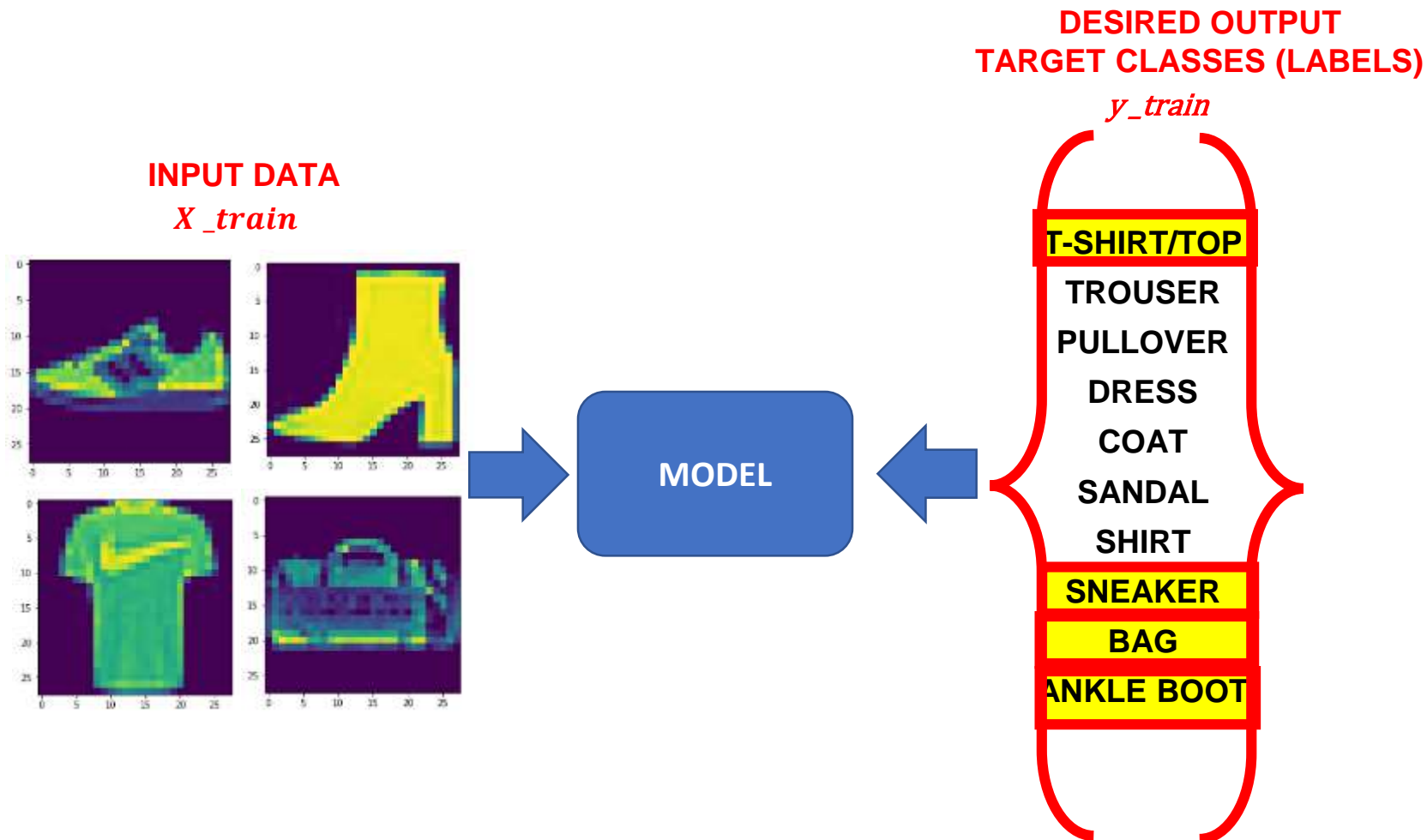


MACHINE LEARNING: BIG PICTURE



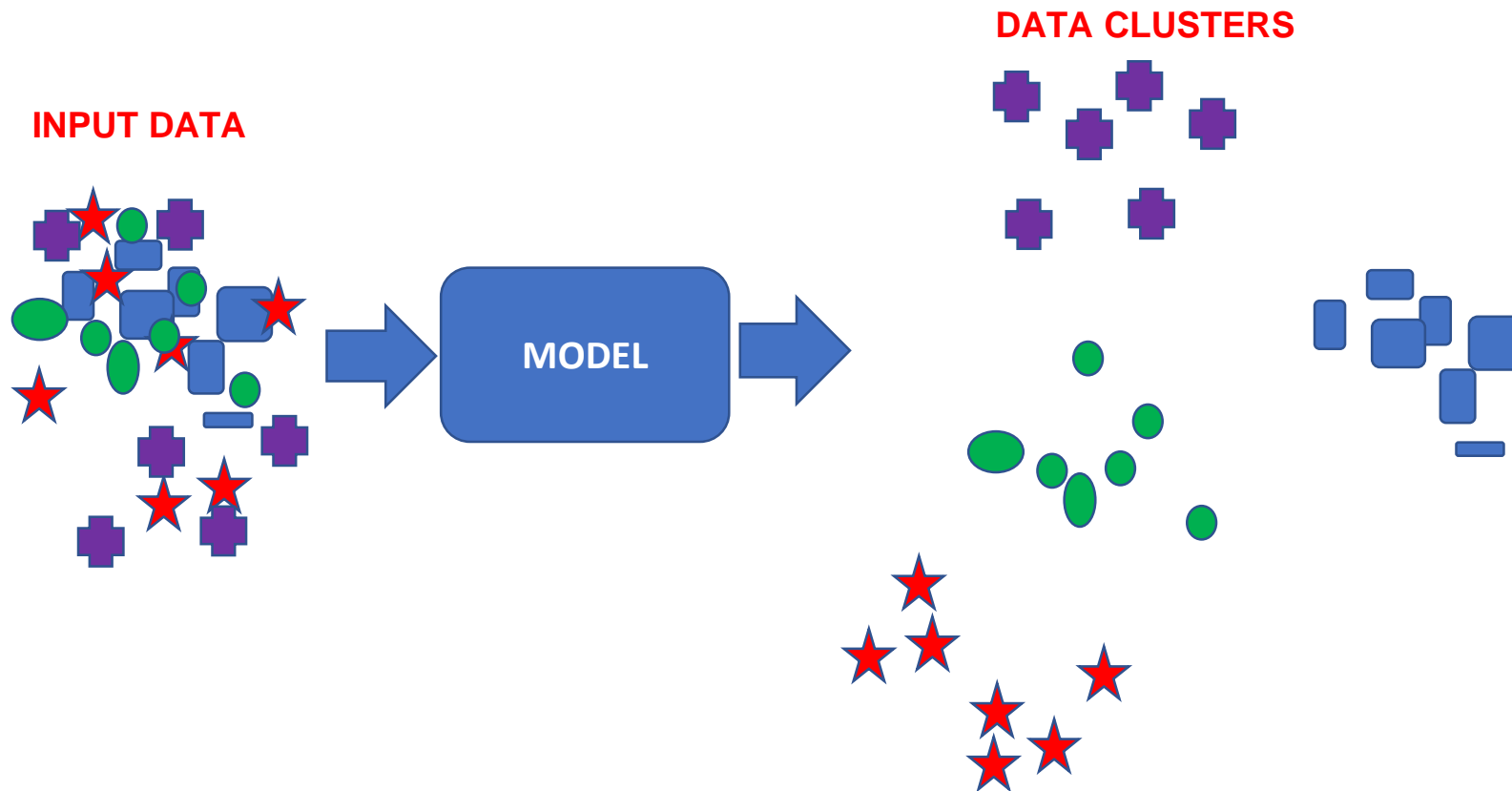
MACHINE LEARNING: SUPERVISED LEARNING

- Supervised: used to train algorithms using labeled input and output data.
- Performance is assessed by comparing trained model prediction vs. real output.



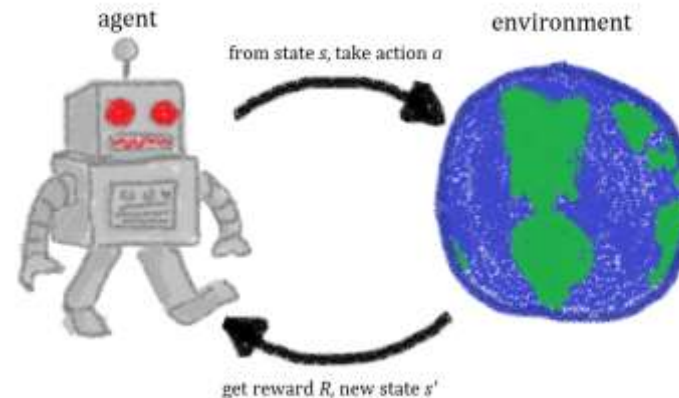
MACHINE LEARNING: UNSUPERVISED LEARNING

- Unsupervised learning: provides the algorithm with no labeled data.
- The algorithm attempts at discovering hidden patterns within the training data.
- Unsupervised learning methods can analyze complex data that humans might find difficult to interpret.
- No feedback!

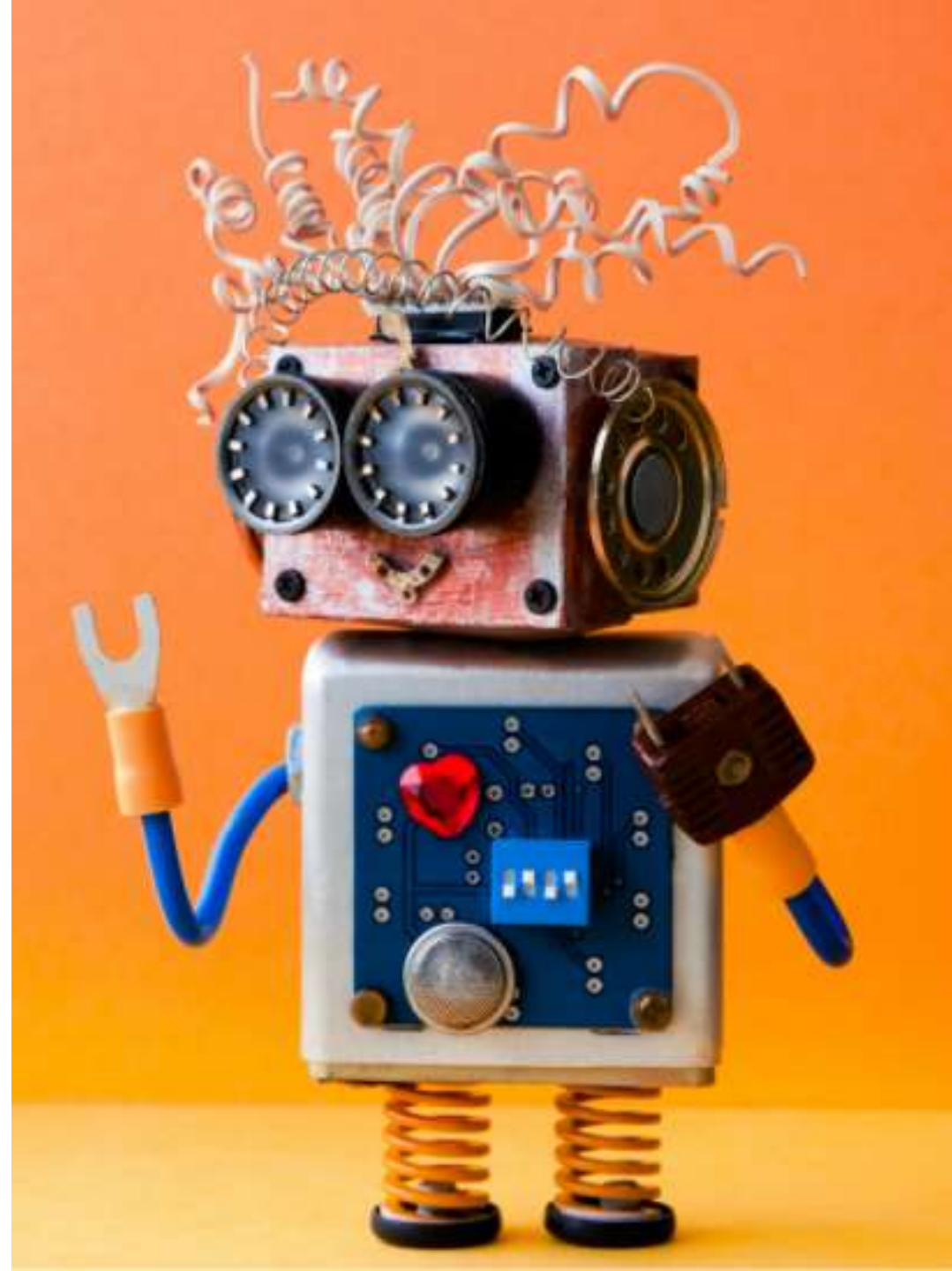


MACHINE LEARNING: REINFORCEMENT LEARNING

- Reinforcement learning allows machines take actions to maximize cumulative reward.
- Reinforcement algorithms learn by trial and error through reward and penalty.
- Two elements: environment and learning agent.
- The environment rewards the agent for correct actions.
- Based on the reward or penalty, agent improves its environment knowledge to make better decision.



