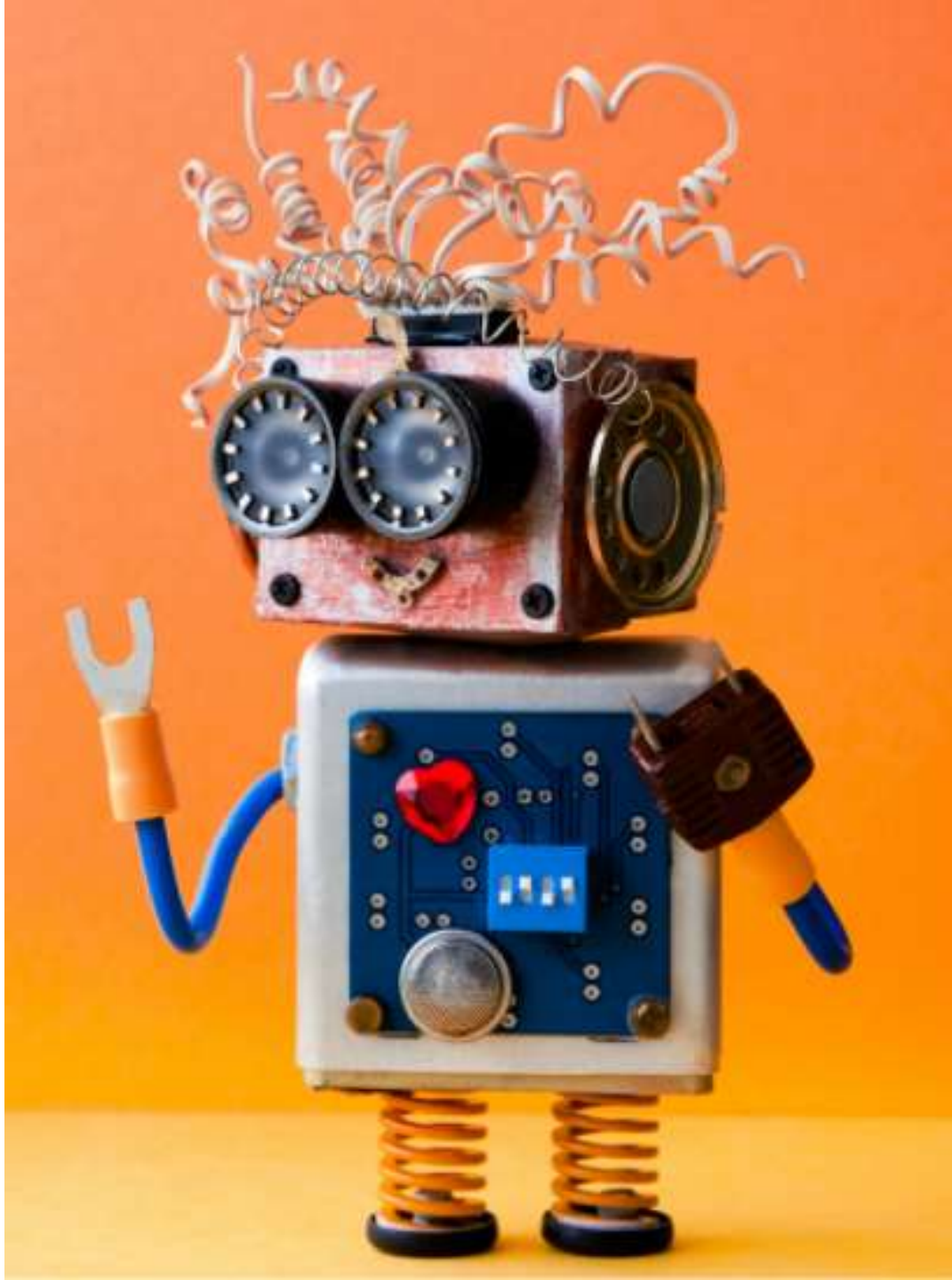
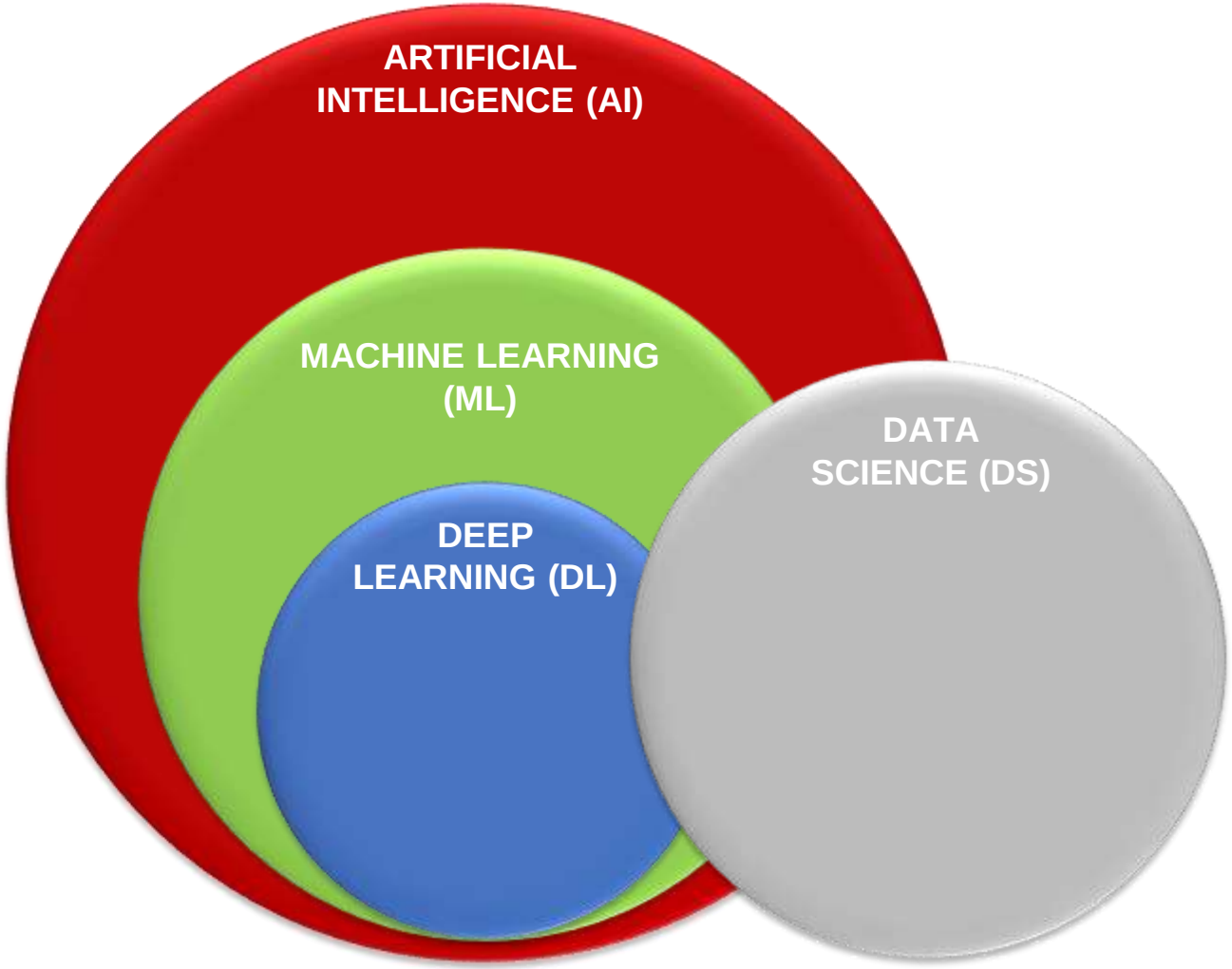
ARTIFICIAL INTELLIGENCE Vs. MACHINE LEARNING Vs. DEEP LEARNING

EASY

ADVANCED



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.

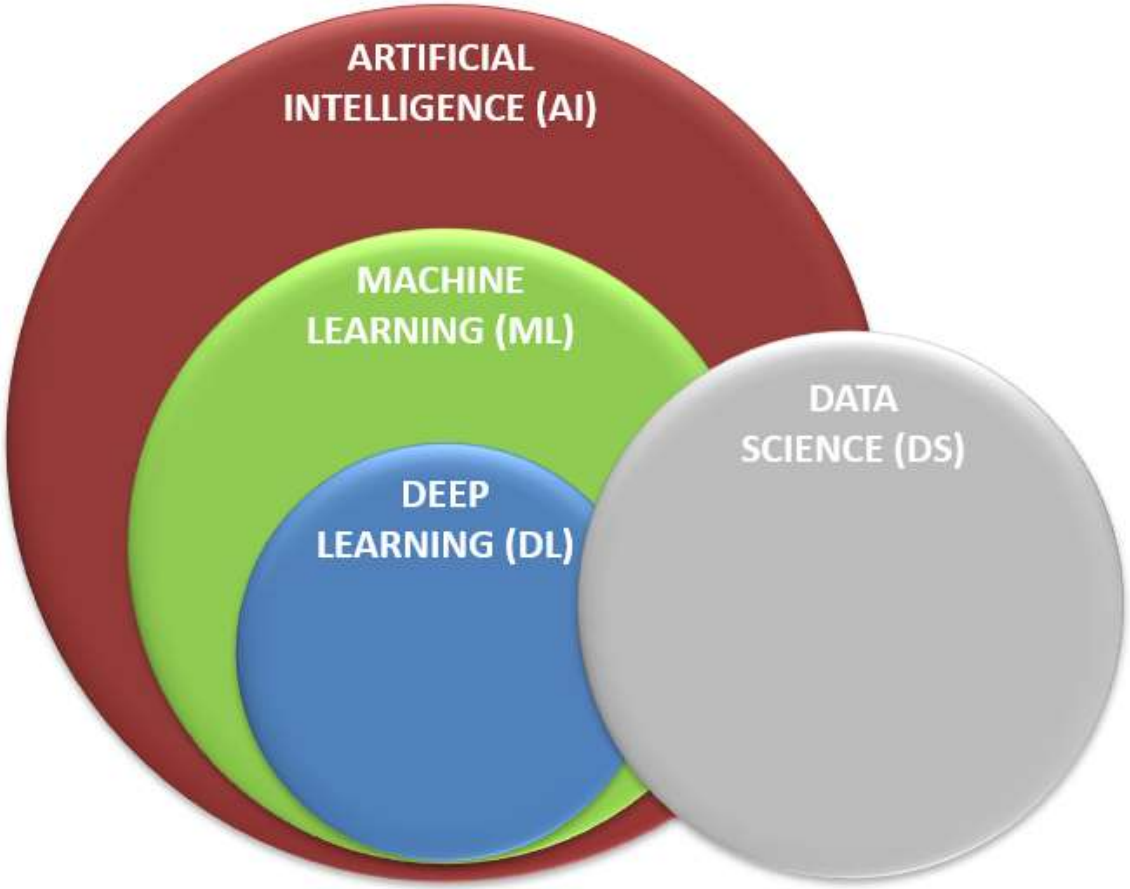
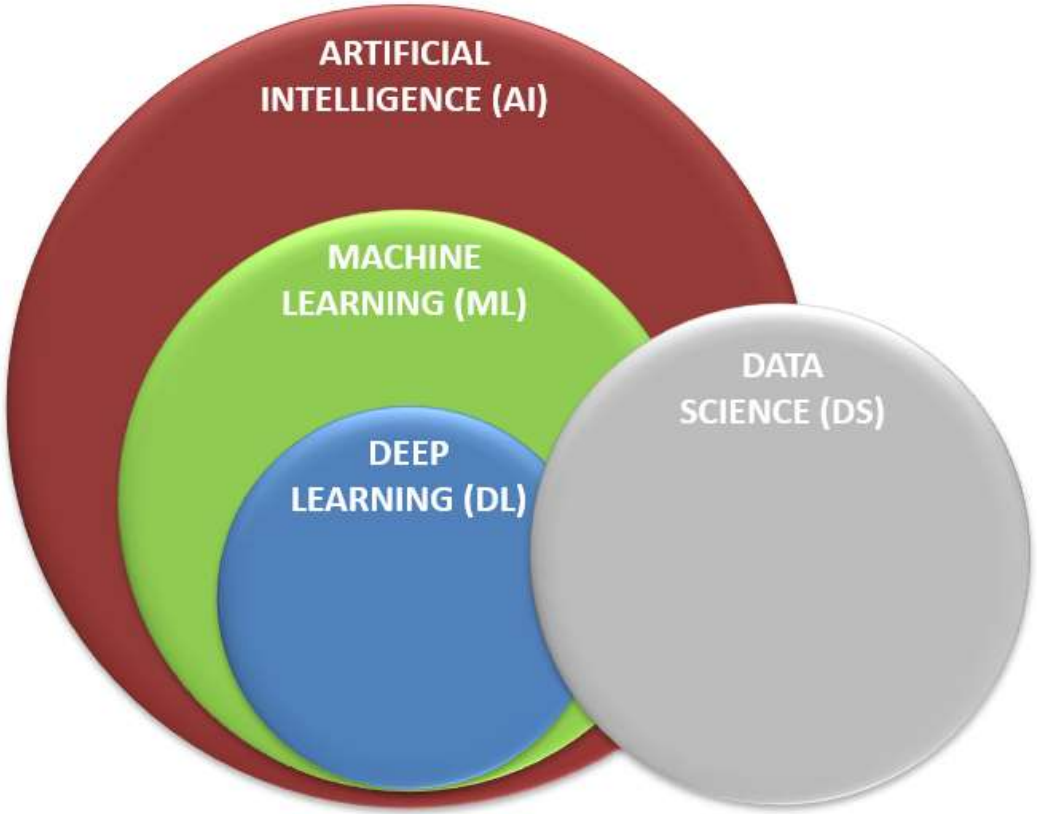


Photo Credit: https://pixabay.com/illustrations/artificial-intelligence-brain-think-4111582/

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.