WHAT ARE THE KEY INGREDIENTS TO BUILD AI/ML MODELS?



AI/ML KEY INGREDIENTS



1. DATA

- Data can come from so many sources such as images, audio, video, and text.
- Collecting, structuring and analysing this data is critical for companies to gain customers insights and set their marketing and product strategies.

IMAGE/VIDEO



TEXT (CORPUS)



AUDIO/SOUND



TIMESERIES/SIGNALS



Photo Credit: <https://pxhere.com/en/photo/1454351>

Photo Credit: <https://www.flickr.com/photos/29881930@N00/2086641598>

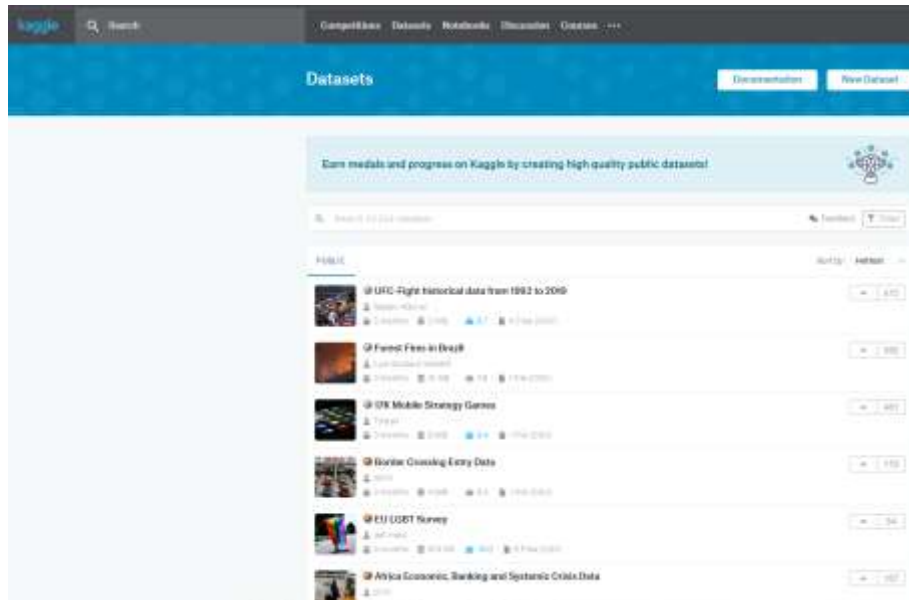
Photo Credit: https://commons.wikimedia.org/wiki/File:Mobile_phone_text_messages.jpg


Photo Credit: https://en.wikipedia.org/wiki/File:Messages_Yosemite.svg

Photo Credit: <https://www.pexels.com/photo/blue-and-yellow-graph-on-stock-market-monitor-159888/>

1. DATA: WHERE DOES THIS DATA COME FROM?

- Data could also come from multiple sources such as Kaggle and University of California, Irvine (UCI).
- Example: ImageNet is an open source repository of images consisting of 21,841 subcategories (classes) and over 14 million images.





UCI Machine Learning Repository
Centre for Machine Learning and Intelligent Systems

Home About Us Contact Us

View All Data Sets

Browse Through: **483 Data Sets**

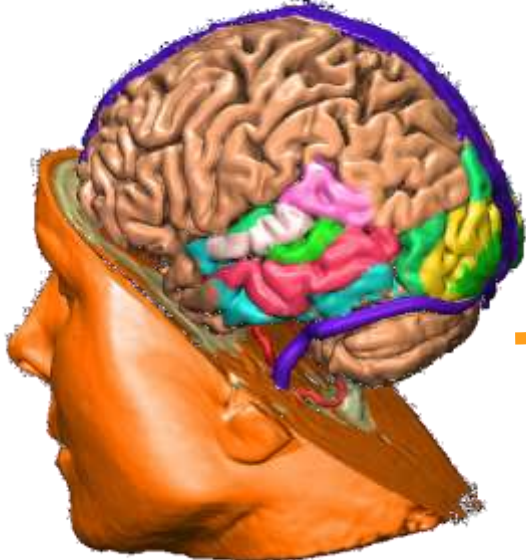
Dataset Task	Name	Data Types	Default Task	Attribute Types	# Instances	# Attributes	Year
Abalone Classification (200) Regression (15) Features (8) Other (5)	Abalone	Multi-class	Classification	Categorical, Integer, Real	1177	8	1989
Adult Classification (48) Regression (24) Other (13)	Adult	Multi-class	Classification	Categorical, Integer	48822	14	1989
Aircraft Classification (4) Regression (1) Other (1)	Aircraft	Multi-class	Classification	Categorical, Integer, Real	198	32	
Aircraft/Bluetooth Web Data Classification (10) Regression (1) Other (1)	Aircraft/Bluetooth Web Data		Recommendation Systems	Categorical	37111	264	1999
Aircraft Classification (10) Regression (1) Other (1)	Aircraft	Multi-class	Classification	Categorical, Integer, Real	423	170	1989
Aircraft Characteristics Classification (10) Regression (1) Other (1)	Aircraft Characteristics	Multi-class	Classification	Categorical, Integer, Real	3301	9	1989
Aircraft Characteristics Classification (10) Regression (1) Other (1)	Aircraft Characteristics	Multi-class	Classification	Categorical	139		1987
Aircraft Characteristics Classification (10) Regression (1) Other (1)	Aircraft Characteristics	Multi-class	Classification	Categorical	138	19	1989
Aircraft Classification (10) Regression (1) Other (1)	Aircraft	Multi-class	Regression	Categorical, Real	108	9	1989
Aircraft Classification (10) Regression (1) Other (1)	Aircraft	Multi-class	Regression	Categorical, Integer, Real	201	26	1987
Aircraft Classification (10) Regression (1) Other (1)	Aircraft	Univariate Text	Classification		284	9	1989

Check out website here: <https://archive.ics.uci.edu/ml/datasets.php>

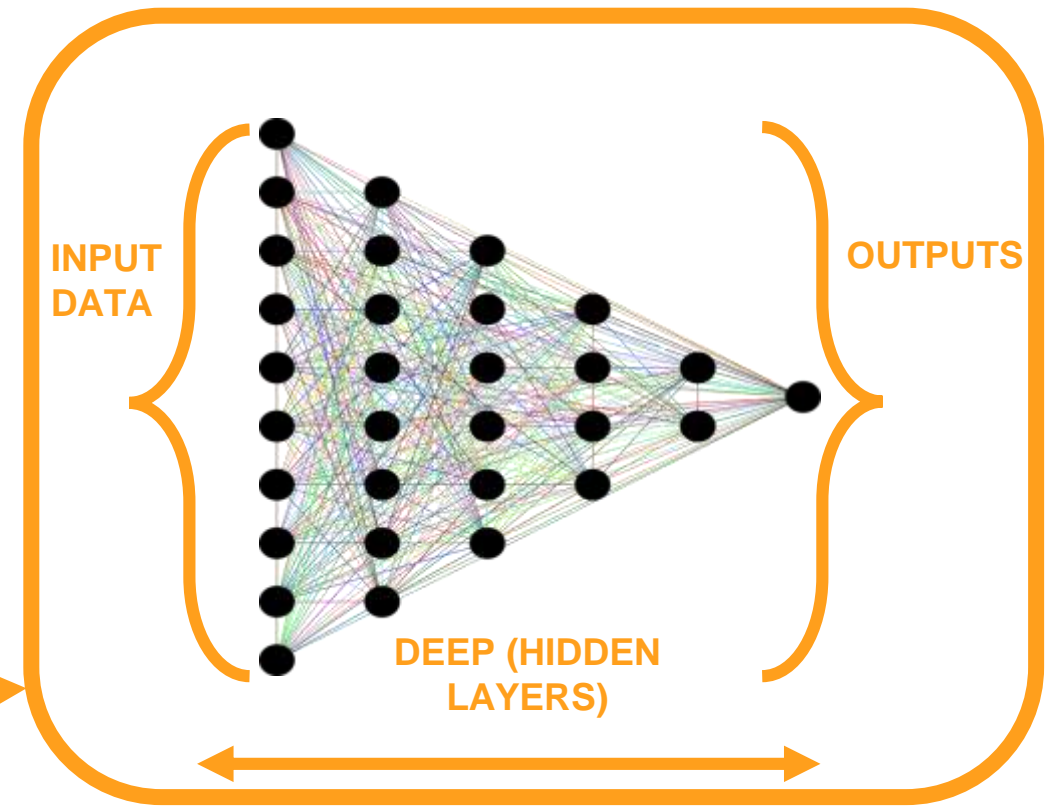
Check out website here: <https://www.kaggle.com/datasets>

2. MODEL

- The human brain consists of billions of neurons that communicate to each other using electrical/chemical signals and enable humans to see, feel, and make decision.
- Artificial neural networks (ANNs) are information processing models inspired by the human brain.
- Simply, ANNs are couple of equations that mimic the human brain!



MIMIC HUMAN BRAIN
USING MATHEMATICAL
EQUATIONS



3. COMPUTE

- ANN requires computation power to be able to learn from the data.
- AI-based specific chips are being developed and optimized for AI training.
- The amount of compute has been increasing exponentially with ~3 months doubling time!!
- Great article by OpenAI:
<https://openai.com/blog/ai-and-compute/>



- **Photo Credit:** <https://www.flickr.com/photos/3336/27830149309>

3. COMPUTE: AI IMMORTAL DICTATOR

TECH

Elon Musk warns A.I. could create an ‘immortal dictator from which we can never escape’

PUBLISHED FRI, APR 6 2018•9:40 AM EDT | UPDATED FRI, APR 6 2018•1:11 PM EDT



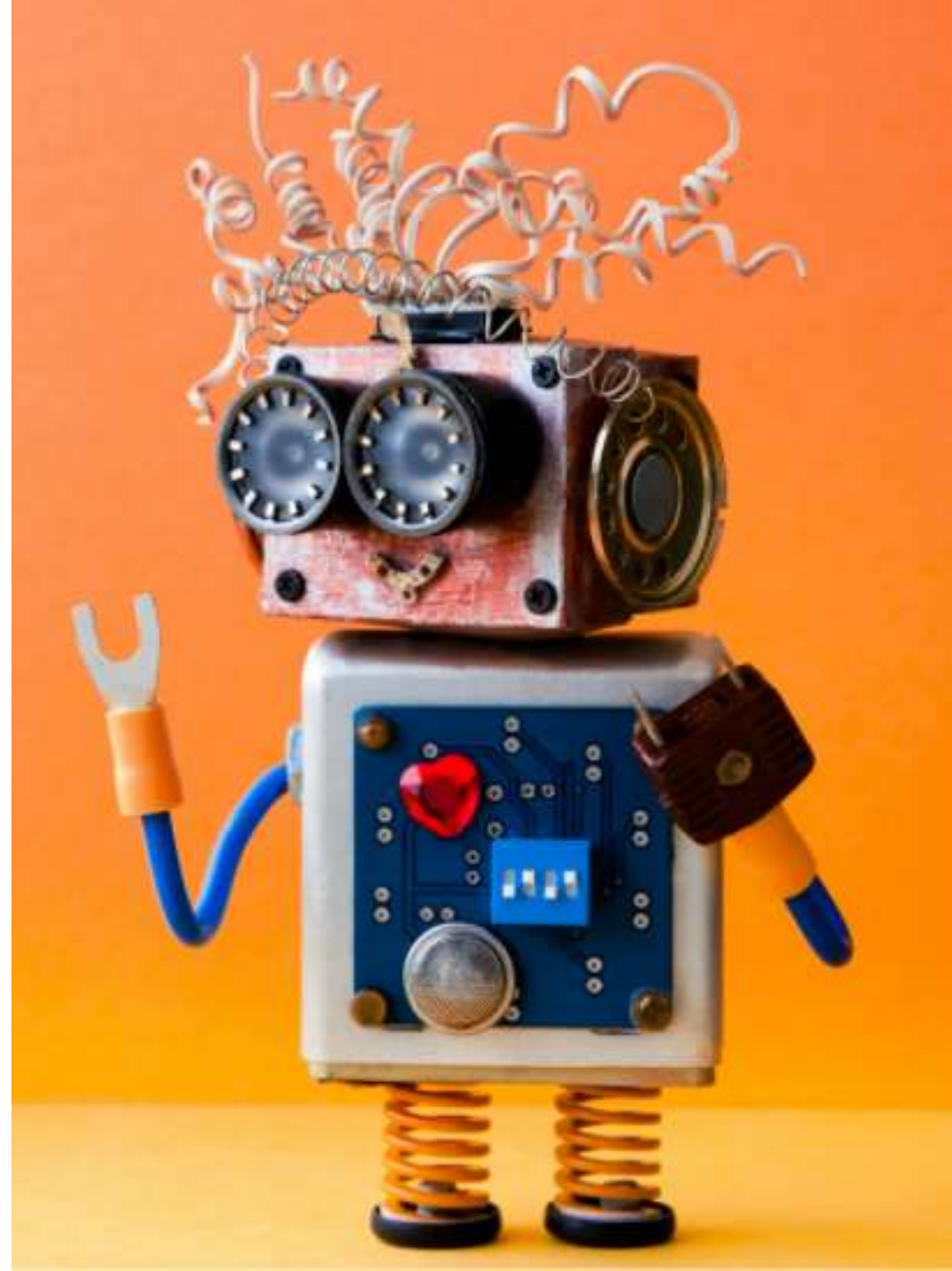
Ryan Browne
@RYAN_BROWNE_

SHARE    

*“The least scary future I can think of is one where we have at least democratized AI because if one company or small group of people manages to develop godlike digital superintelligence, they could take over the world,”
Elon Musk.*