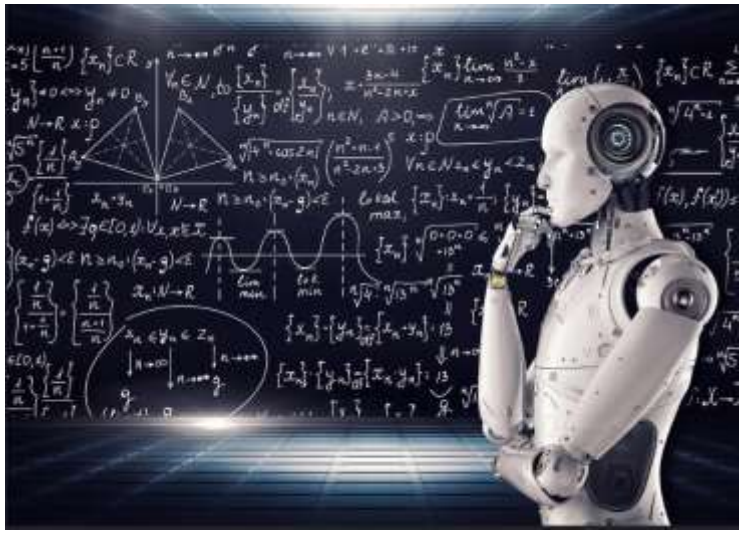
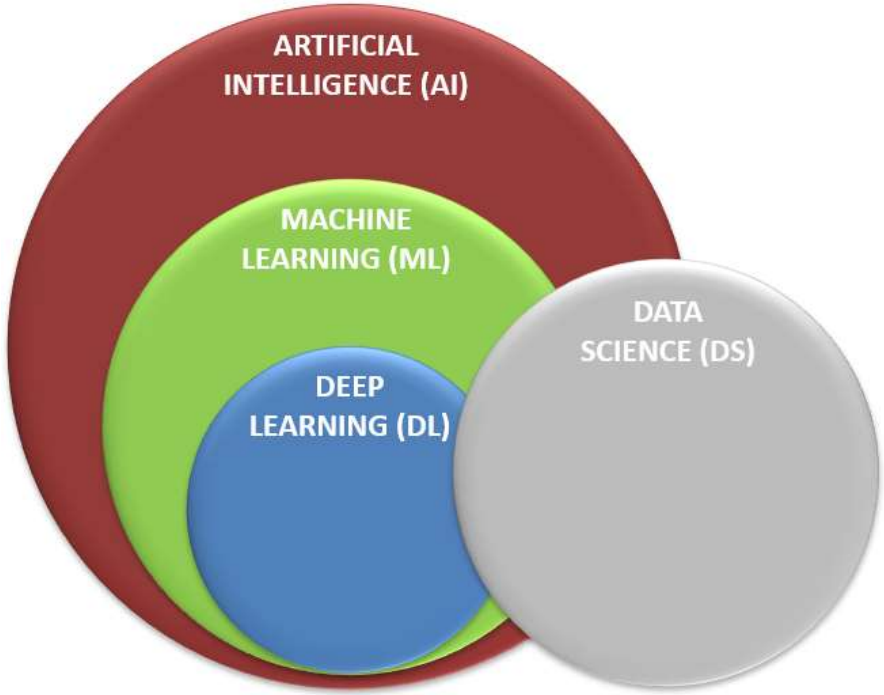
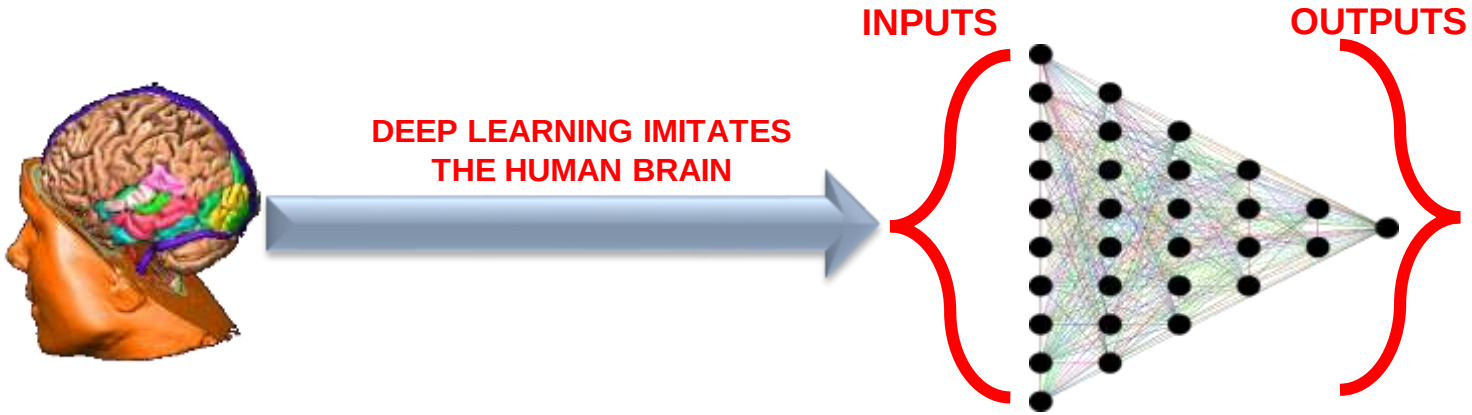


Photo Credit: https://www.flickr.com/photos/mikemacmarketing/30212411048

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.

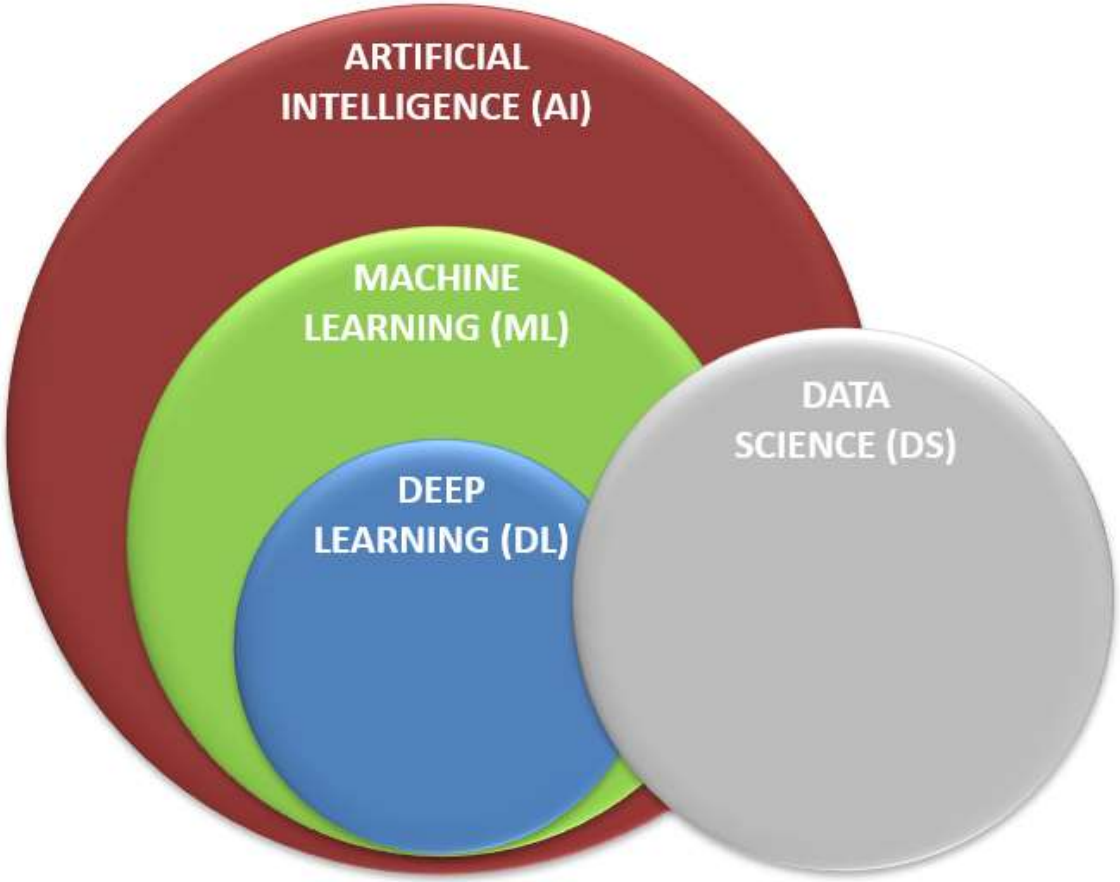




- **Photo Credit:** https://pixabay.com/en/neural-network-thought-mind-mental-3816319/
- **Photo Credit:** https://commons.wikimedia.org/wiki/File:Voxel-man-brain.jpg

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.

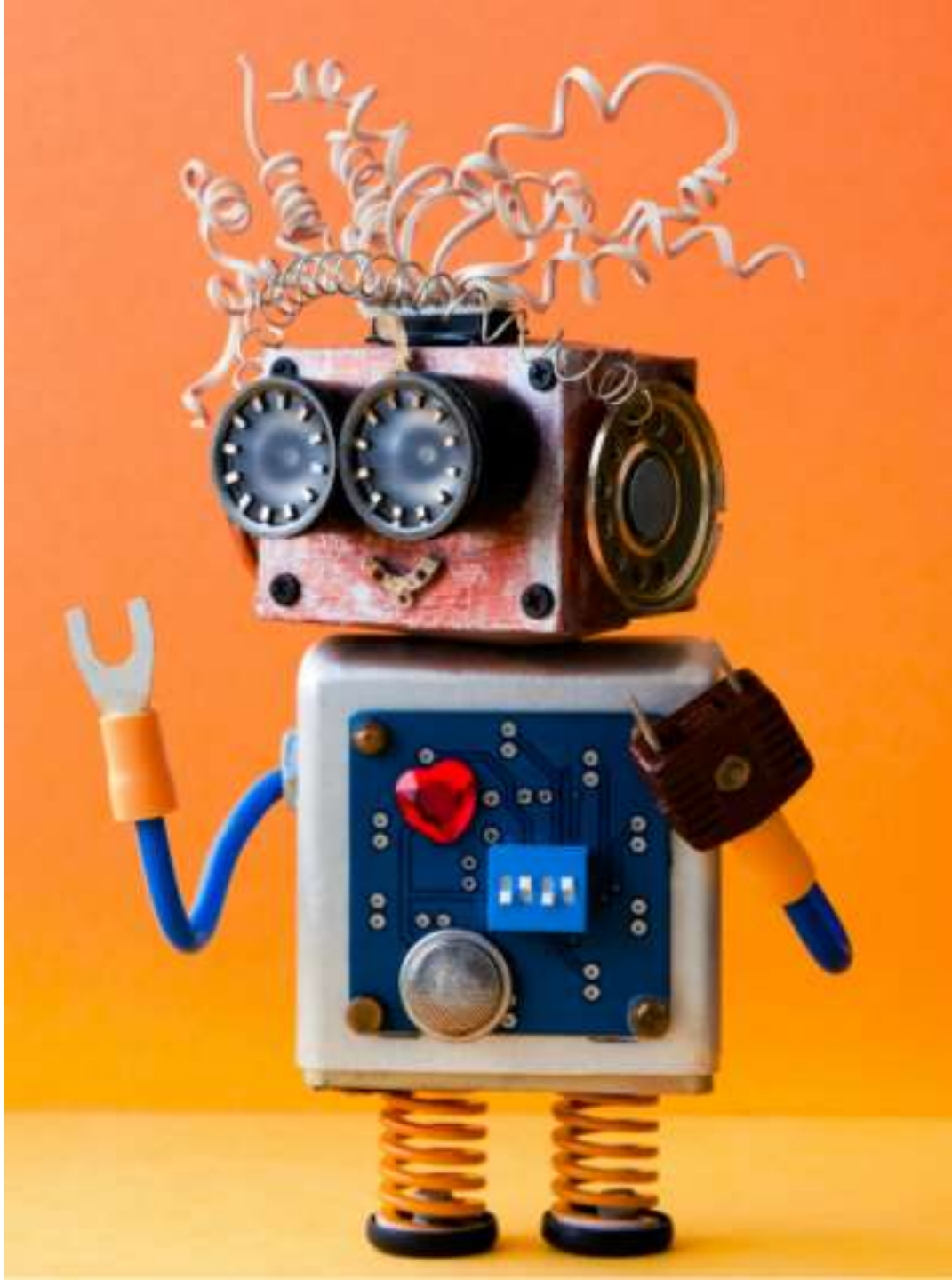


EXAMPLE

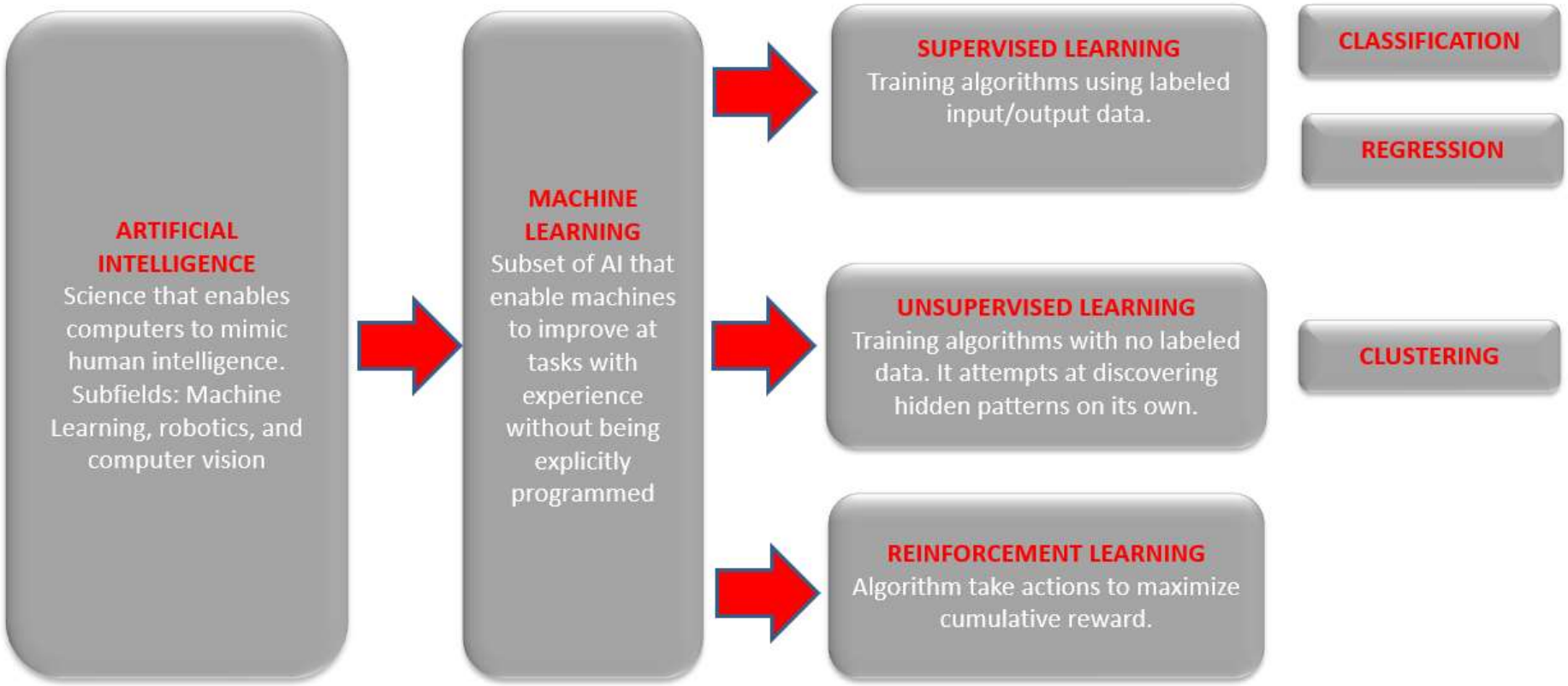
- “Understanding The Difference Between AI, ML, And DL: Using An Incredibly Simple Example” by Gavita Regunath
- Link to blog: https://www.advancinganalytics.co.uk/blog/2021/12/15/understanding-the-difference-between-ai-ml-and-dl-using-an-incredibly-simple-example

MACHINE LEARNING: THE BIG PICTURE

EASY ADVANCED

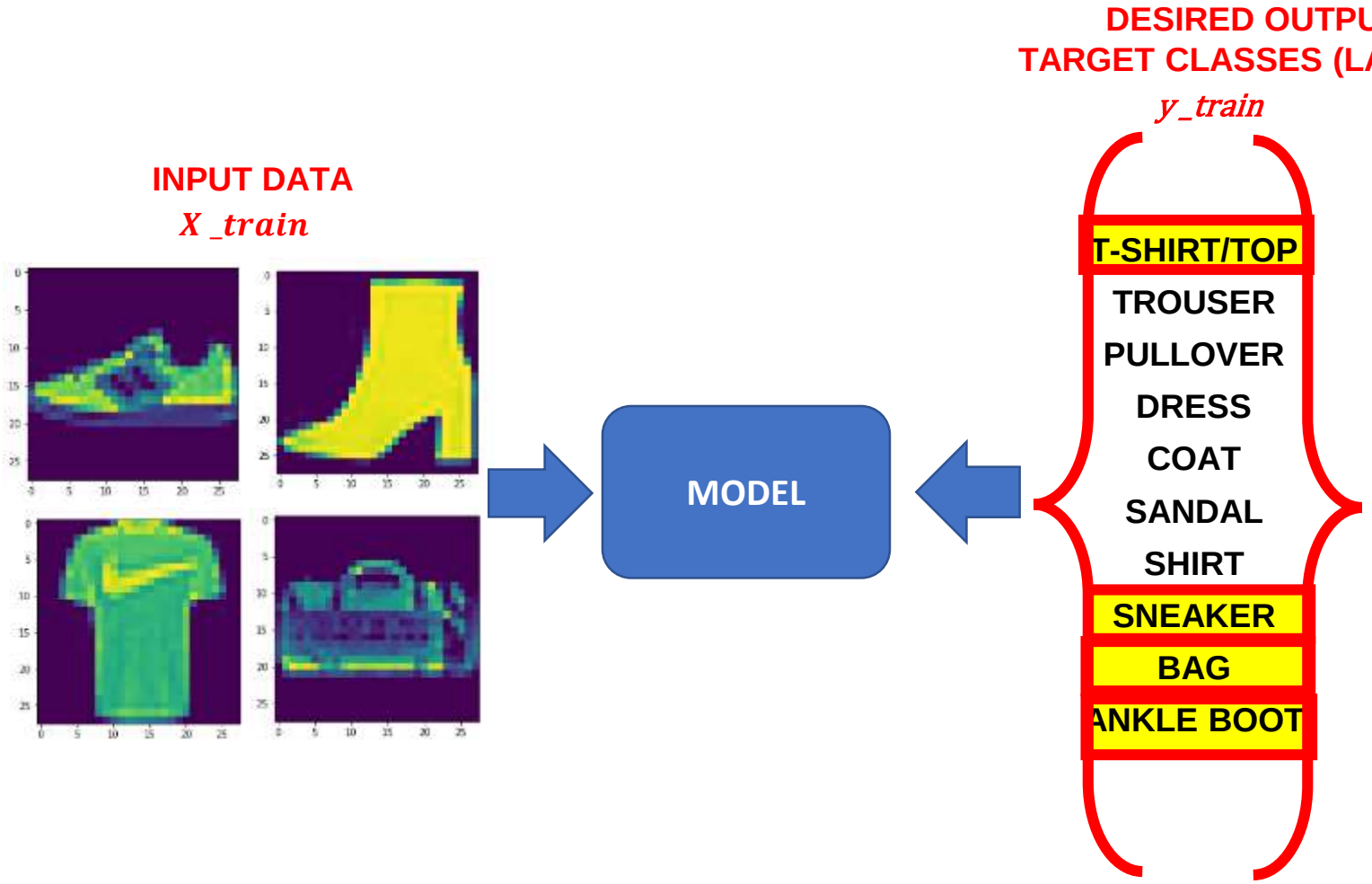


MACHINE LEARNING: BIG PICTURE



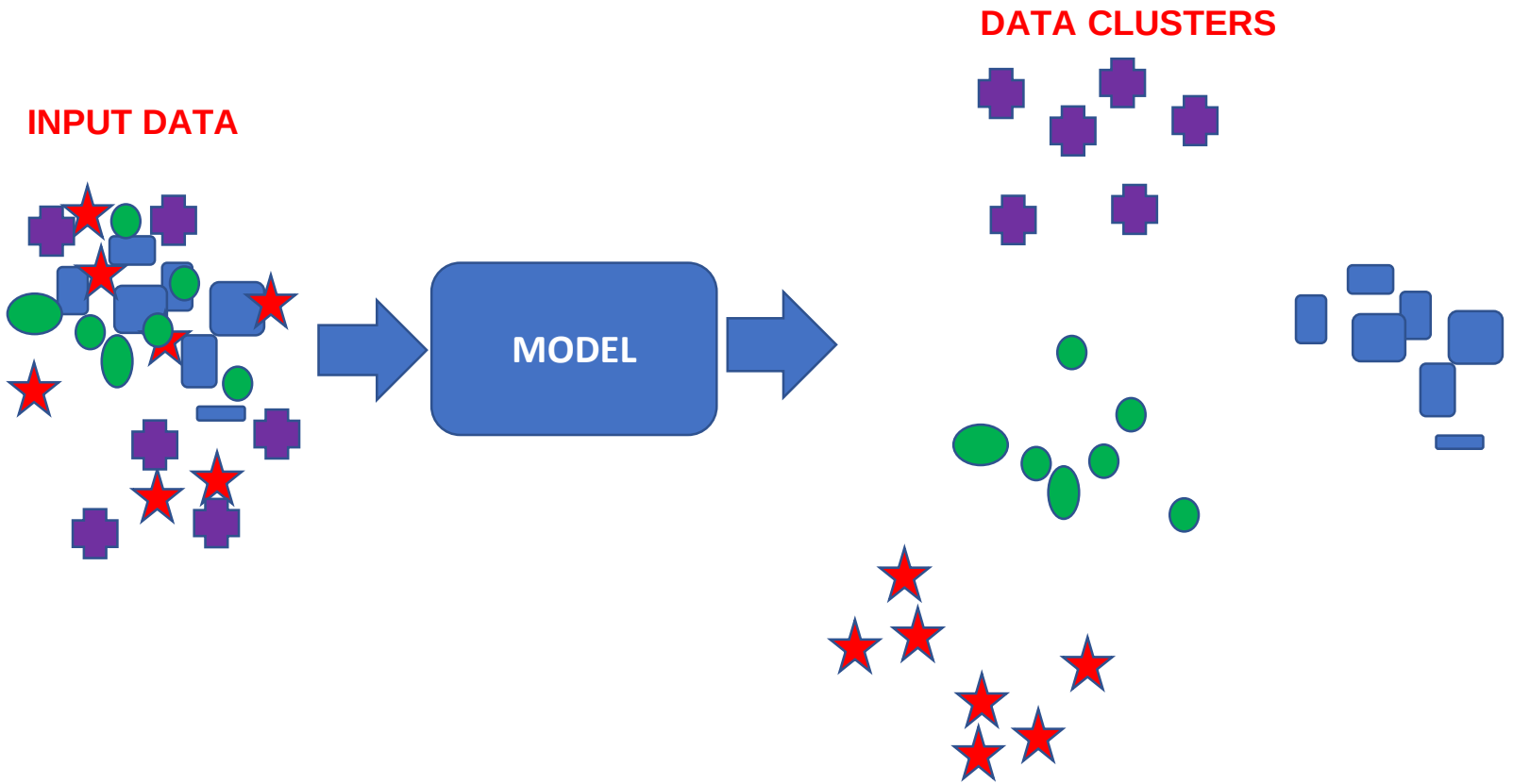
MACHINE LEARNING: SUPERVISED LEARNING

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



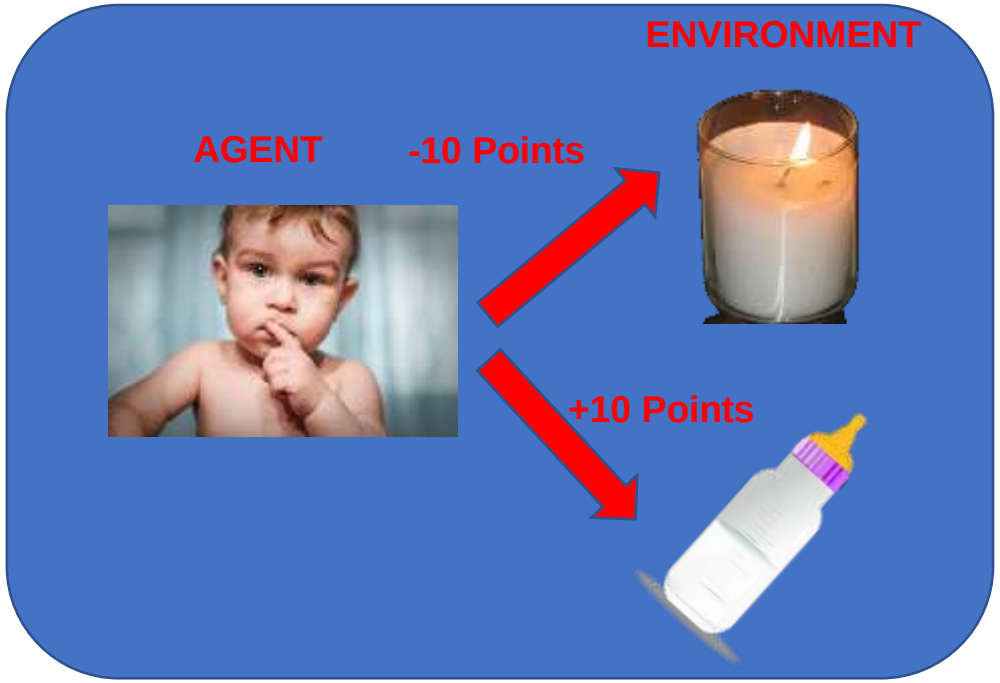
MACHINE LEARNING: UNSUPERVISED LEARNING

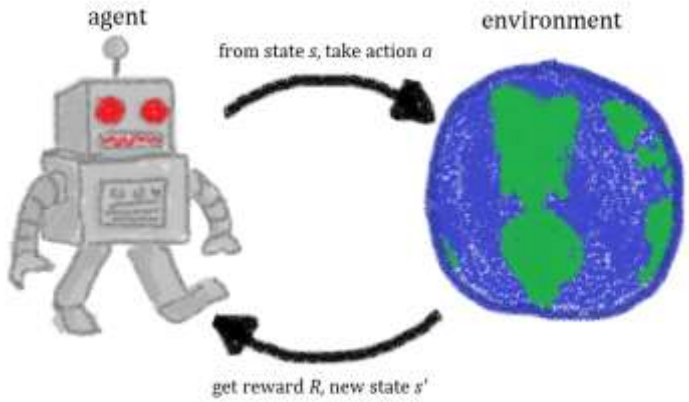
- Unsupervised learning: provides the algorithm with no labeled data.
- The algorithm attempts at discovering hidden patterns within the training data.
- Unsupervised learning methods can analyze complex data that humans might find difficult to interpret.
- No feedback!



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.