Link to article: <https://www.cnbc.com/2018/04/06/elon-musk-warns-ai-could-create-immortal-dictator-in-documentary.html>

MACHINE LEARNING COMPONENTS IN AWS



MACHINE LEARNING COMPONENTS IN AWS: 1. DATA

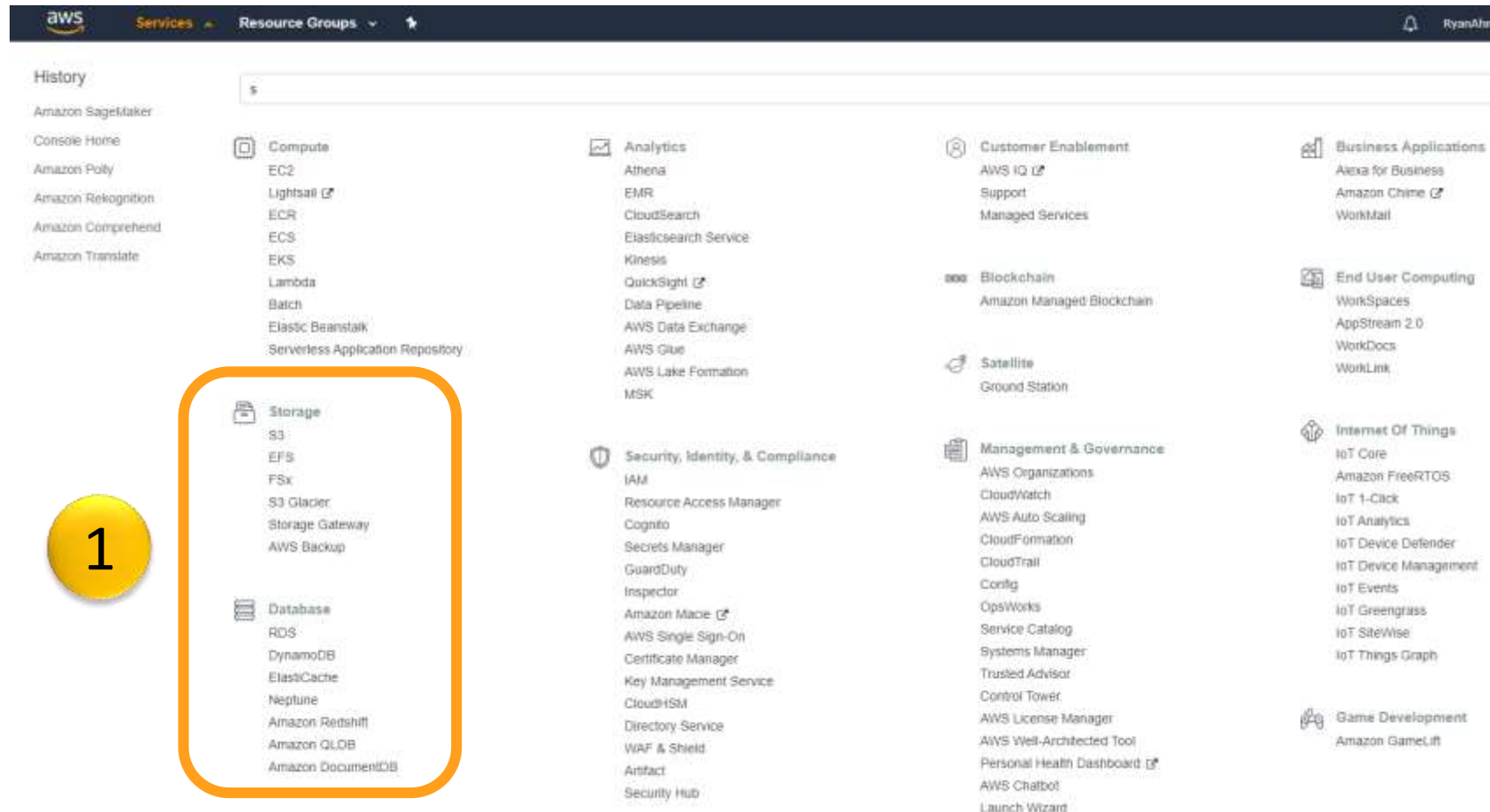
1. DATA



2. MODEL



3. COMPUTE



MACHINE LEARNING COMPONENTS IN AWS: 2. MODEL

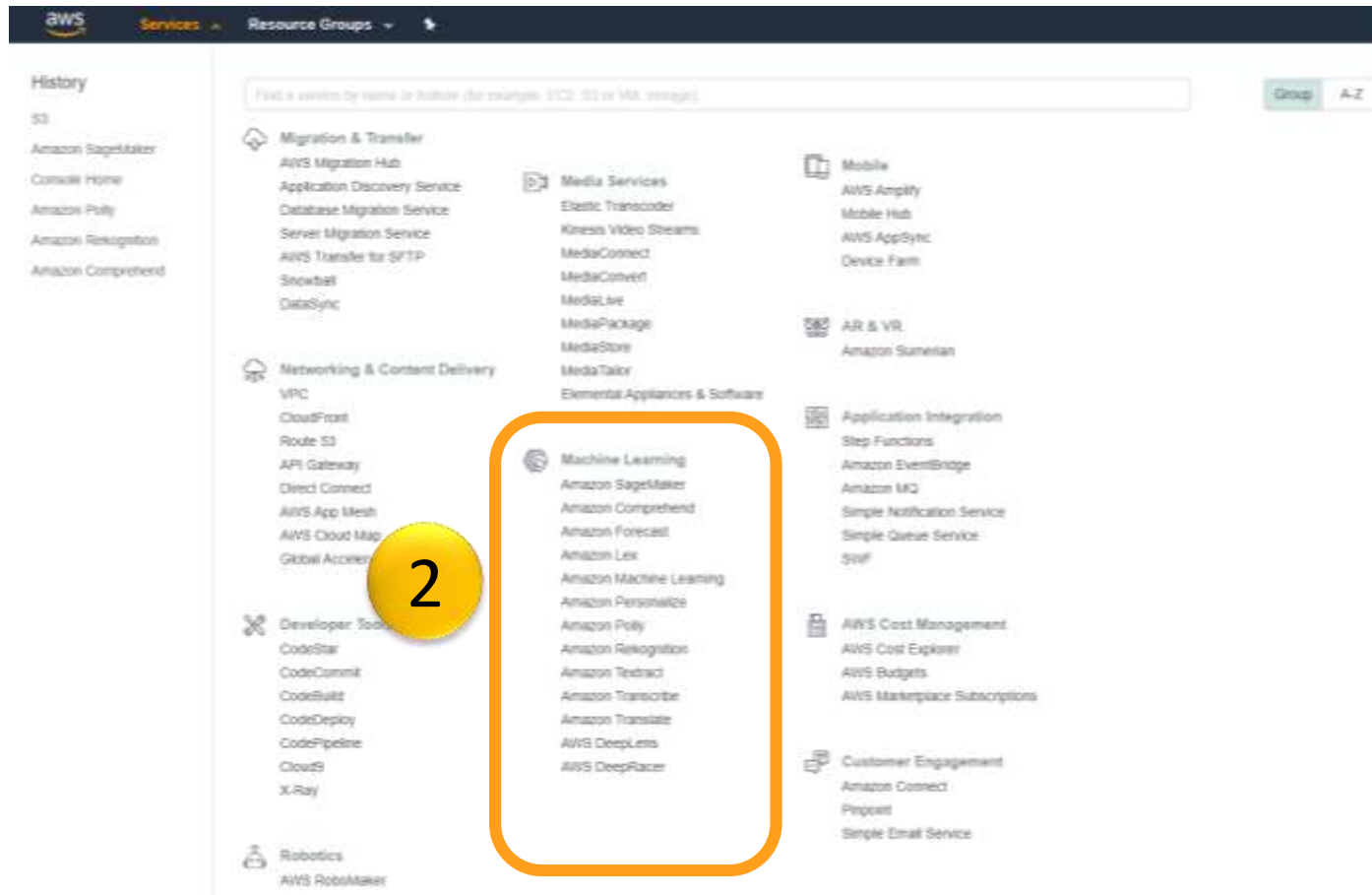
1. DATA



2. MODEL



3. COMPUTE



MACHINE LEARNING COMPONENTS IN AWS: 3. COMPUTE

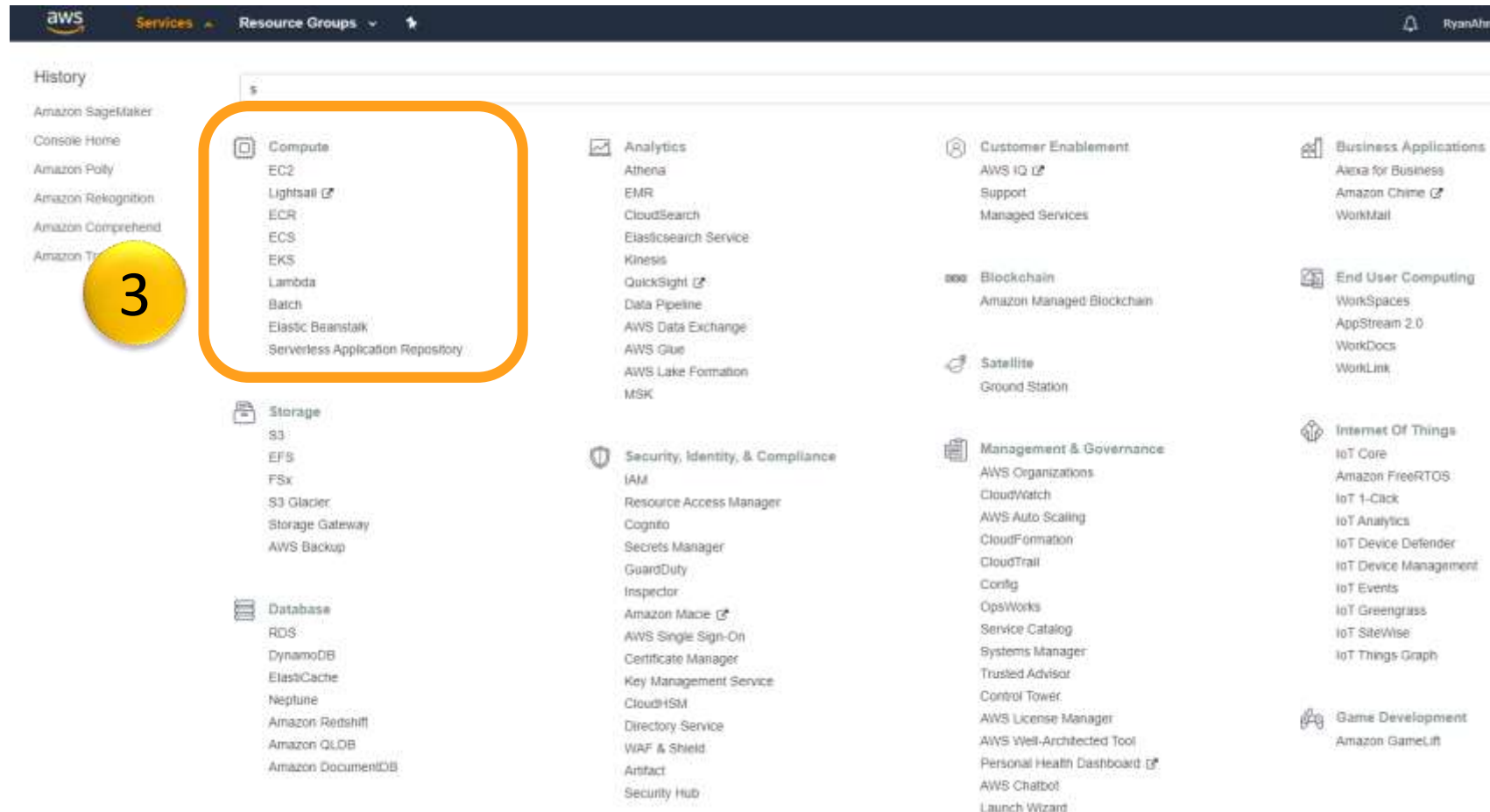
1. DATA



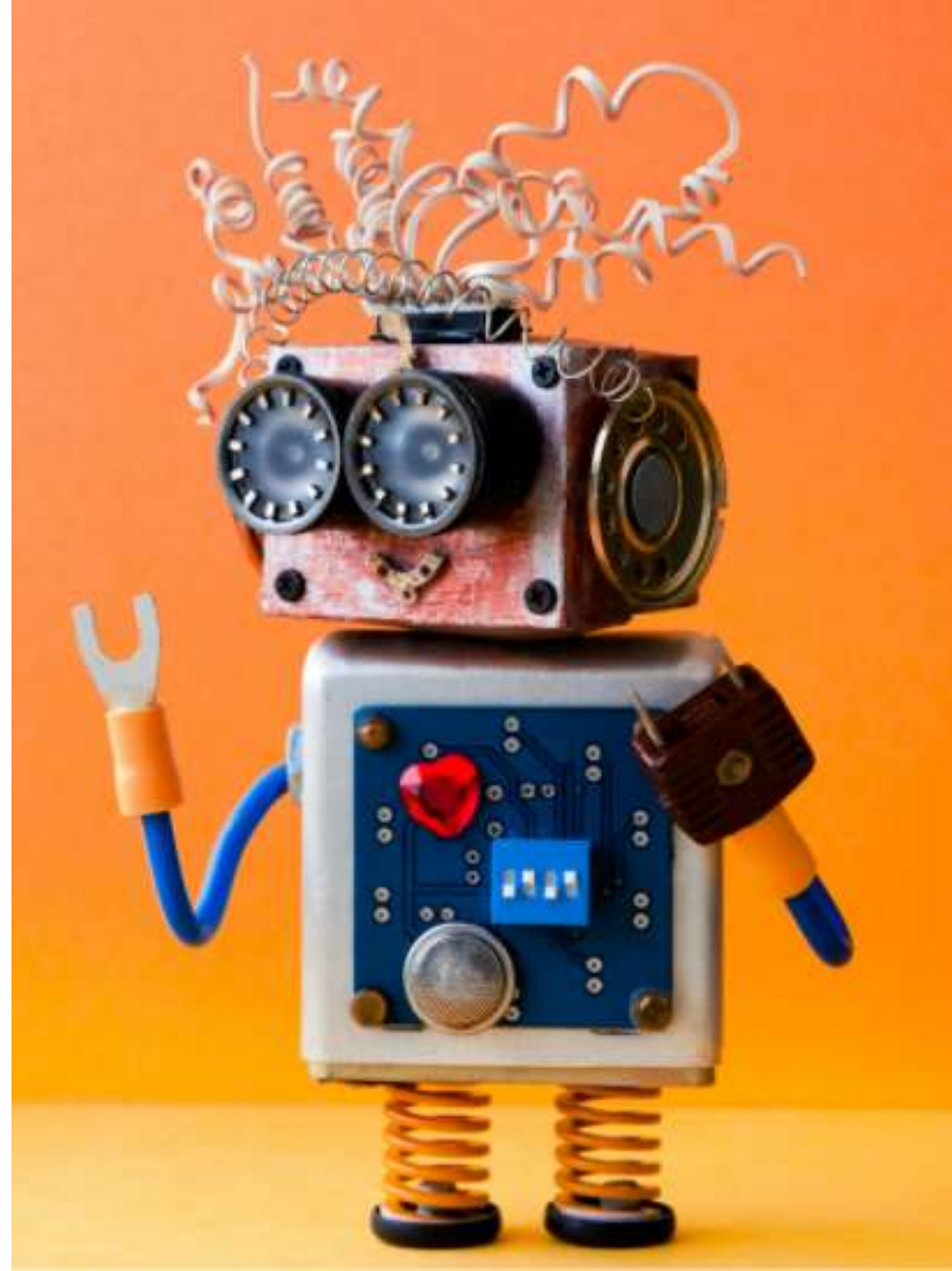
2. MODEL



3. COMPUTE



AMAZON SIMPLE STORAGE SERVICE (S3)



WHAT IS AMAZON S3?

- Amazon Simple Storage Service (Amazon S3) is a storage service that allows enterprises/individuals to store and protect any amount of data.
- Amazon S3 is extremely easy to use and allows enterprises to organize their data and configure finely-tuned access controls.
- Amazon S3 extremely durable to 99.999999999% (11 9's).
- Amazon S3 is 99.9% available.
- Amazon S3 offers numerous enhanced features such as:
 - (1) Scalability
 - (2) Data availability
 - (3) Security
 - (4) Performance



Photo Credit: https://commons.wikimedia.org/wiki/File:AWS_Simple_Icons_AWS_Cloud.svg

Photo Credit: https://commons.wikimedia.org/wiki/File:AWS_Simple_Icons_Storage_Amazon_S3.svg

WHAT IS AMAZON S3? CONTINUED

- Amazon Simple Storage Service (Amazon S3) is built to be extremely simple and robust.
- Amazon S3 allows customers to store data in buckets or directories (much like folders).
- A bucket is a container for objects stored in Amazon S3. Objects are contained in buckets.
- Each of the buckets will have global (universal) unique name. So, you cannot have the same bucket name as somebody else!
- You can store an infinite amount of data in a bucket in which each object can contain up to 5 TB of data.
- S3 allows anyone to collect, store and analyze the data from anywhere and in any amount.
- Data is stored on 3 different availability zones to ensure data protection.
- S3 data is fully encryption to ensure compliance and security.
- Great video by AWS: https://www.youtube.com/watch?v=_l14_sXHO8U&t

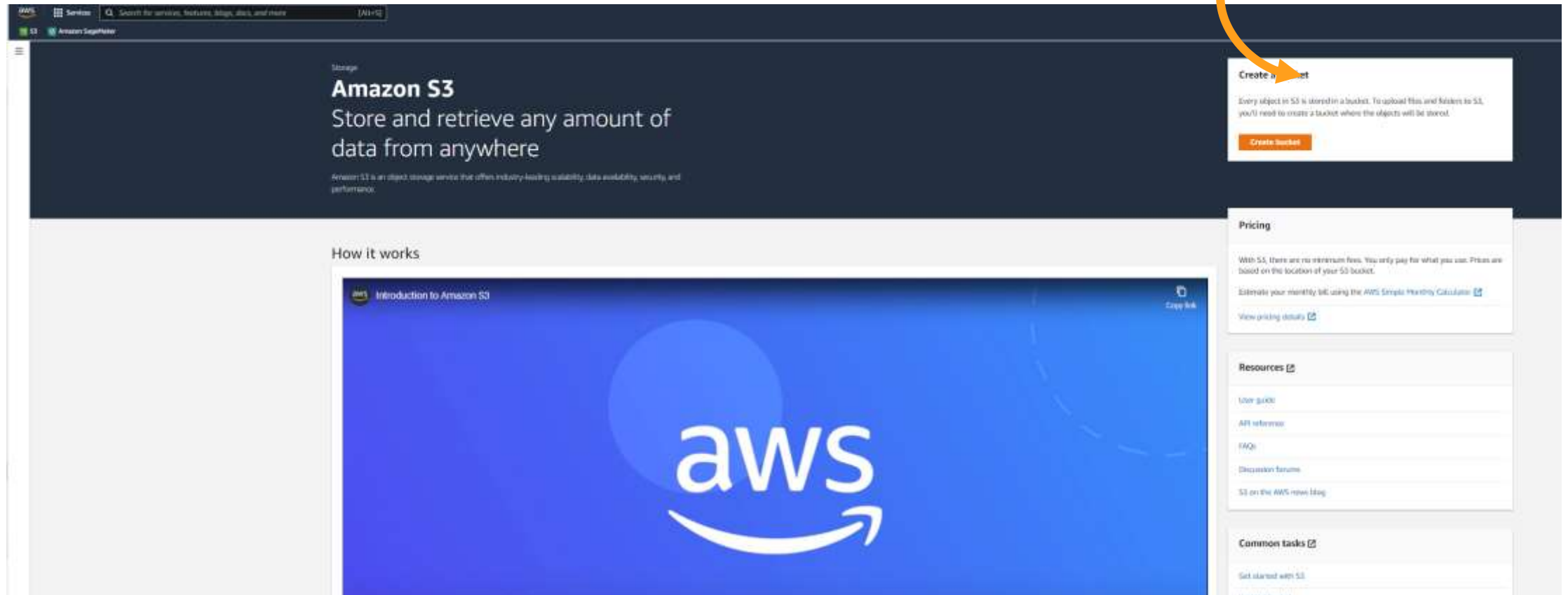


Photo Credit: https://commons.wikimedia.org/wiki/File:AWS_Simple_Icons_AWS_Cloud.svg

Photo Credit: https://commons.wikimedia.org/wiki/File:AWS_Simple_Icons_Storage_Amazon_S3.svg

WHAT IS AMAZON S3?

CREATE A BUCKET
AND SIMPLY UPLOAD
DATA TO IT