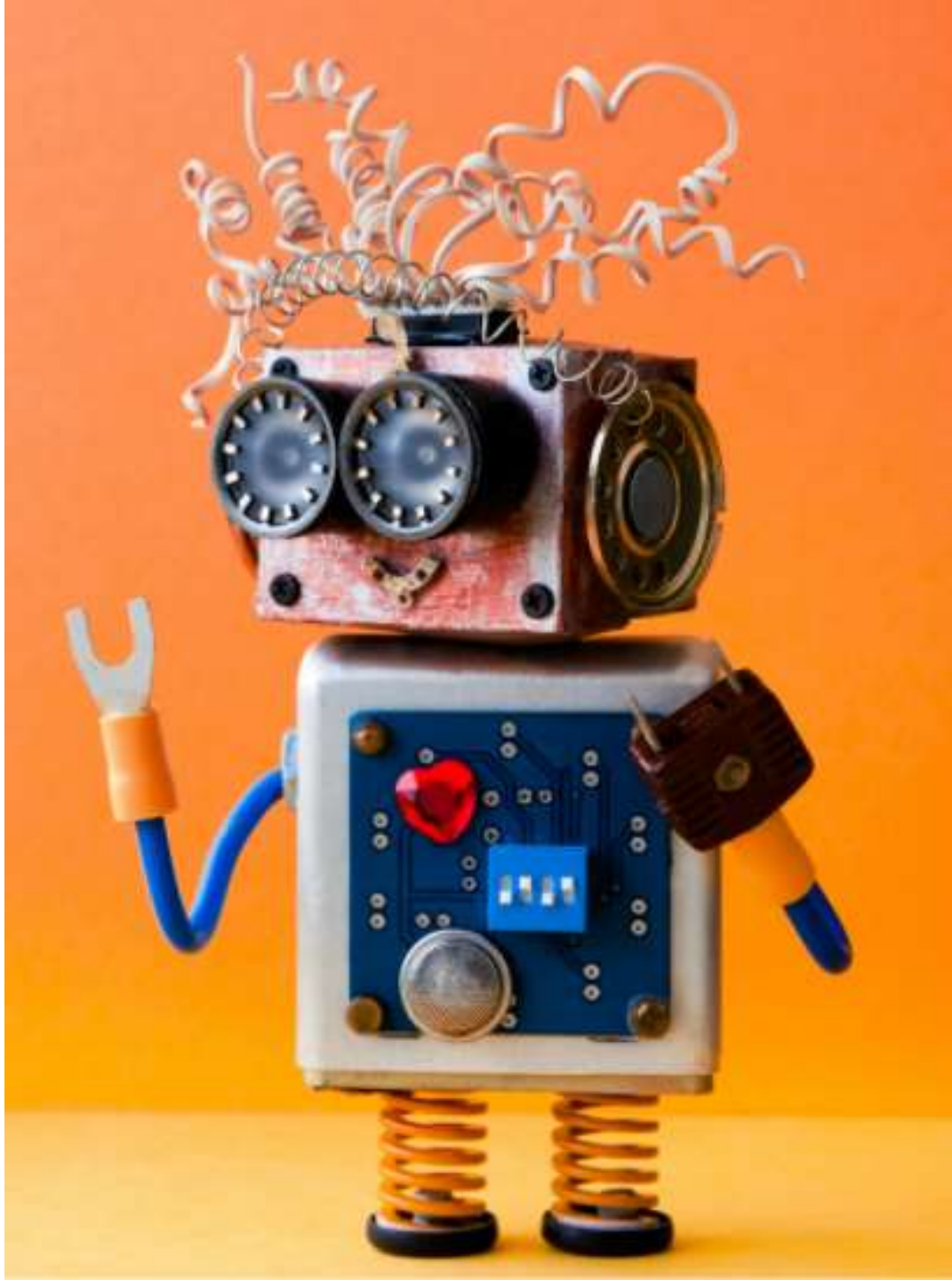


https://commons.wikimedia.org/wiki/File:Rl_agent.png

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

EASY

ADVANCED



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)

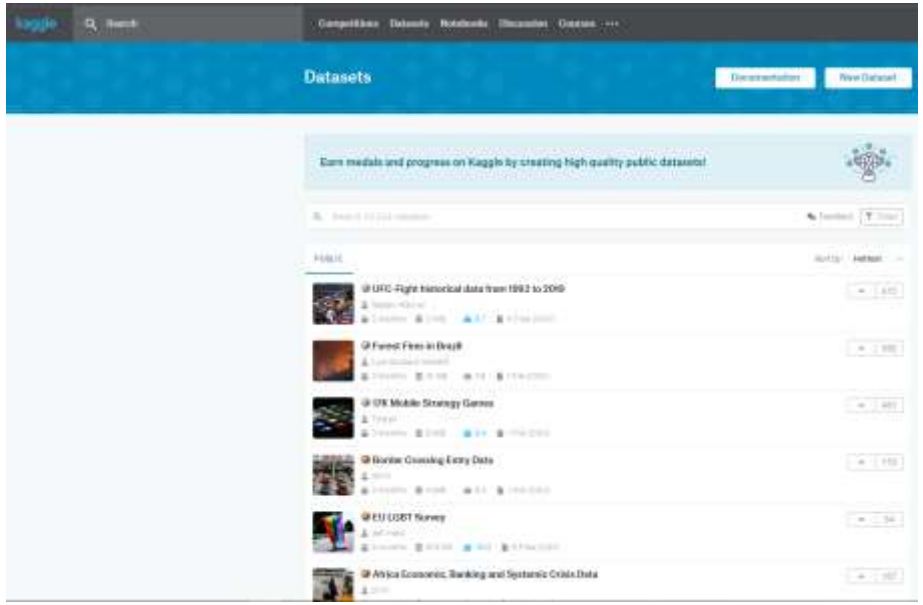
AUDIO/SOUND

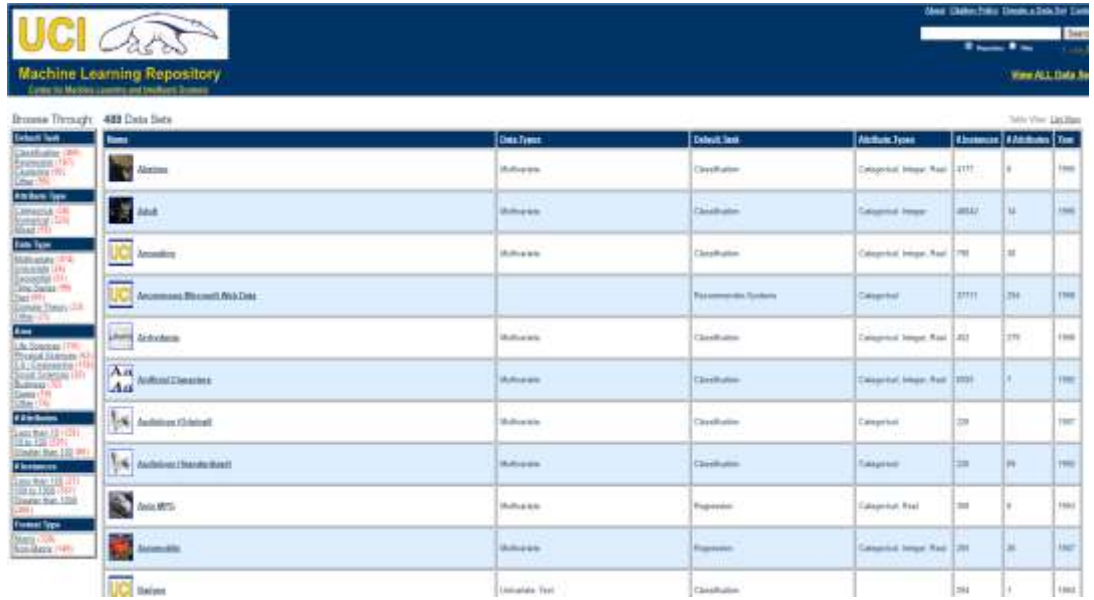
TIMESERIES/SIGNALS

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.

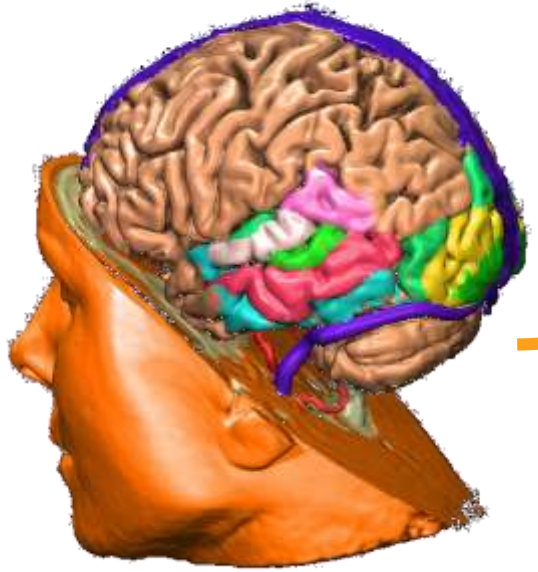




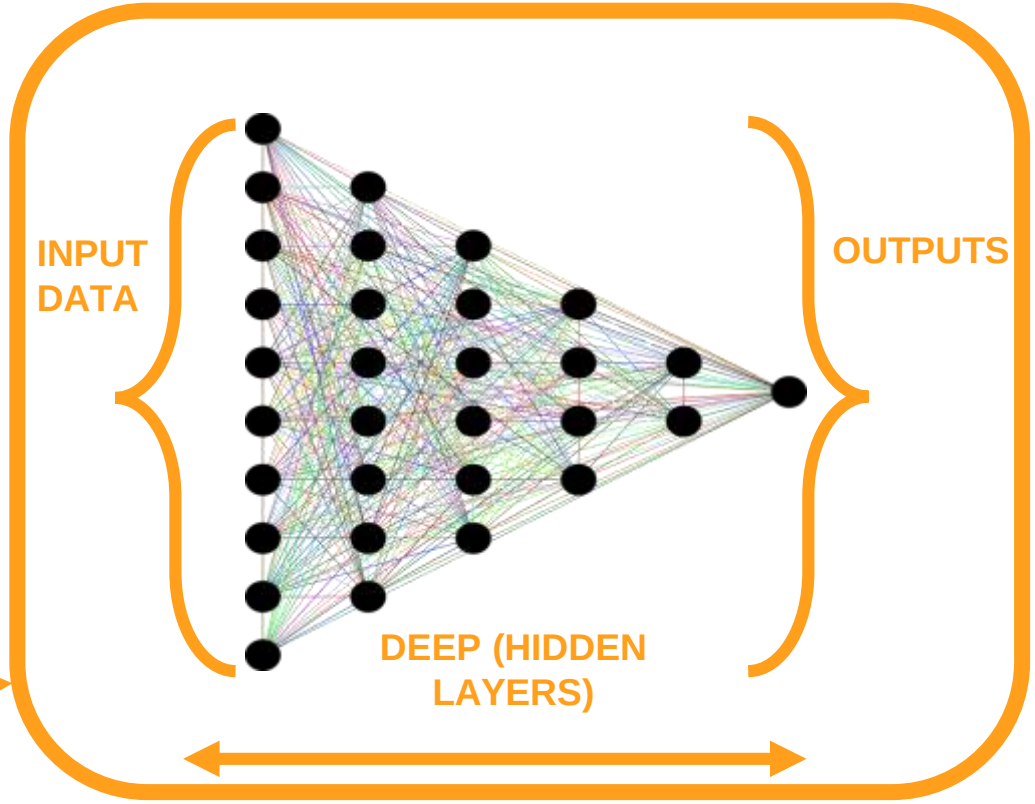
Check out website here: https://archive.ics.uci.edu/ml/datasets.php
Check out website here: https://www.kaggle.com/datasets

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



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

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_

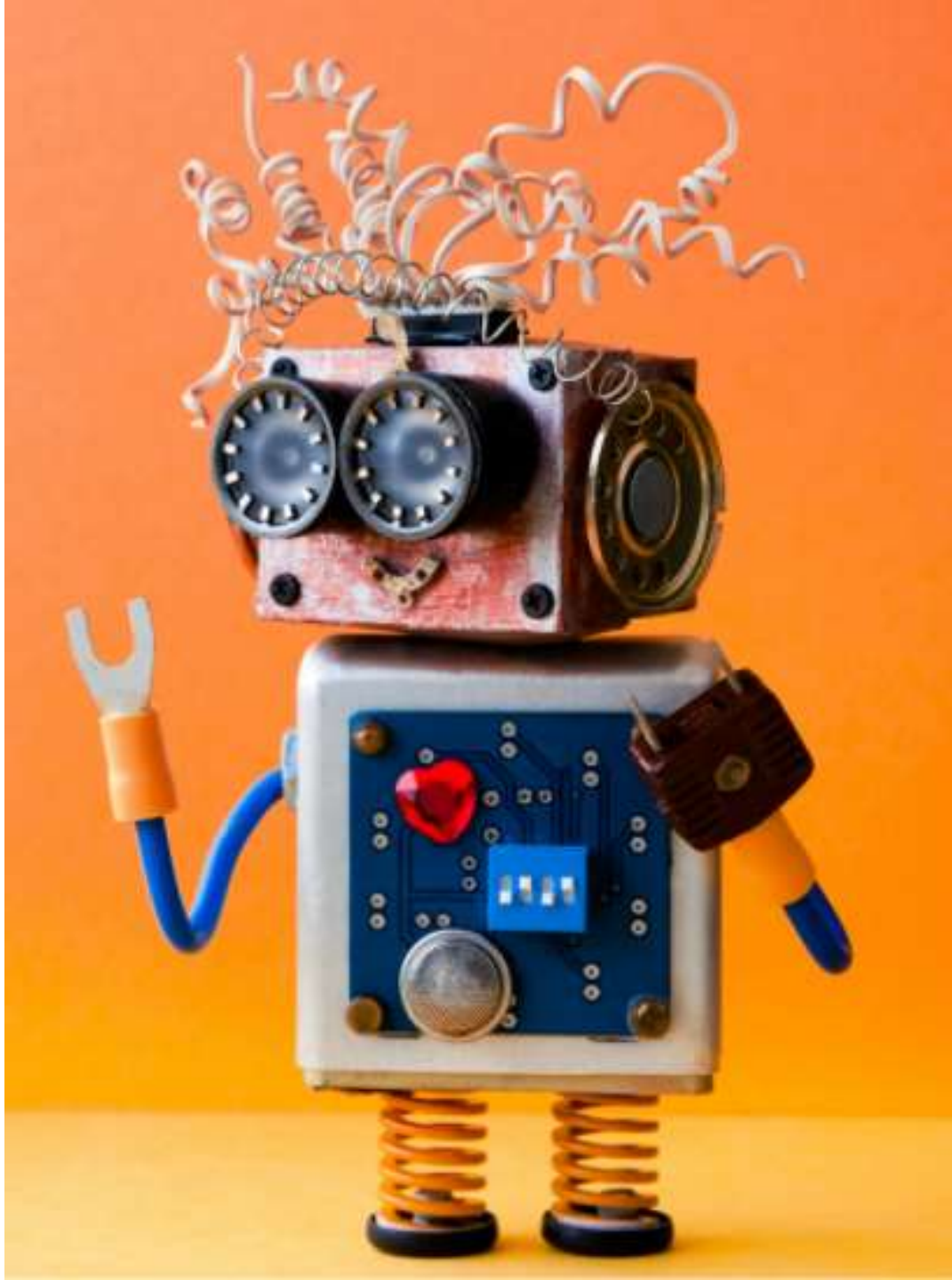
SHARE

"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

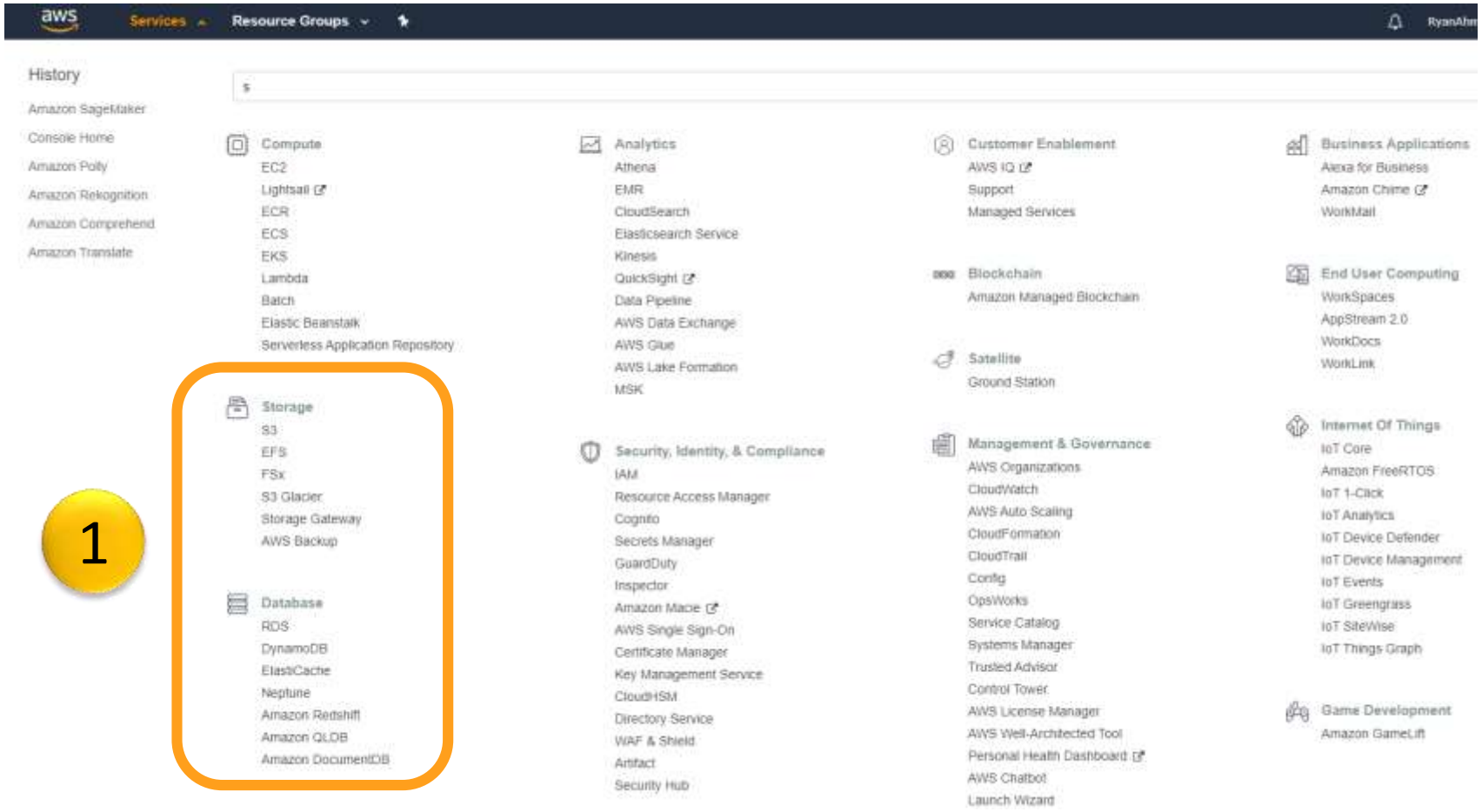
MACHINE LEARNING COMPONENTS IN AWS

EASY ADVANCED



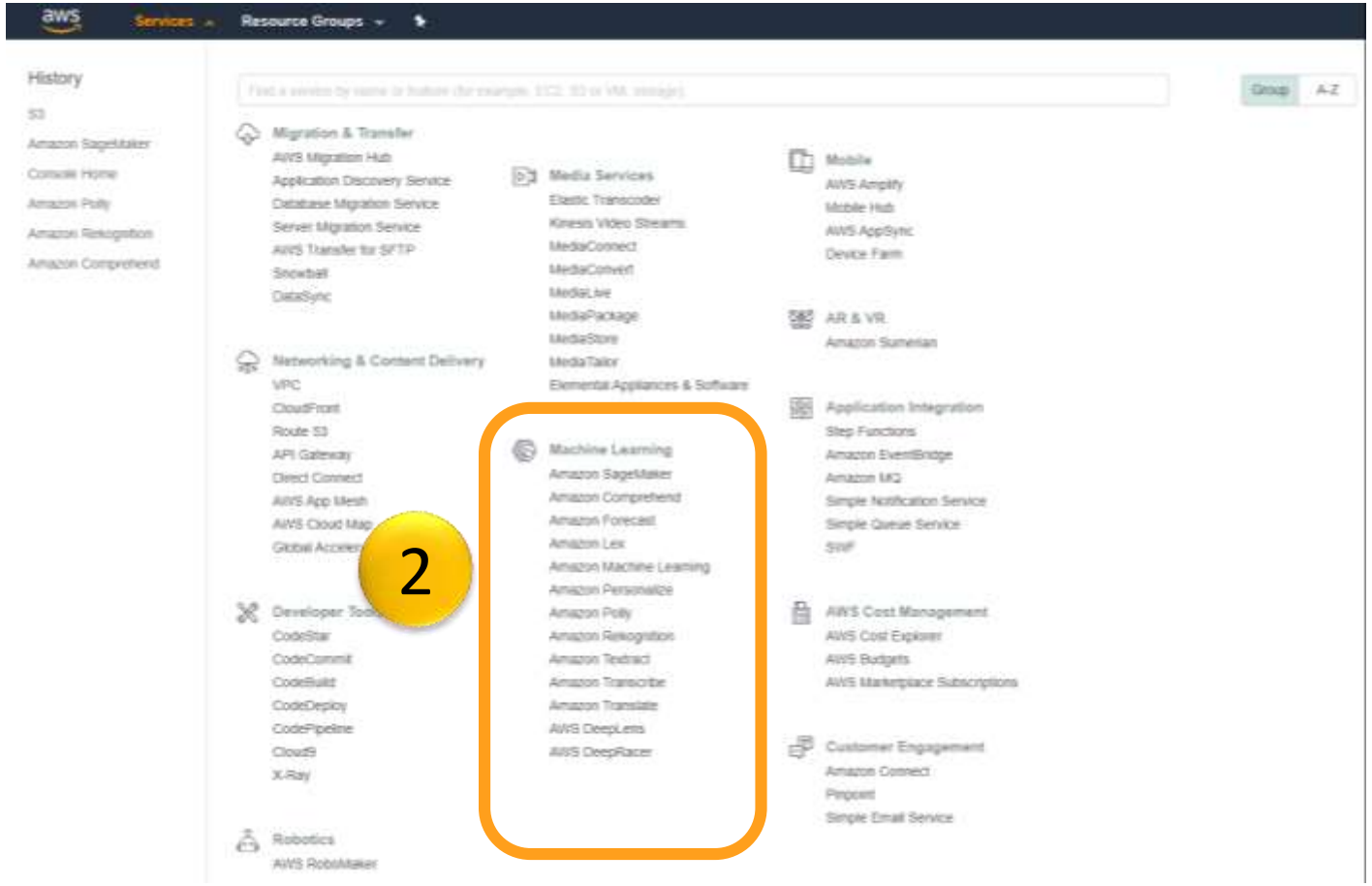
MACHINE LEARNING COMPONENTS IN AWS: 1. DATA

1. DATA + **2. MODEL** + **3. COMPUTE**



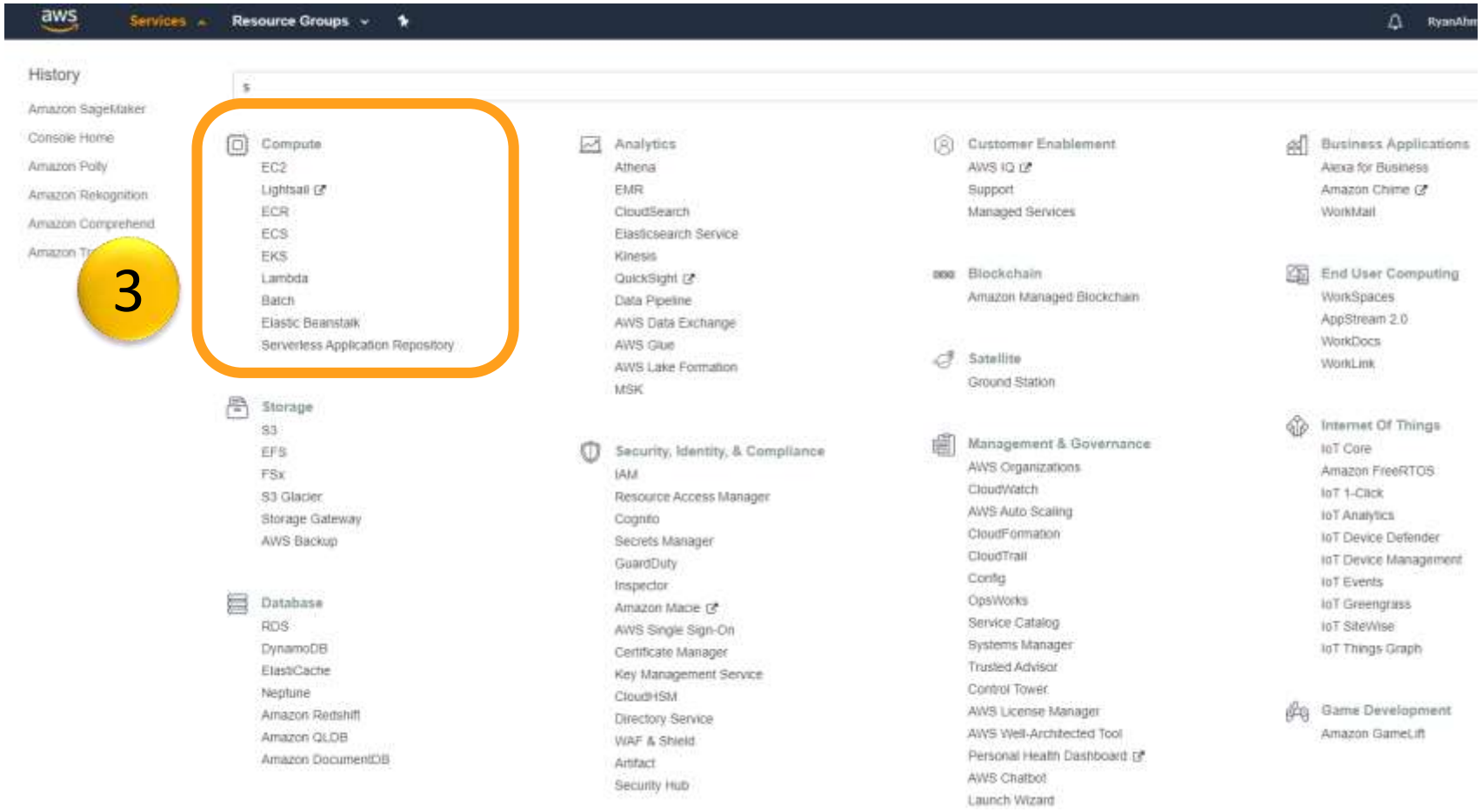
MACHINE LEARNING COMPONENTS IN AWS: 2. MODEL