The screenshot shows the Amazon S3 console interface. At the top, there's a navigation bar with the AWS logo, 'Services', a search bar, and a user profile icon. Below this, the main header area displays 'Storage' and 'Amazon S3' with the tagline 'Store and retrieve any amount of data from anywhere'. A sub-header states: 'Amazon S3 is an object storage service that offers industry-leading scalability, data availability, security, and performance.' The main content area is titled 'How it works' and features a large blue graphic with the AWS logo and the text 'Introduction to Amazon S3'. On the right side, there's a sidebar with several sections: 'Create a bucket' (with a 'Create bucket' button), 'Pricing' (with links to pricing details and a calculator), 'Resources' (with links to user guides, API reference, FAQs, discussion forums, and the S3 on the AWS news blog), and 'Common tasks' (with a link to 'Get started with S3'). An orange arrow points from the text 'CREATE A BUCKET AND SIMPLY UPLOAD DATA TO IT' to the 'Create bucket' button in the sidebar.

DEMO: AWS MANAGEMENT CONSOLE

GIVE A NAME TO THE BUCKET, ENABLE
ENCRYPTION AND CLICK CREATE

aws Services Search for services, features, blogs, docs, and more [Alt+S]

S3 Amazon SageMaker

Amazon S3 X

Buckets

Access Points

Object Lambda Access Points

Multi-Region Access Points

Batch Operations

Access analyzer for S3

Block Public Access settings for this account

▼ **Storage Lens**

Dashboards

AWS Organizations settings

Feature spotlight 3

► AWS Marketplace for S3

Amazon S3 > Buckets > Create bucket

Create bucket [Info](#)

Buckets are containers for data stored in S3. [Learn more](#)

General configuration

Bucket name

become-aws-mlengineer

Bucket name must be unique and must not contain spaces or uppercase letters. [See rules for bucket naming](#)

AWS Region

US East (N. Virginia) us-east-1

Copy settings from existing bucket - *optional*

Only the bucket settings in the following configuration are copied.

Choose bucket

Object Ownership [Info](#)

Control ownership of objects written to this bucket from other AWS accounts and the use of access control lists (ACLs). Object ownership determines who can specify access to objects.

☒ **ACLs disabled (recommended)**

All objects in this bucket are owned by this account. Access to this bucket and its objects is specified using only policies.

☐ **ACLs enabled**

Objects in this bucket can be owned by other AWS accounts. Access to this bucket and its objects can be specified using ACLs.