1. DATA + 2. MODEL + 3. COMPUTE



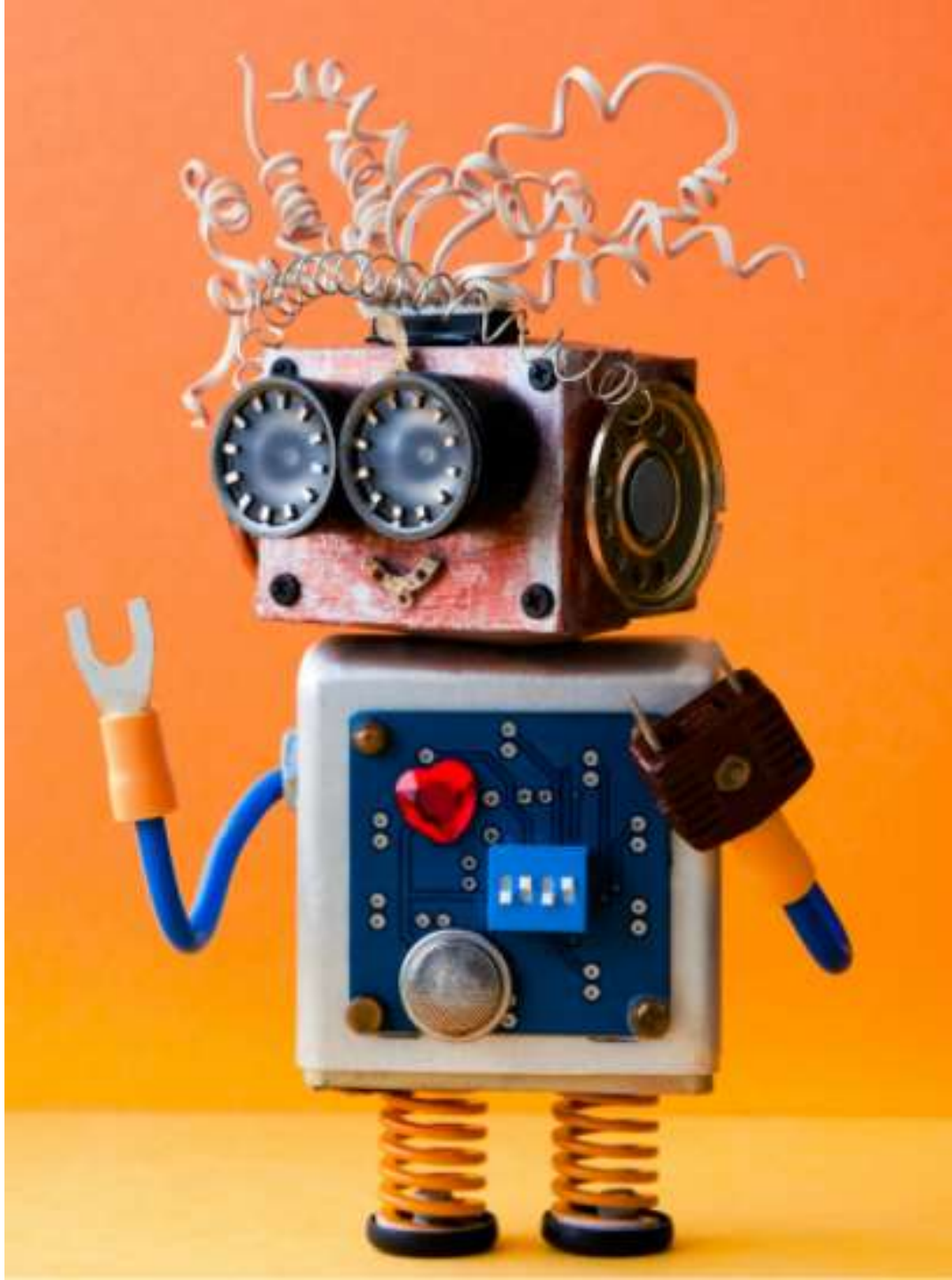
MACHINE LEARNING COMPONENTS IN AWS: 3. COMPUTE

1. DATA + **2. MODEL** + **3. COMPUTE**



AMAZON SIMPLE STORAGE SERVICE (S3)

EASY ADVANCED



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

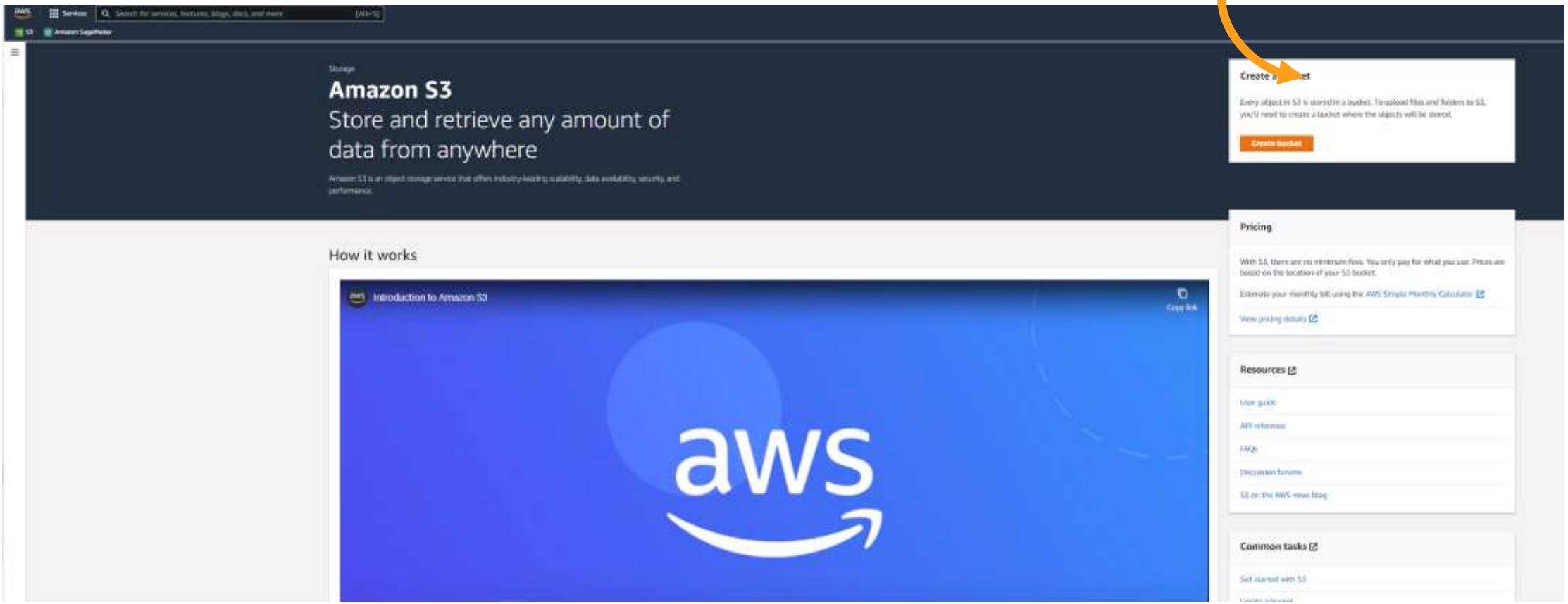
WHAT IS AMAZON S3? CONTINUED

- 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=_I14_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

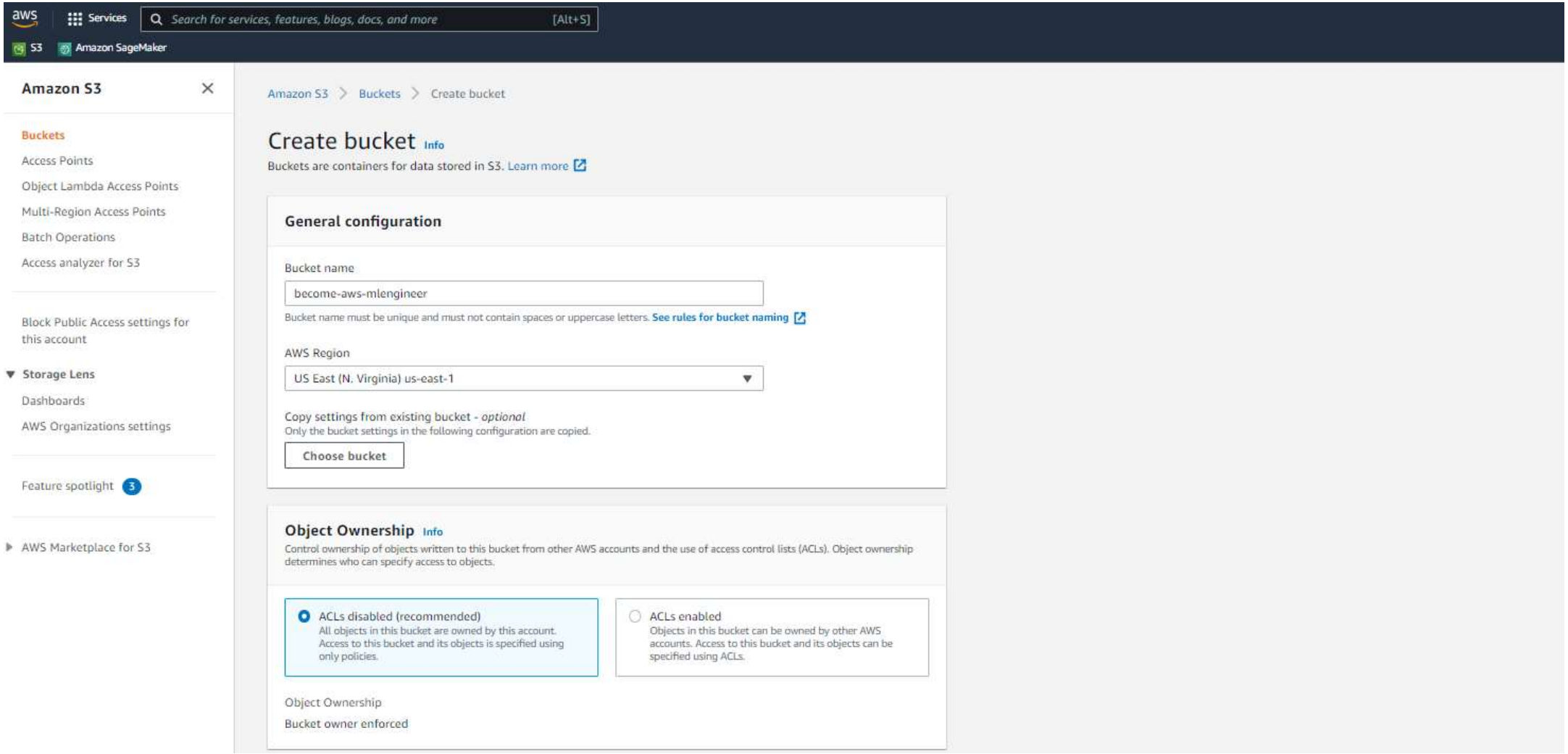
WHAT IS AMAZON S3?