Object Ownership

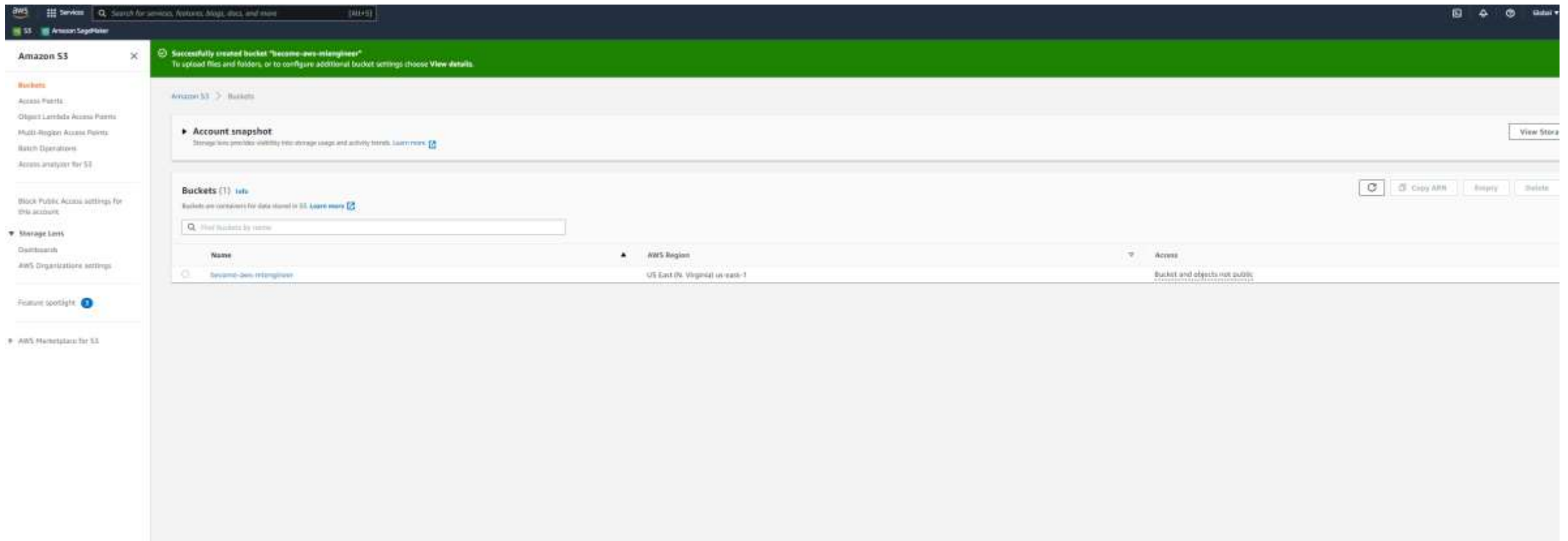
Bucket owner enforced

DEMO: AWS MANAGEMENT CONSOLE

[illegible]

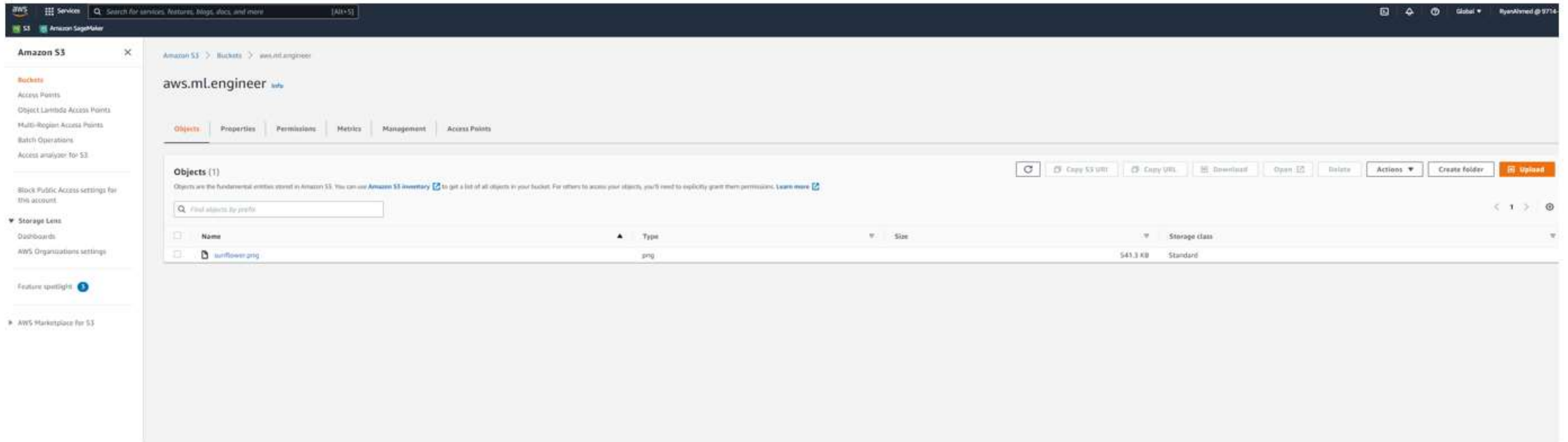
DEMO: AWS MANAGEMENT CONSOLE

BUCKET IS NOW AVAILABLE, YOU CAN
UPLOAD DATA TO THE BUCKET



DEMO: AWS MANAGEMENT CONSOLE

UPLOAD A PNG IMAGE TO THE NEWLY
CREATED BUCKET



DEMO: AWS MANAGEMENT CONSOLE

CLICK ON THE OBJECT URL, YOU WILL GET THE ACCESS DENIED MESSAGE BELOW SINCE THE BUCKET IS NOT OPEN TO THE PUBLIC

The screenshot displays the AWS Management Console interface. The top navigation bar includes the AWS logo, a search bar, and the text 'Services'. Below this, the 'Amazon S3' service is selected. The left-hand navigation pane shows various S3 features, with 'Storage Lens' expanded. The main content area shows the breadcrumb path 'Amazon S3 > Buckets > .aws.ml.engineer > sunflower.png'. The object 'sunflower.png' is selected, and its details are shown under the 'Properties' tab. The 'Object overview' section lists metadata such as Owner (become.aws.ml.engineer), AWS Region (US East (N. Virginia) us-east-1), Size (541.5 KB), Type (png), and Key (sunflower.png). On the right, the 'S3 URI' is provided as 's3://aws.ml.engineer/sunflower.png', and the 'Object URL' is 'https://fs3.amazonaws.com/aws.ml.engineer/sunflower.png'. Below the overview, the 'Object management overview' section indicates that bucket properties and object management configurations impact the object's behavior. The 'Bucket properties' section shows 'Bucket Versioning' as 'Disabled'. The 'Management configurations' section shows 'Replication status' as 'When a replication rule is applied to an object the replication status indicates the progress of the operation.'.

This XML file does not appear to have any style information associated with it. The document tree is shown below:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<Error>
  <Code>AccessDenied</Code>
  <Message>Access Denied</Message>
  <RequestId>ZSHH64TFHX8873ZM</RequestId>
  <HostId>+35BUNVXokrnUmfIy2t0c1V1ZyWYjndF3P3zu9KIj8FnzRT8HnYc7P9cP3m8He6q4eP9SIC68</HostId>
</Error>
```

DEMO: AWS MANAGEMENT CONSOLE

CLICK ON PERMISSIONS AND THEN SELECT READ ACCESS

The screenshot shows the AWS Management Console interface. At the top, there's a navigation bar with the AWS logo, 'Services' menu, a search bar, and a keyboard shortcut '[Alt+S]'. Below the navigation bar, a breadcrumb trail indicates the path: 'Amazon S3 > Buckets > aws.ml.engineer > sunflower.png > Edit access control list'. The main heading is 'Edit access control list' with an 'Info' link. The content area is titled 'Access control list (ACL)' and includes a sub-header 'Grant basic read/write permissions to AWS accounts. Learn more'. Below this, there's a table with three columns: 'Grantee', 'Objects', and 'Object ACL'. The table lists three grantees: 'Object owner (your AWS account)', 'Everyone (public access)', and 'Authenticated users group (anyone with an AWS account)'. Each grantee has associated permissions for 'Read' and 'Write' access. A warning box at the bottom states: 'When you grant access to the Everyone or Authenticated users group grantees, anyone in the world can access this object.' and includes a checkbox for 'I understand the effects of these changes on this object.' which is checked. At the bottom, there's a section 'Access for other AWS accounts' stating 'No other AWS accounts associated with the resource.' and an 'Add grantee' button.

Grantee	Objects	Object ACL
Object owner (your AWS account) Canonical ID: b9bc94de5738b4e19a8ad1854815537b4d57ec1d68fdd12da9e542a23b988408	<input checked="" type="checkbox"/> Read	<input checked="" type="checkbox"/> Read <input checked="" type="checkbox"/> Write
Everyone (public access) Group: http://acs.amazonaws.com/groups/global/AllUsers	<input checked="" type="checkbox"/> Read	<input checked="" type="checkbox"/> Read <input type="checkbox"/> Write
Authenticated users group (anyone with an AWS account) Group: http://acs.amazonaws.com/groups/global/AuthenticatedUsers	<input type="checkbox"/> Read	<input type="checkbox"/> Read <input type="checkbox"/> Write

When you grant access to the Everyone or Authenticated users group grantees, anyone in the world can access this object.
[Learn more](#)

☒ I understand the effects of these changes on this object.

Access for other AWS accounts
No other AWS accounts associated with the resource.

[Add grantee](#)

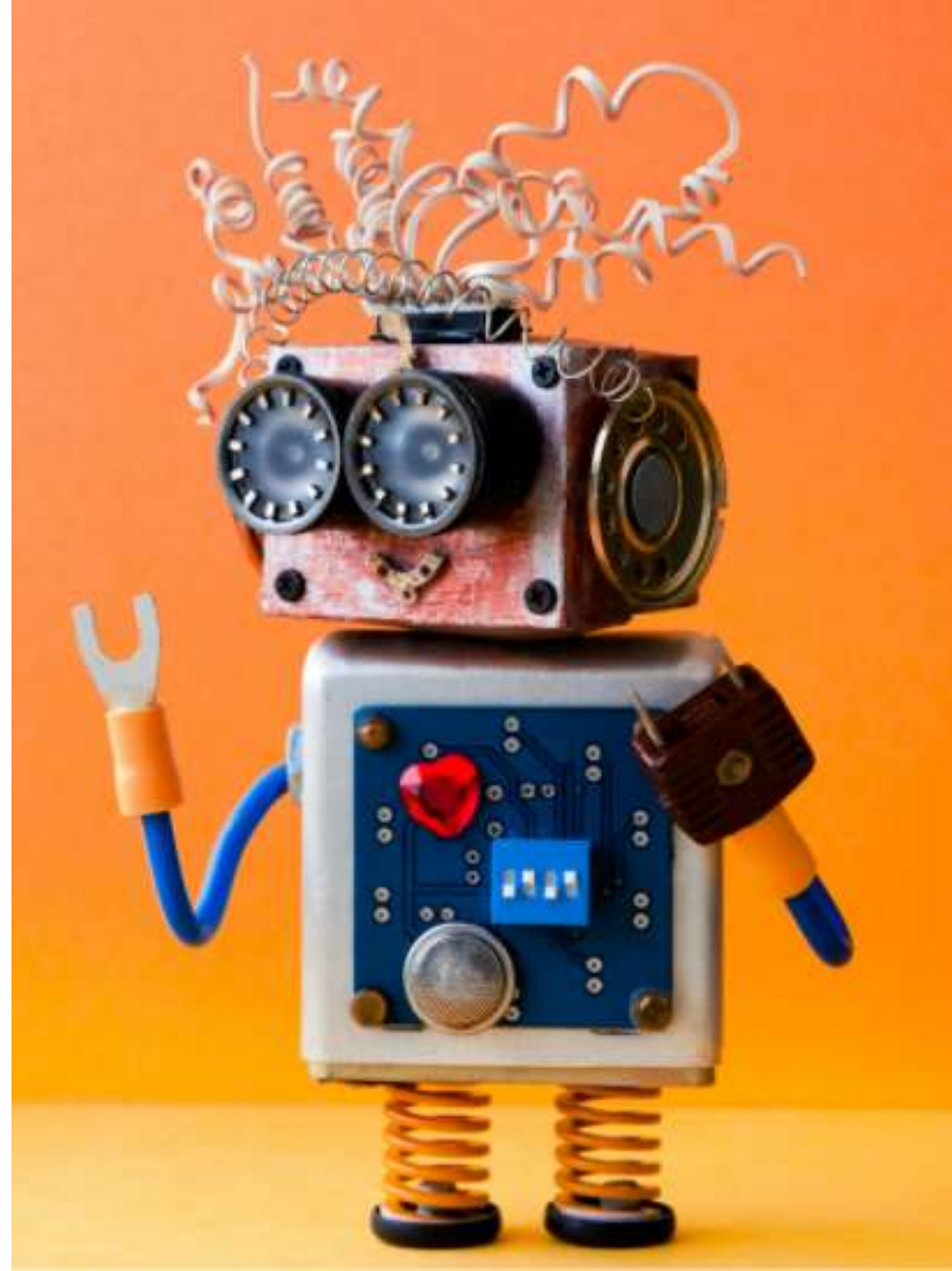
DEMO: AWS MANAGEMENT CONSOLE

NOW YOU SHOULD SEE THE IMAGE

← → ↻ s3.amazonaws.com/aws.m1.engineer/sunflower.png
Kindle Cloud Reader YouTube Maps



AMAZON ELASTIC COMPUTE CLOUD (EC2)

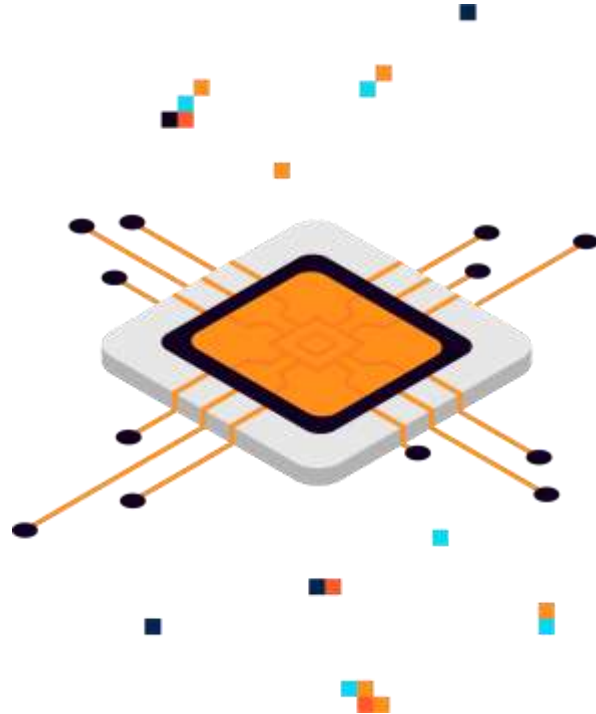


AMAZON EC2: INTRODUCTION

- Amazon Elastic Compute Cloud (EC2) offers resizable compute capacity in the cloud.
- AWS EC2 can be used to acquire, configure and scale capacity in a very easy fashion.
- EC2 is a service that allows you to simply rent a server in the cloud.
- EC2 offers 7x fewer downtime hours than the next largest cloud provider.
- EC2 covers 22 regions and 69 availability zones all over the world.
- Note: EC2 is a compute service which is NOT serverless (lambda is serverless).



AMAZON EC2



AMAZON EC2: INSTANCE TYPES SELECTION

- Check this out for a full list of ML instance Types:
<https://aws.amazon.com/sagemaker/pricing/instance-types/>

STANDARD

Instance type	vCPU	GPU	Mem (GiB)	GPU Mem (GiB)	Network Performance
Standard - Current Generation					
m1.t2.medium	2	-	4	-	Low to Moderate
m1.t2.large	2	-	8	-	Low to Moderate

MEMORY OPTIMIZED

Memory Optimized - Current Generation					
m1.r5.large	2	-	16	-	Up to 10 Gbps
m1.r5.xlarge	4	-	32	-	Up to 10 Gbps
m1.r5.2xlarge	8	-	64	-	Up to 10 Gbps
m1.r5.4xlarge	16	-	128	-	Up to 10 Gbps

COMPUTE OPTIMIZED

Compute Optimized - Current Generation					
m1.c5.large	2	-	4	-	Up to 10 Gbps
m1.c5.xlarge	4	-	8	-	Up to 10 Gbps
m1.c5.2xlarge	8	-	16	-	Up to 10 Gbps
m1.c5.4xlarge	16	-	32	-	Up to 10 Gbps
m1.c5.9xlarge	36	-	72	-	10 Gigabit

ACCELERATED COMPUTING

Accelerated Computing - Current Generation					
m1.p3.2xlarge	8	1xV100	61	16	Up to 10 Gbps
m1.p3.8xlarge	32	4xV100	244	64	10 Gigabit
m1.p3.16xlarge	64	8xV100	488	128	25 Gigabit
m1.p3dn.24xlarge	96	8xV100	768	256	100 Gigabit

AMAZON EC2: DEMO

NAVIGATE TO EC2 AND CLICK ON INSTANCES

The screenshot shows the AWS Management Console interface. At the top, there's a dark blue header with the AWS logo, 'Services' link, a search bar, and navigation icons. Below the header, a sidebar on the left contains the 'EC2 Dashboard' and a list of links: 'EC2 Global View', 'Events', 'Tags', 'Limits', 'Instances' (expanded), 'Instances' (with a 'New' tag), 'Instance Types', 'Launch Templates', 'Spot Requests', 'Savings Plans', 'Reserved Instances' (with a 'New' tag), and 'Dedicated Hosts'. The main content area is titled 'Resources' and shows a summary of EC2 resources in the 'US East (N. Virginia) Region'. It includes a table with two columns of resource counts and a notification banner at the bottom.

Resources	
Instances (running)	0
Elastic IPs	0
Key pairs	0
Placement groups	0
Snapshots	0
Dedicated Hosts	0
Instances	0
Load balancers	0
Security groups	5
Volumes	0

Notification: Easily size, configure, and deploy Microsoft SQL Server Always On availability groups on AWS using the AWS Launch Wizard for SQL Server. [Learn more](#)


AMAZON EC2: DEMO


CLICK ON LAUNCH INSTANCES

The screenshot shows the Amazon EC2 console interface. At the top, there's a navigation bar with the AWS logo, 'Services' link, a search bar, and user information (N. Virginia, RyanAhmedAly). Below this, the left sidebar contains navigation links: 'New EC2 Experience' (with a close button), 'EC2 Dashboard', 'EC2 Global View', 'Events', 'Tags', 'Limits', and a collapsed 'Instances' section. The 'Instances' section is expanded, showing links for 'Instances' (marked 'New'), 'Instance Types', 'Launch Templates', 'Spot Requests', 'Savings Plans', and 'Reserved Instances' (marked 'New'). The main content area is titled 'Instances' and includes an 'Info' link, a refresh button, a 'Connect' button, an 'Instance state' dropdown, an 'Actions' dropdown, and a prominent orange 'Launch instances' button. Below these are a search bar and pagination controls (showing 1 instance). A table header lists columns: Name, Instance ID, Instance state, Instance type, Status check, and Alarm status. The table body contains the message 'You do not have any instances in this region'. At the bottom, there's a modal titled 'Select an instance' with a close button.

AMAZON EC2: DEMO

CHOOSE THE AMI: MICROSOFT WINDOWS SERVER 2019 BASE

 Services [Alt+F3]

 N. Virginia RyanAhmed

You've been invited to try an early, beta iteration of the new launch instance wizard. We will continue to improve the experience over the next few months. We're asking customers for their feedback on this early release. To exit the new launch instance wizard at any time, choose the Cancel button.

[Try it now!](#)

1. Choose AMI2. Choose Instance Type3. Configure Instance4. Add Storage5. Add Tags6. Configure Security Group7. Review

Step 1: Choose an Amazon Machine Image (AMI)
An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace, or you can select one of your own AMIs.


Quick Start


My AMIs


AWS Marketplace


Community AMIs

☐ Free Tier only

**Amazon Linux 2 AMI (HVM) - Kernel 5.10, SSD Volume Type** - ami-0c293f3676ec4f90 (64-bit x86) / ami-005d843eadb96ed7f (64-bit Arm)
Free tier eligible
Amazon Linux 2 comes with five years support. It provides Linux kernel 5.10 tuned for optimal performance on Amazon EC2, systemd 219, GCC 7.3, Glibc 2.26, Binutils 2.29.1, and the latest software packages through extras. This AMI is the successor of the Amazon Linux AMI that is now under maintenance only mode and has been removed from this wizard.
Root device type: ebs | Virtualization type: hvm | ENA Enabled: Yes

**Amazon Linux 2 AMI (HVM) - Kernel 4.14, SSD Volume Type** - ami-0e322da50e0e90e21 (64-bit x86) / ami-0be75c86405b3320a (64-bit Arm)
Free tier eligible
Amazon Linux 2 comes with five years support. It provides Linux kernel 4.14 tuned for optimal performance on Amazon EC2, systemd 219, GCC 7.3, Glibc 2.26, Binutils 2.29.1, and the latest software packages through extras. This AMI is the successor of the Amazon Linux AMI that is now under maintenance only mode and has been removed from this wizard.
Root device type: ebs | Virtualization type: hvm | ENA Enabled: Yes

**macOS Monterey 12.2.1** - ami-03f795d99e0a6256e
The macOS Monterey AMI is an EBS-backed, AWS-supported image. This AMI includes the AWS Command Line Interface, Command Line Tools for Xcode, Amazon SSM Agent, and Homebrew. The AWS Homebrew Tap includes the latest versions of multiple AWS packages included in the AMI.
Root device type: ebs | Virtualization type: hvm | ENA Enabled: Yes

**macOS Big Sur 11.6.4** - ami-09b4af2619e2e8db0
The macOS Big Sur AMI is an EBS-backed, AWS-supported image. This AMI includes the AWS Command Line Interface, Command Line Tools for Xcode, Amazon SSM Agent, and Homebrew. The AWS Homebrew Tap includes the latest versions of multiple AWS packages included in the AMI.

1 to 45 of 45 AMIs

Select

☒ 64-bit (x86)
☐ 64-bit (Arm)

Select

☒ 64-bit (x86)
☐ 64-bit (Arm)

Select

64-bit (Mac)

Select

64-bit (Mac)

AMAZON EC2: DEMO

SELECT t2 MICRO AND CLICK CONFIGURE INSTANCE DETAILS

Services

Search for services, features, blogs, docs, and more

[Alt+5]

53

1. Choose AMI2. Choose Instance Type3. Configure Instance4. Add Storage5. Add Tags6. Configure Security Group7. Review

Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your . [Learn more](#) about instance types and how they can meet your computing needs.

Filter by:

All instance families

Current generation

Show/Hide Columns

Currently selected: t2.micro (- ECUs, 1 vCPUs, 2.5 GHz, -, 1 GiB memory, EBS only)

	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Sup
	t2	t2.nano	1	0.5	EBS only	-	Low to Moderate	Y
	t2	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Y
	t2	t2.small	1	2	EBS only	-	Low to Moderate	Y
	t2	t2.medium	2	4	EBS only	-	Low to Moderate	Y