CREATE A BUCKET
AND SIMPLY UPLOAD
DATA TO IT

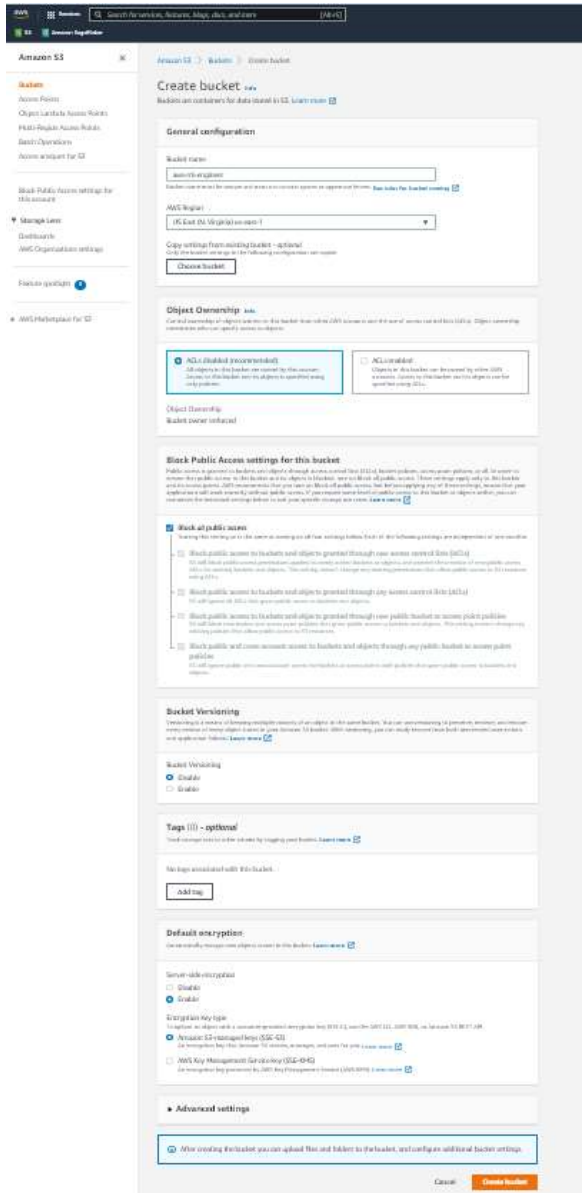


DEMO: AWS MANAGEMENT CONSOLE

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

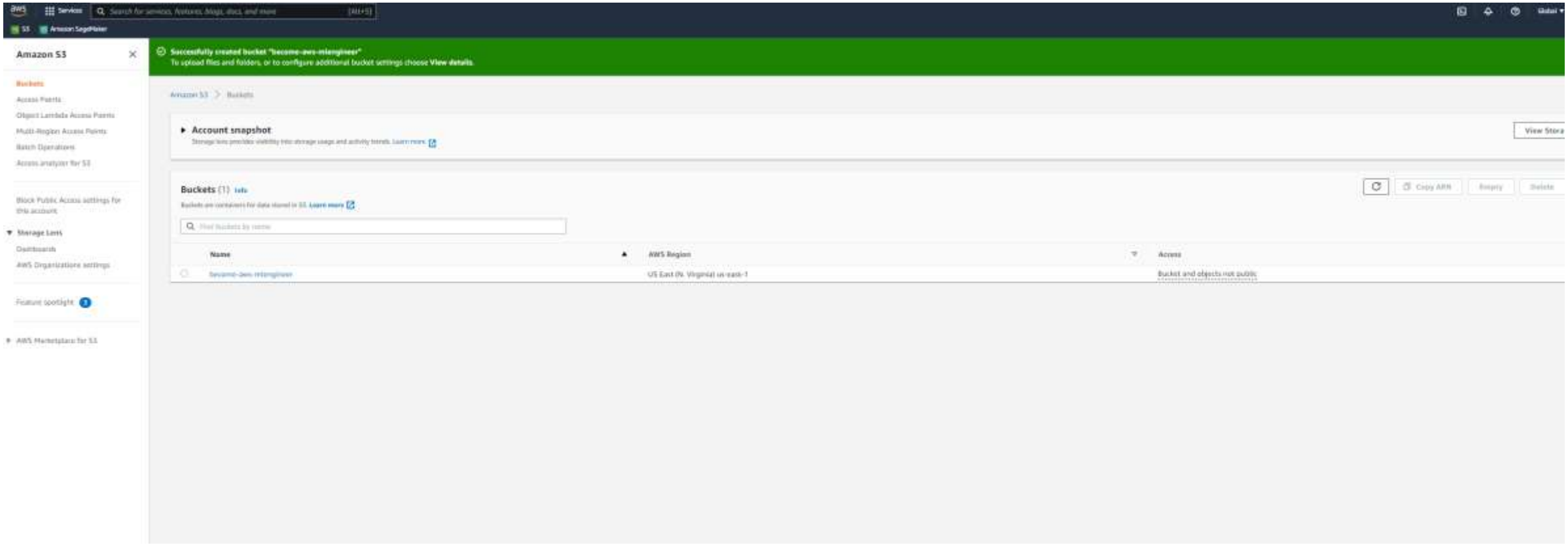


DEMO: AWS MANAGEMENT CONSOLE



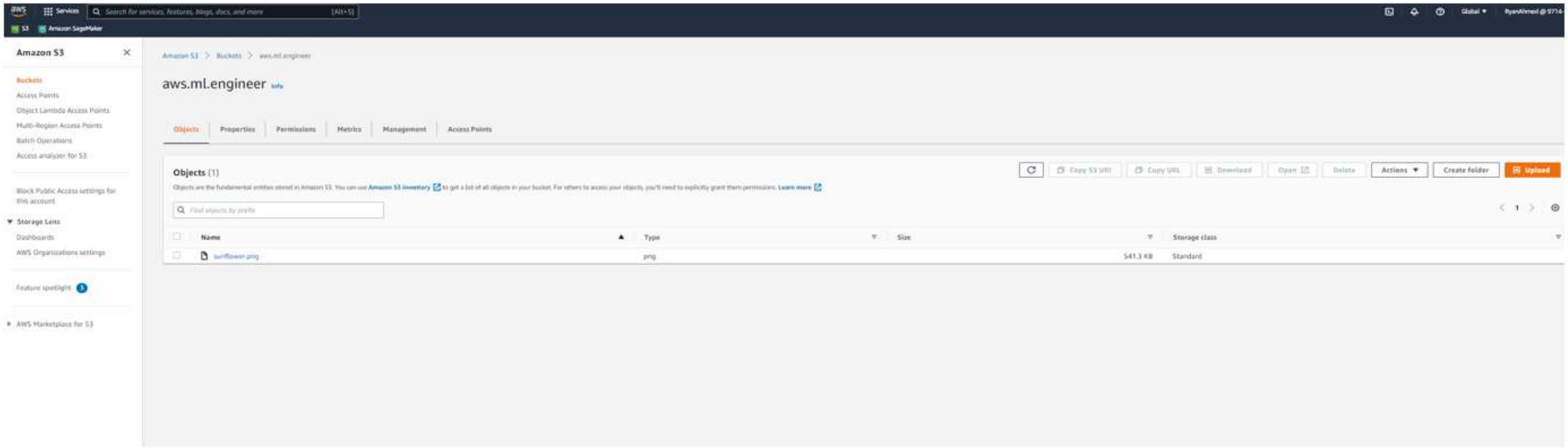
DEMO: AWS MANAGEMENT CONSOLE

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



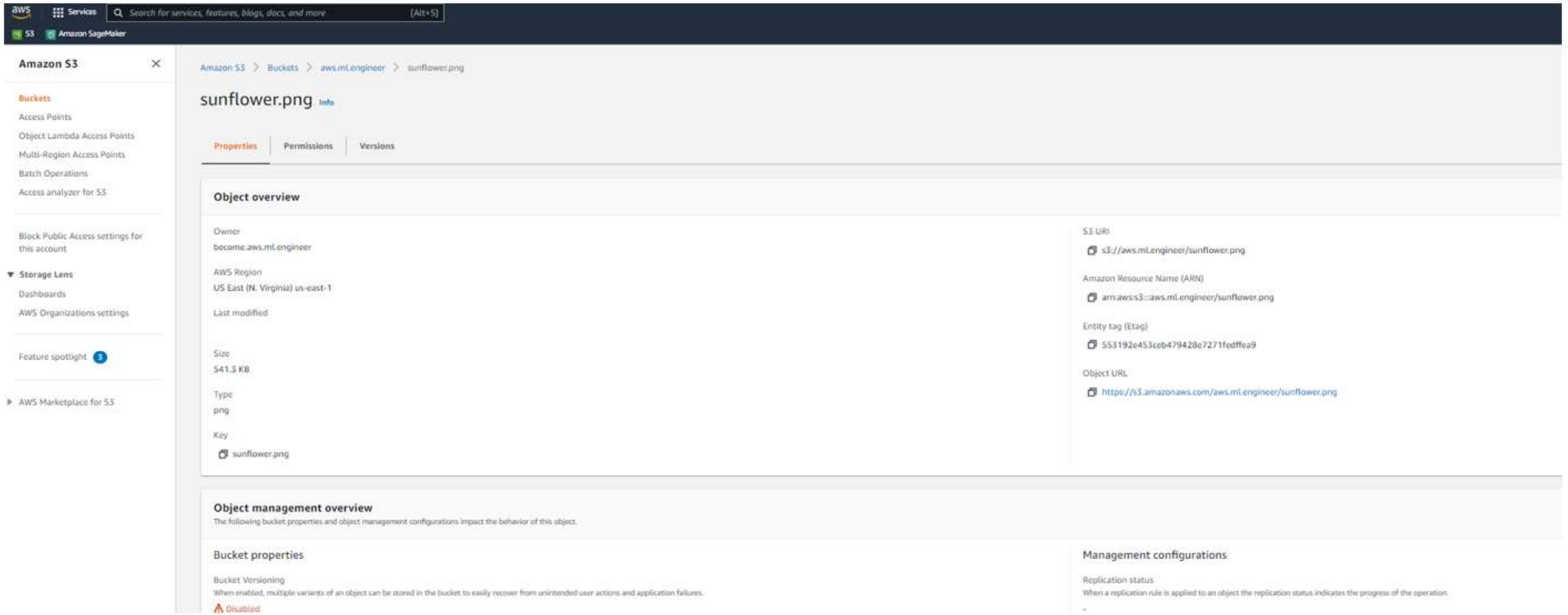
DEMO: AWS MANAGEMENT CONSOLE

UPLOAD A PNG IMAGE TO THE NEWLY CREATED BUCKET



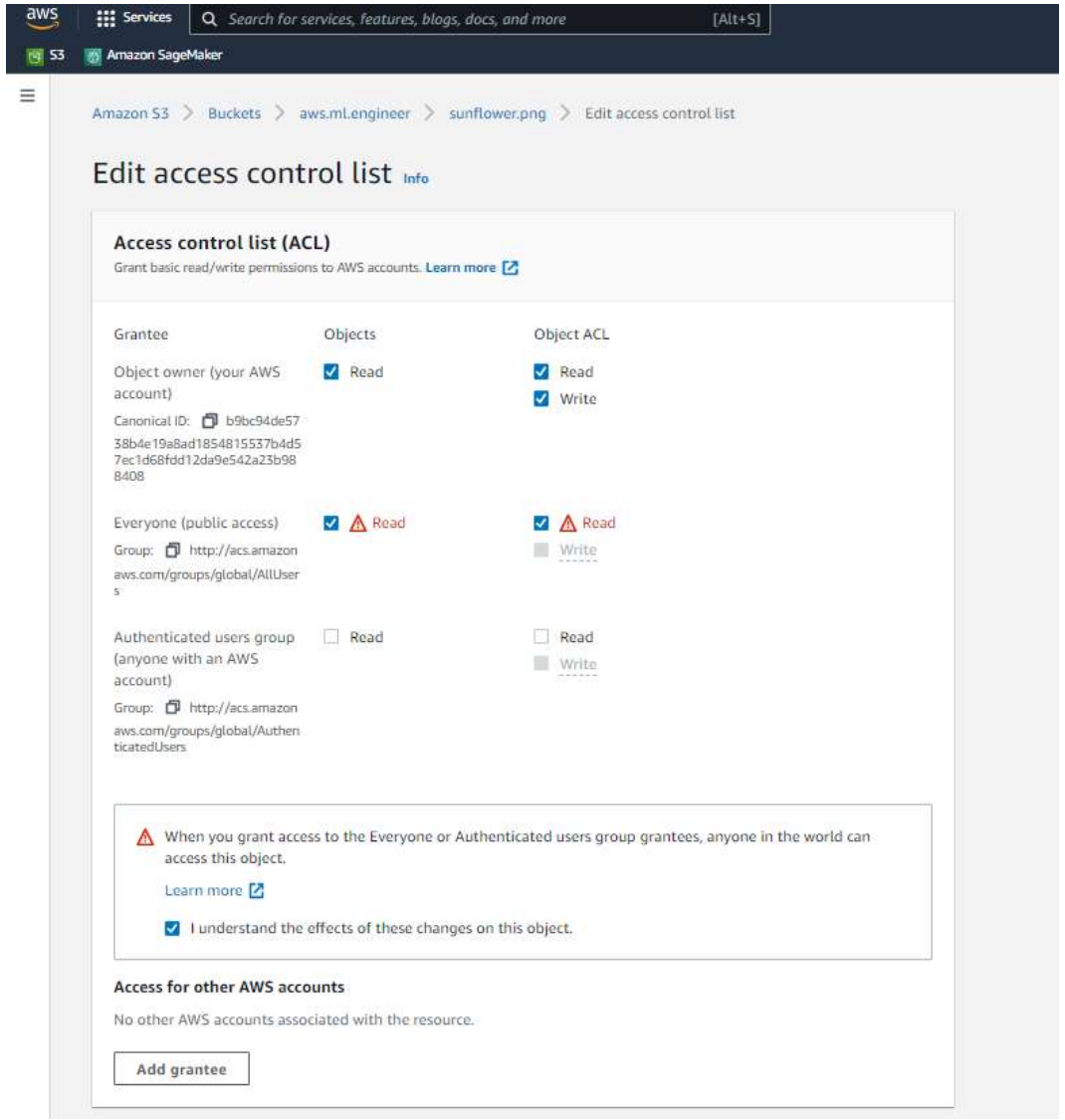
DEMO: AWS MANAGEMENT CONSOLE

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



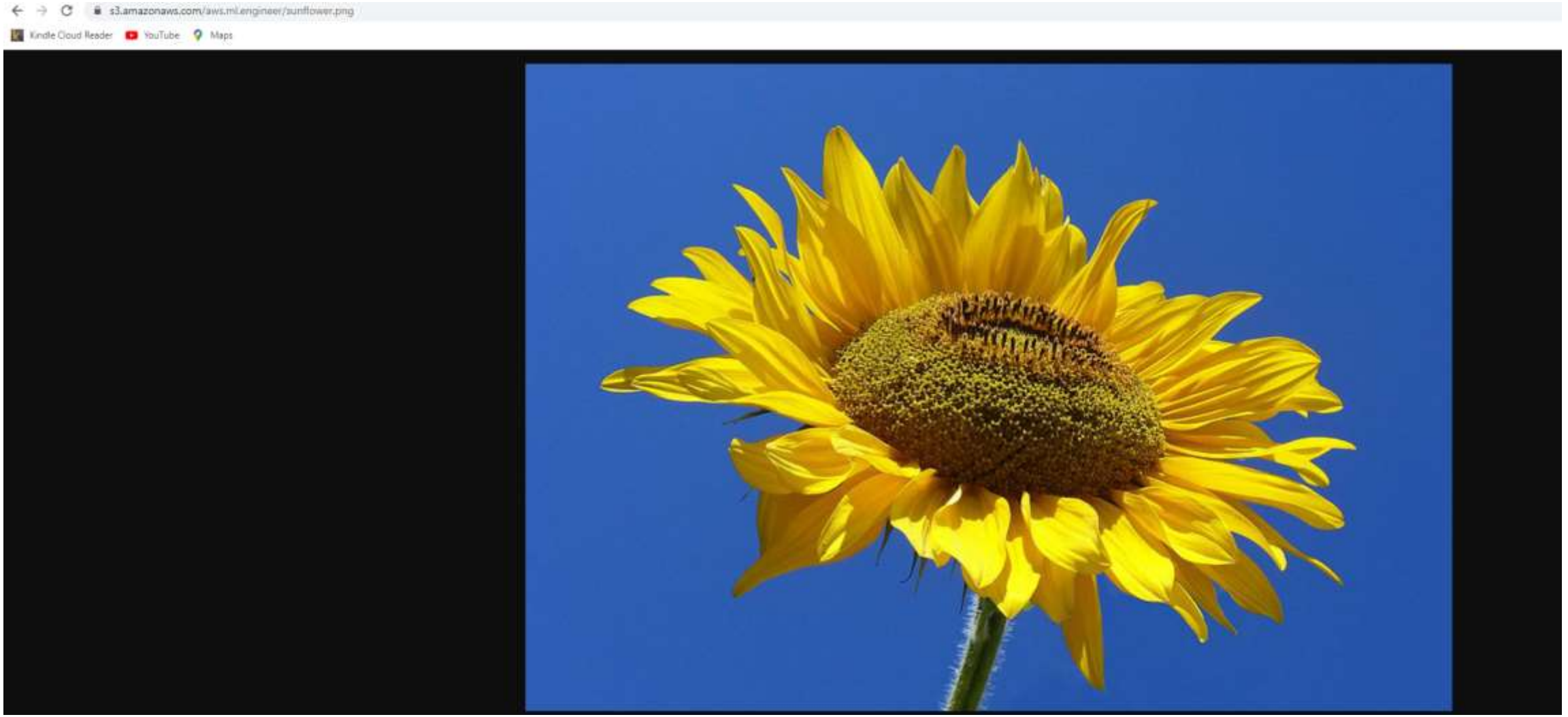
DEMO: AWS MANAGEMENT CONSOLE

CLICK ON PERMISSIONS AND THEN SELECT READ ACCESS



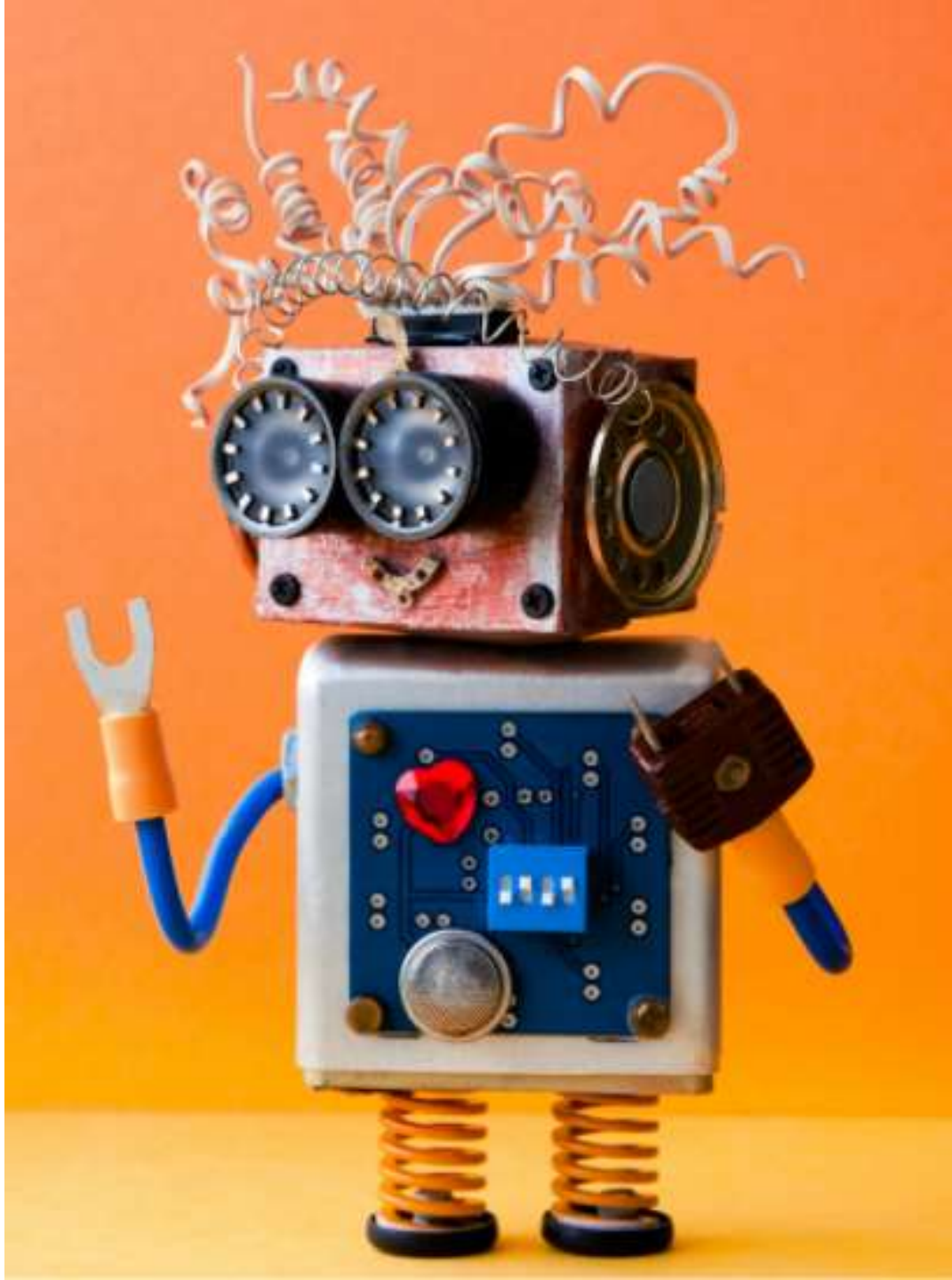
DEMO: AWS MANAGEMENT CONSOLE

NOW YOU SHOULD SEE THE IMAGE