	t2	t2.large	2	8	EBS only	-	Low to Moderate	Y
	t2	t2.xlarge	4	16	EBS only	-	Moderate	Y
	t2	t2.2xlarge	8	32	EBS only	-	Moderate	Y
	t3	t3.nano	2	0.5	EBS only	Yes	Up to 5 Gigabit	Y
	t3	t3.micro	2	1	EBS only	Yes	Up to 5 Gigabit	Y
	t3	t3.small	2	2	EBS only	Yes	Up to 5 Gigabit	Y
	t3	t3.medium	2	4	EBS only	Yes	Up to 5 Gigabit	Y
	t3	t3.large	2	8	EBS only	Yes	Up to 5 Gigabit	Y

Cancel

Previous

Review and Launch

Next: Configure Ins

AMAZON EC2: DEMO

SKIP ADD TAGS AND CLICK ON CONFIGURE SECURITY GROUP

aws

Services

Search for services, features, blogs, docs, and more

[Alt+S]

S3

N. Virginia

RyanAhmedAli

1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Add Tags

6. Configure Security Group

7. Review

Step 5: Add Tags

A tag consists of a case-sensitive key-value pair. For example, you could define a tag with key = Name and value = Webserver.
A copy of a tag can be applied to volumes, instances or both.
Tags will be applied to all instances and volumes. [Learn more](#) about tagging your Amazon EC2 resources.

Key (128 characters maximum)	Value (256 characters maximum)	Instances ⓘ	Volumes ⓘ	Network Interfaces ⓘ	Spot Instance Requests ⓘ
This resource currently has no tags.					
Choose the Add tag button or click to add a Name tag .					
Make sure your IAM policy includes permissions to create tags.					

Add Tag

(Up to 50 tags maximum)

Cancel

Previous

Review and Launch

Next: Configure Security Group

AMAZON EC2: DEMO

KEEP DEFAULT VALUES AND CLICK ON REVIEW AND LAUNCH



- 1. Choose AMI
- 2. Choose Instance Type
- 3. Configure Instance
- 4. Add Storage
- 5. Add Tags
- 6. Configure Security Group
- 7. Review

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: ☒ Create a new security group
☐ Select an existing security group

Security group name:

Description:

Type <small>i</small>	Protocol <small>i</small>	Port Range <small>i</small>	Source <small>i</small>	Description <small>i</small>
<div>RDP</div>	<div>TCP</div>	<div>3389</div>	<div>Custom</div> <div>0.0.0.0/0</div>	<div>e.g. SSH for Admin Desktop</div>
<div>Add Rule</div>				

Warning
Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

AMAZON EC2: DEMO

CLICK ON LAUNCH

aws

Services

Search for services, features, blogs, docs, and more

[Alt+5]

53

N. Virginia

RyanAhmedAliy

1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Add Tags

6. Configure Security Group

7. Review

Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

Improve your instances' security. Your security group, launch-wizard-3, is open to the world.

Your instances may be accessible from any IP address. We recommend that you update your security group rules to allow access from known IP addresses only. You can also open additional ports in your security group to facilitate access to the application or service you're running, e.g., HTTP (80) for web servers. [Edit security groups](#)

AMI Details

Microsoft Windows Server 2019 Base - ami-0c19f80dba70861db

Free tier eligible

Microsoft Windows 2019 Datacenter edition [English]

Root Device Type: x86_64 Virtualization type: hvm

If you plan to use this AMI for an application that benefits from Microsoft License Mobility, fill out the [License Mobility Form](#). [Don't show me this again](#)

Instance Type

Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
T2.micro	-	1	1	EBS only	-	Low to Moderate

Security Groups

Security group name: launch-wizard-3

Description: launch-wizard-3 created 2022-03-05T09:14:00:585-05:00

Type	Protocol	Port Range	Source	Description
RDP	TCP	3389	0.0.0.0/0	

Instance Details

Edit AMI

Edit instance type

Edit security groups

Edit instance details

Cancel

Previous

Launch

AMAZON EC2: DEMO

CREATE A NEW KEY PAIR AND CLICK DOWNLOAD KEY PAIR. KEEP THAT DOWNLOADED FILE IN A SAFE PLACE

Step 7: Review Instance Launch

You can also open additional ports in your security group to facilitate access to the application or service you're running, e.g., HTTP (80) for web servers. [Edit security groups](#)

AMI Details

Microsoft Windows Server 2019 Base - ami-0c19f80db370861db
Microsoft Windows 2019 Datacenter edition (English)
Root Device Type: sbs Virtualization type: hvm
If you plan to use this AMI for an application that benefits from Microsoft License Mobility, see our [License Mobility](#) page.

Instance Type

Instance Type	ECUs	vCPUs	Memory (GB)	Instance Storage
T2.micro	-	1	1	EBS only

Security Groups

Security group name	Description
launch-wizard-3	launch-wizard-3 created 2022-03-05T09:14:00.585-05:00

Type	Protocol	Port Range
RDP	TCP	3389

Instance Details

Storage

Tags

Select an existing key pair or create a new key pair

A key pair consists of a **public key** that AWS stores, and a **private key** file that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance. Amazon EC2 supports ED25519 and RSA key pair types.

Note: The selected key pair will be added to the set of keys authorized for this instance. [Learn more about removing existing key pairs from a public AMI](#)

Create a new key pair

Key pair type

☒ RSA ☐ ED25519

Key pair name

AWSMLWindows2019

Download Key Pair

You have to download the private key file (*.pem file) before you can continue. Store it in a secure and accessible location. You will not be able to download the file again after it's created.

Cancel **Launch Instances**

AMAZON EC2: DEMO

UNDER INSTANCES, YOU SHOULD FIND OUR NEWLY CREATED INSTANCE

The screenshot displays the AWS Management Console interface for the EC2 service. The top navigation bar includes the AWS logo, a 'Services' menu, a search bar, and user information (N. Virginia, RyanAhmed). The left sidebar shows navigation options like 'New EC2 Experience', 'EC2 Dashboard', 'EC2 Global View', 'Events', 'Tags', 'Limits', 'Instances', 'Images', 'Elastic Block Store', and 'Network & Security'. The main content area is titled 'Instances (3)' and contains a table with three instances. The first two are 'Terminated' (t2.micro), and the third is 'Running' (t2.micro) with a status of 'Initializing'. Below the table is a 'Select an instance' section.

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 ...	Elastic IP	IPv6 IPs
-	i-03001cd923133481e	Terminated	t2.micro	-	No alarms	us-east-1a	-	-	-	-
-	i-04ced69dffd4947d4	Terminated	t2.micro	-	No alarms	us-east-1a	-	-	-	-
-	i-024b36756d7f6487c	Running	t2.micro	Initializing	No alarms	us-east-1a	ec2-3-83-51-15.comput...	3.83.51.15	-	-

Select an instance

AMAZON EC2: DEMO

GO TO THE INSTANCE AND CLICK CONNECT.

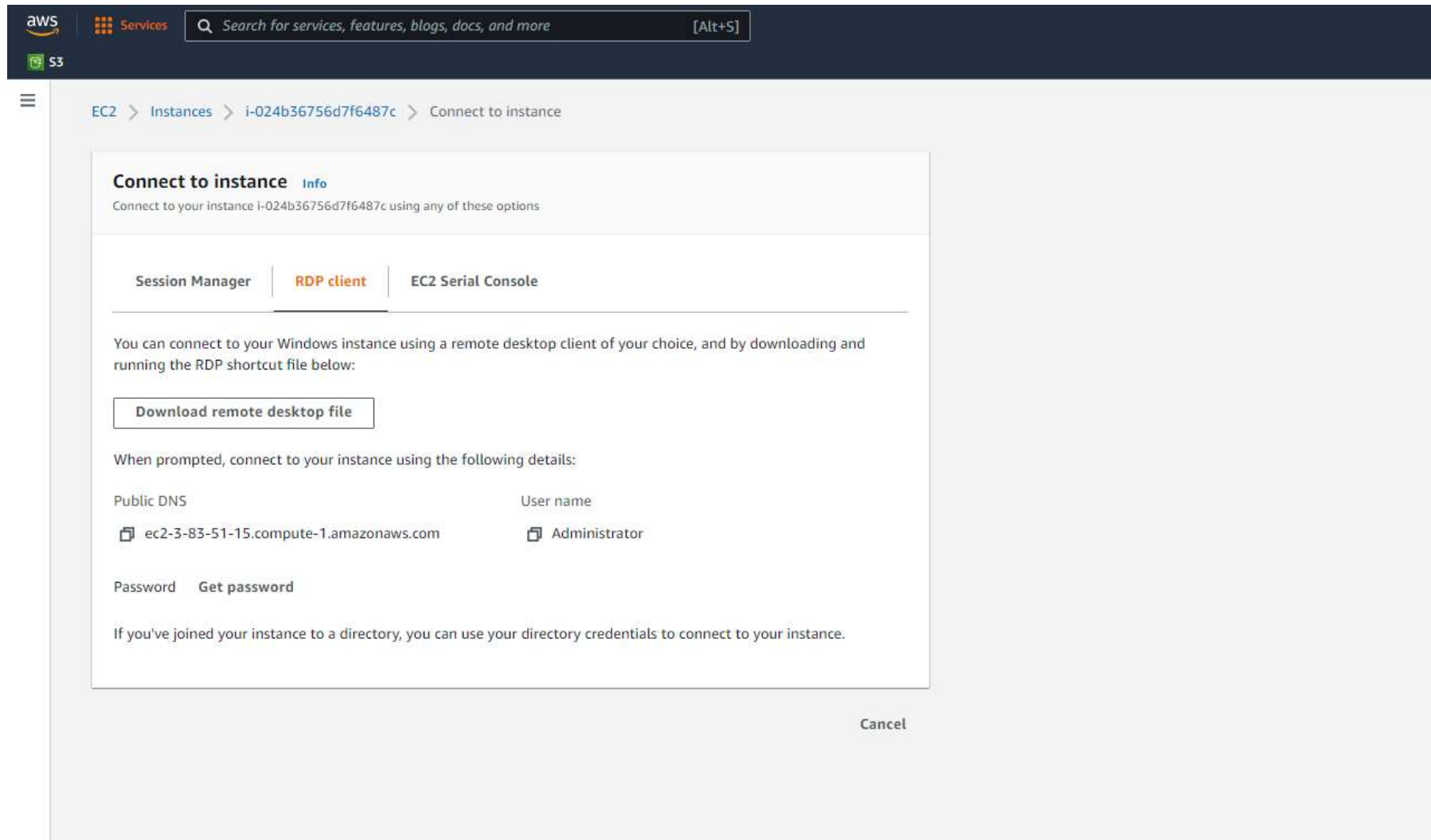
The screenshot displays the AWS Management Console interface. At the top, the navigation bar includes the AWS logo, a search bar, and the user's profile (RyanAhmedAliy) in the N. Virginia region. The left-hand navigation pane shows various services, with 'Instances' selected under the 'EC2' category. The main content area is titled 'Instance summary for i-024b36756d7f6487c' and shows the instance is in a 'Running' state. Below the summary, there are tabs for 'Details', 'Security', 'Networking', 'Storage', 'Status checks', 'Monitoring', and 'Tags'. The 'Details' tab is active, showing a grid of instance information. The instance is a t2.micro type running Windows Server 2019. It has a public IPv4 address of 3.83.51.15 and is associated with a VPC and subnet. The 'Connect' button is visible in the top right of the instance summary section.

Instance summary for i-024b36756d7f6487c		
Instance ID	Public IPv4 address	Private IPv4 addresses
i-024b36756d7f6487c	3.83.51.15 open address	172.31.87.176
IPv6 address	Instance state	Public IPv4 DNS
-	Running	ec2-3-83-51-15.compute-1.amazonaws.com open address
Hostname type	Private IP DNS name (IPv4 only)	Answer private resource DNS name
IP name: ip-172-31-87-176.ec2.internal	ip-172-31-87-176.ec2.internal	IPv4 (A)
Instance type	Elastic IP addresses	VPC ID
t2.micro	-	vpc-047b4f531164a1e0f
AWS Compute Optimizer finding	IAM Role	Subnet ID
Opt-in to AWS Compute Optimizer for recommendations. Learn more	-	subnet-0fb13fb2758a814df

▼ Instance details		
Platform	AMI ID	Monitoring
windows	ami-0c19f80dba70861db	disabled
Platform details	AMI name	Termination protection
Windows	Windows_Server-2019-English-Full-Base-2022.02.10	Disabled
Launch time	AMI location	Lifecycle
	amazon/Windows_Server-2019-English-Full-Base-2022.02.10	spot

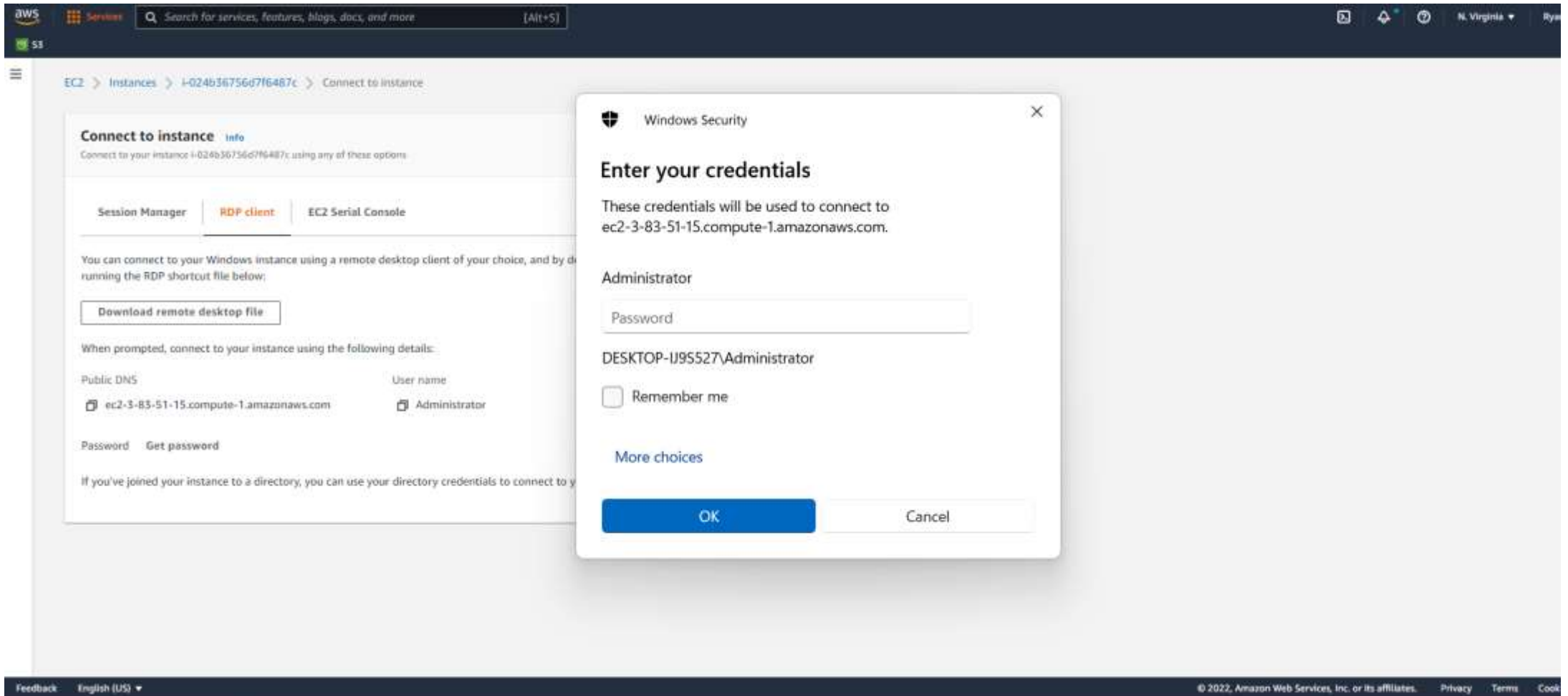
AMAZON EC2: DEMO

SELECT RDP CLIENT AND CLICK ON DOWNLOAD REMOTE
DESKTOP FILE



AMAZON EC2: DEMO

OPEN THE DOWNLOADED FILE, NOTE THAT YOU NEED A
PASSWORD NOW



AMAZON EC2: DEMO

CLICK ON GET PASSWORD, UPLOAD THE KEY PAIR FILE
“AWSMLwindows2019” ASSOCIATED WITH THIS INSTANCE

The screenshot shows the AWS Management Console interface. At the top, there's a dark blue header with the AWS logo, a 'Services' menu, a search bar, and a notification icon. Below the header, the breadcrumb navigation shows 'EC2 > Instances > i-024b36756d7f6487c > Get Windows password'. The main content area is titled 'Get Windows password' with an 'info' link. It contains the following text: 'Retrieve and decrypt the initial Windows administrator password for this instance.' and 'To decrypt the password, you will need your key pair for this instance.' Below this, a light blue box displays 'Key pair associated with this instance' and 'AWSMLwindows2019'. Underneath, the text 'Browse to your key pair:' is followed by a 'Browse' button. Then, the text 'Or copy and paste the contents of the key pair below:' is followed by a large text input field. At the bottom right, there are two buttons: 'Cancel' and 'Decrypt password'.

Get Windows password [info](#)

Retrieve and decrypt the initial Windows administrator password for this instance.

To decrypt the password, you will need your key pair for this instance.

Key pair associated with this instance
AWSMLwindows2019

Browse to your key pair:


Browse


Or copy and paste the contents of the key pair below:

Cancel Decrypt password

AMAZON EC2: DEMO

DECRYPT PASSWORD

 Services [Alt+S]




EC2 > Instances > i-024b36756d7f6487c > Get Windows password


Get Windows password [Info](#)


Retrieve and decrypt the initial Windows administrator password for this instance.

To decrypt the password, you will need your key pair for this instance.

 **Key pair associated with this instance**
AWSMLwindows2019

Browse to your key pair:

 Browse

 AWSMLwindows2019.pem
1.7KB

Or copy and paste the contents of the key pair below:

```
-----BEGIN RSA PRIVATE KEY-----
MIIeowIBAAKCAQEAj3T6PkcUAaYAf2BeGd+BM0j/oTaH7dPCLV2rLwAEsLDuM6yH
txB2Ullc8p56RYqPUGa8OOrA0QX6ZxpfeiF9jaVkr+7Da8+qzLl41kohRjvpQVwy
JmEshn5UDzBixBFY16zeOrEQE2W2k4Z4Gzg504gC2MDRBpvD6R89XX5XMXsaoZnM
GZ/FoT/jx7lWzxbzpmFAvOd4i37XeoryvbvOE7k+aVFugzOP6RkKTjwhAmEFAJdB
la4z7dmr/MyUftS2t1zKklEF4VNJZ/7rmmo9OSqmBouTvUJr0UAISltj3QjhXuZG
XrzCBN2OqWC1JKyMlVT63ZGihsicyAsWjtc8xQIDAQABAoIBADbvm/kHbSDoeh5N
QBv2XFrQZJxO7qTjx+NpkGlyP1mOl9mQA3TWSAi1YbPDfp1s307x2LiPJYGmIWsk
-----
```

Cancel Decrypt password

AMAZON EC2: DEMO

COPY THE PASSWORD AND USE IT TO LOG IN THE VIRTUAL MACHINE

aws Services Search for services, features, blogs, docs, and more [Alt+S]

S3

☰

✓ Password Decryption Successful
The password for instance i-024b36756d7f6487c was successfully decrypted.

EC2 > Instances > i-024b36756d7f6487c > Connect to instance

Connect to instance Info

Connect to your instance i-024b36756d7f6487c using any of these options.

Session Manager **RDP client** EC2 Serial Console

You can connect to your Windows instance using a remote desktop client of your choice, and by downloading and running the RDP shortcut file below:

[Download remote desktop file](#)

When prompted, connect to your instance using the following details:

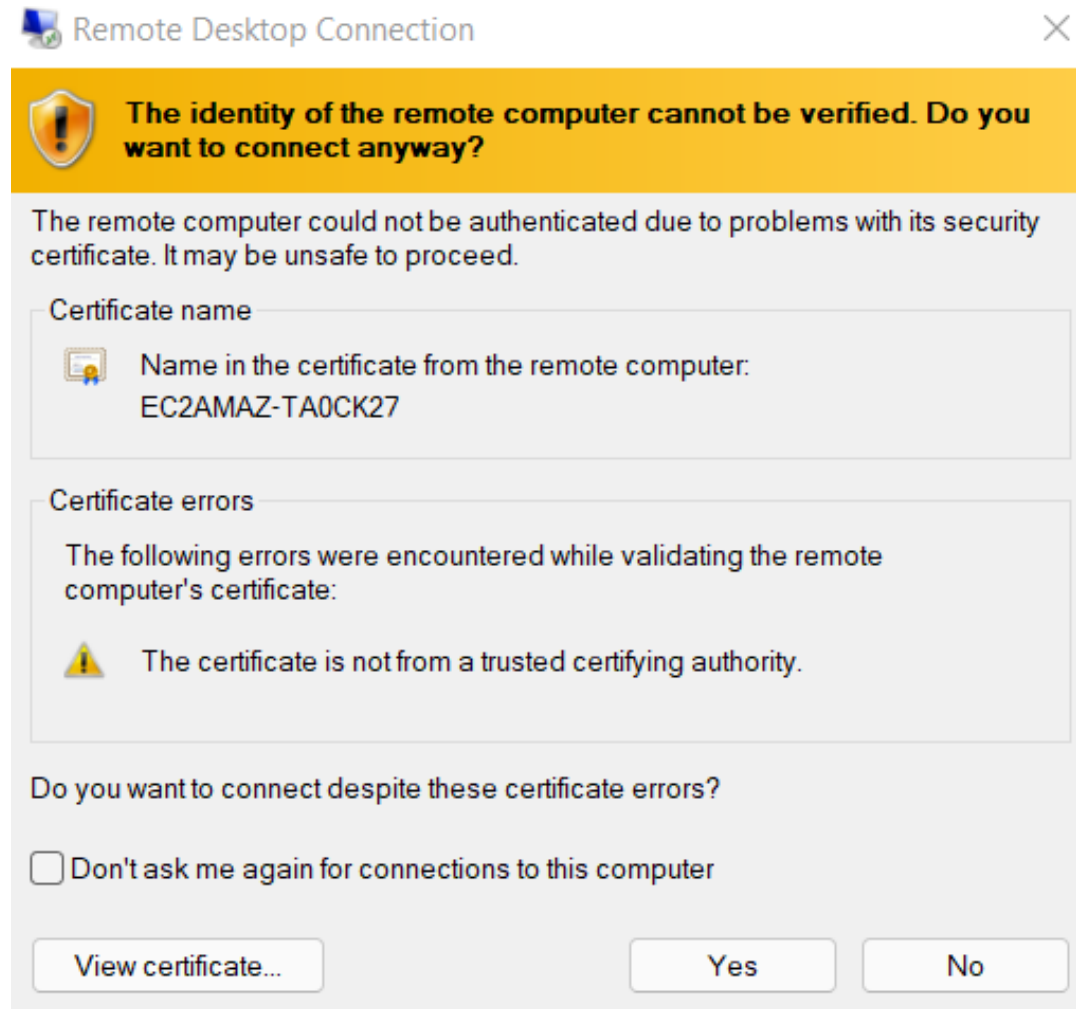
Public DNS	User name
ec2-3-83-51-15.compute-1.amazonaws.com	Administrator
Password	
VnNR?BVSj=*)AAX!hHN;aADd-HX2L&IA	

If you've joined your instance to a directory, you can use your directory credentials to connect to your instance.

Cancel

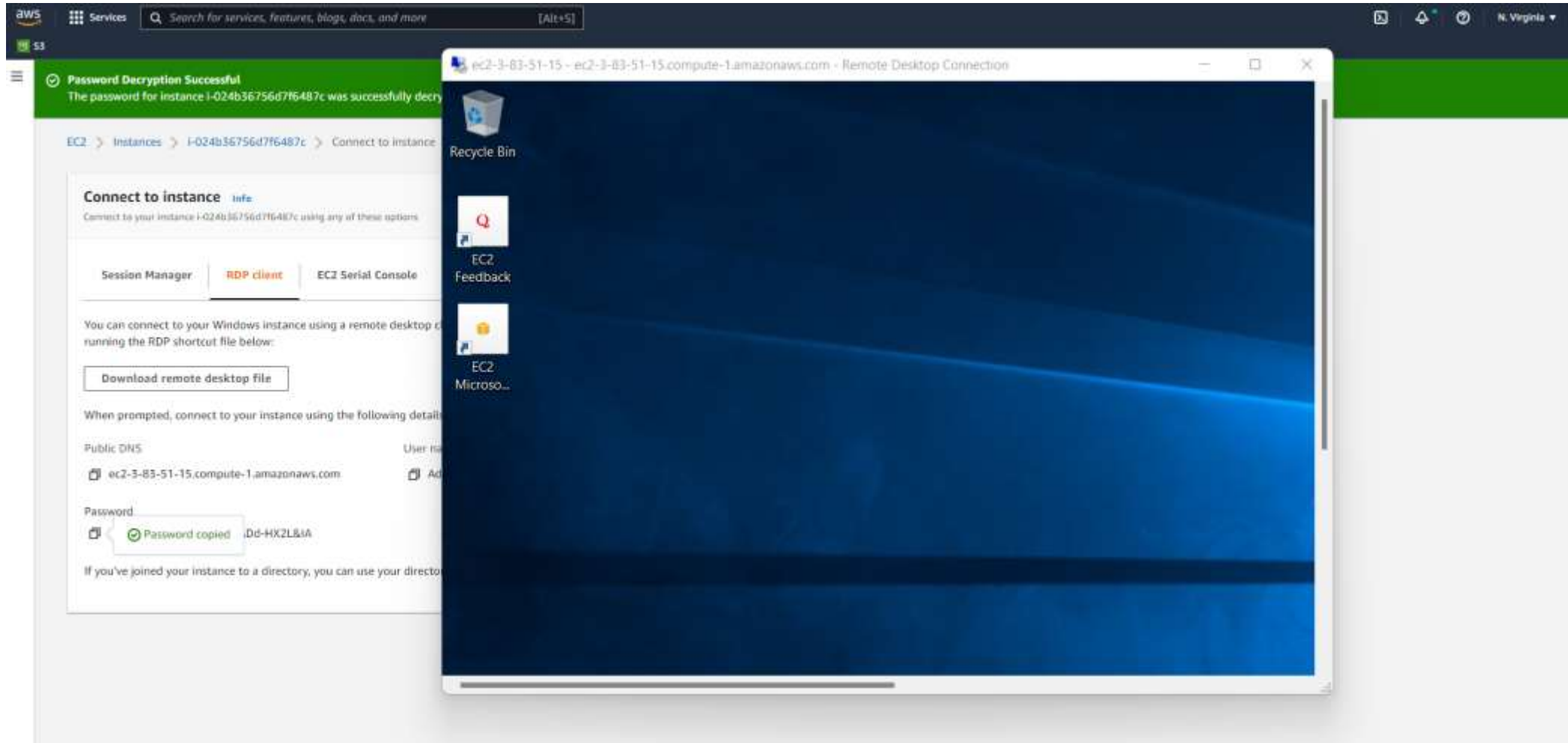
AMAZON EC2: DEMO

CLICK YES



AMAZON EC2: DEMO

CONGRATULATIONS! YOU NOW HAVE A VIRTUAL MACHINE
RUNNING WITH SPOT INSTANCE OPTION



AMAZON EC2: DEMO

CLICK ON THE INSTANCE AND TERMINATE INSTANCE

The screenshot displays the AWS Management Console interface for the EC2 service. The top navigation bar includes the AWS logo, a search bar, and the user's profile. The left sidebar shows the 'Instances' section with a list of navigation links. The main content area shows the 'Instances (1/3)' table with columns for Name, Instance ID, Instance state, Instance type, Status check, Alarm status, Availability Zone, and Public IPv4 DNS. Three instances are listed, all with a 'Terminated' state. The instance 'i-024b36756d7f6487c' is selected, and the 'Actions' dropdown menu is open, showing options like 'Stop instance', 'Start instance', 'Reboot instance', 'Hibernate instance', and 'Terminate instance'.

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS
-	i-03001cd923133481e	Terminated	t2.micro	-	No alarms	us-east-1a	-
-	i-04ced69dff64947d4	Terminated	t2.micro	-	No alarms	us-east-1a	-
-	i-024b36756d7f6487c	Terminated	t2.micro	-	No alarms	us-east-1a	-

Instance: i-024b36756d7f6487c

Details | Security | Networking | Storage | Status checks | Monitoring | Tags

Instance summary

Instance ID	Public IPv4 address	Private IPv4 addresses
i-024b36756d7f6487c	-	-