AMAZON ELASTIC COMPUTE CLOUD (EC2)

EASY ADVANCED



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

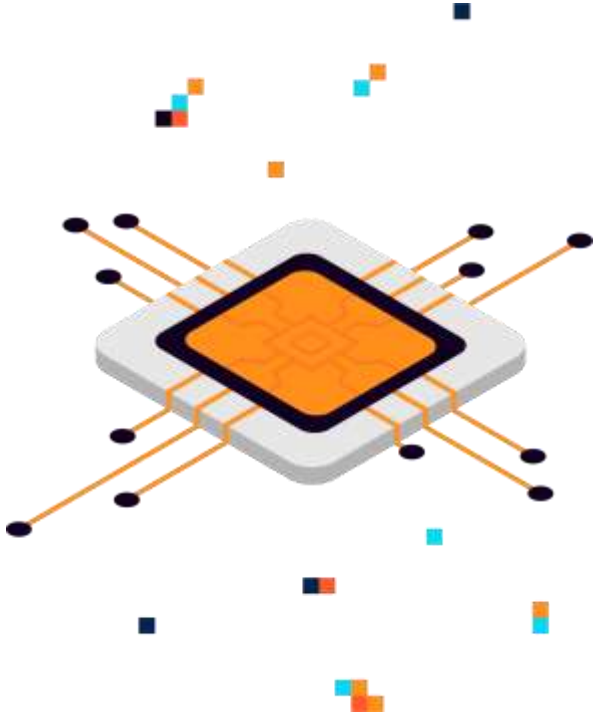


Photo Credit: https://pixabay.com/photos/transistors-gpu-processor-pc-chip-1137502/

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					
ml.t2.medium	2	-	4	-	Low to Moderate
ml.t2.large	2		8		Low to Moderate

MEMORY OPTIMIZED

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

COMPUTE OPTIMIZED

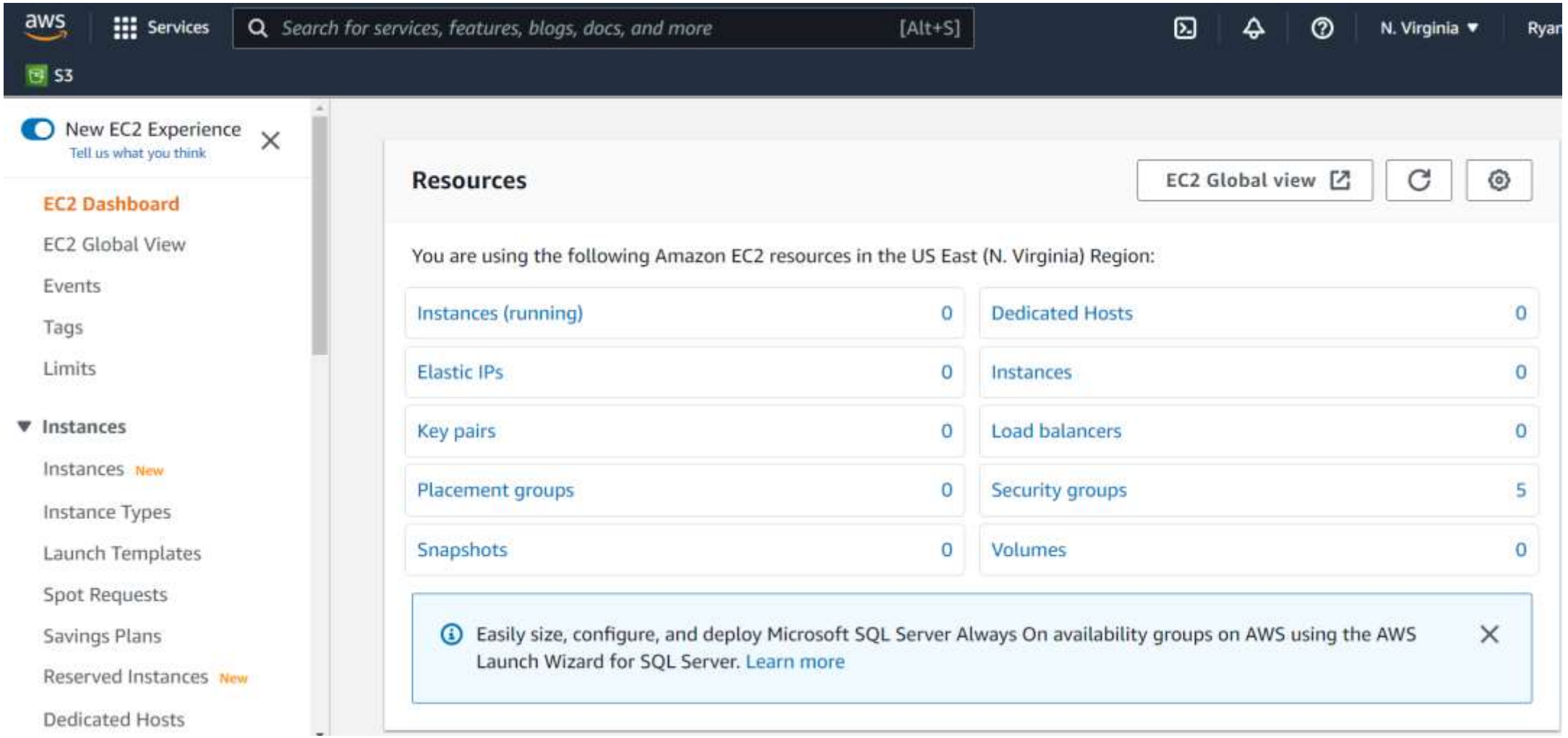
Compute Optimized – Current Generation					
ml.c5.large	2		4		Up to 10 Gbps
ml.c5.xlarge	4	-	8	-	Up to 10 Gbps
ml.c5.2xlarge	8	-	16	-	Up to 10 Gbps
ml.c5.4xlarge	16	-	32	-	Up to 10 Gbps
ml.c5.9xlarge	36	-	72	-	10 Gigabit

ACCELERATED COMPUTING

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

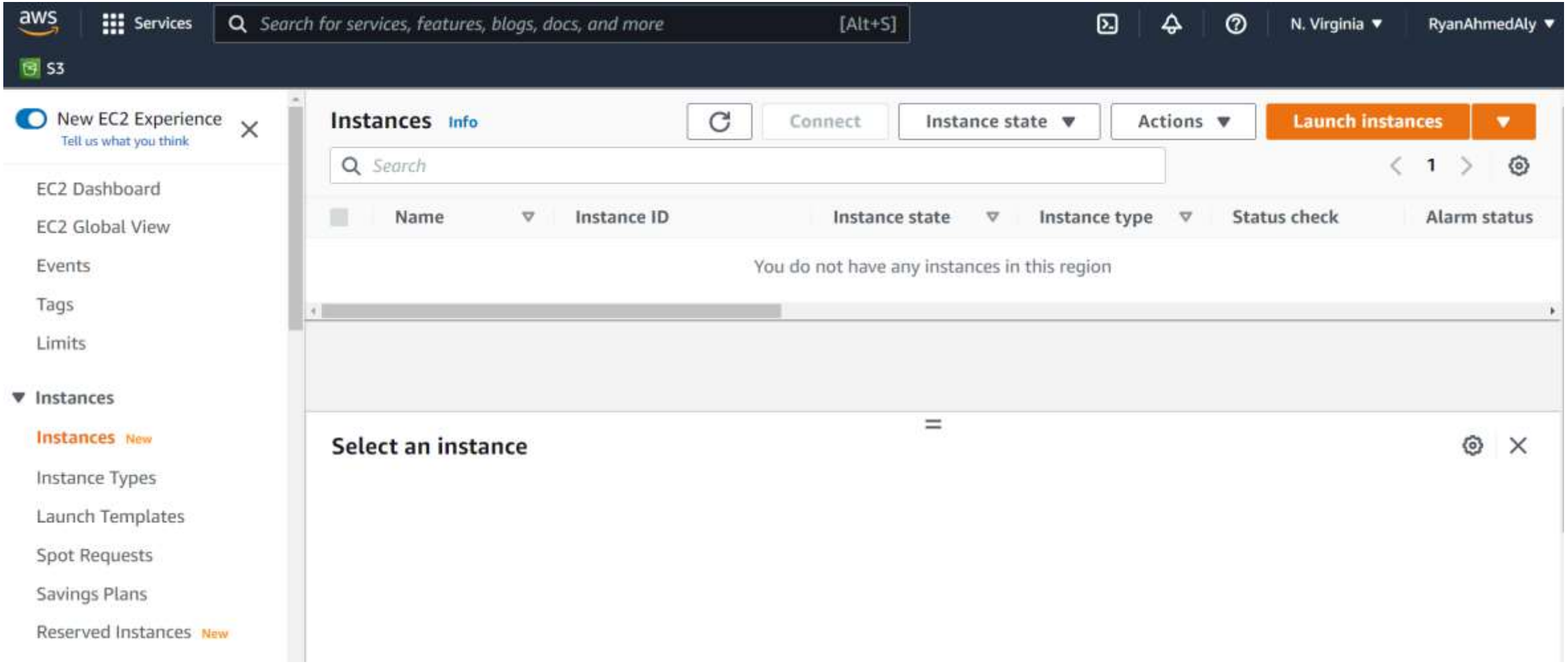
AMAZON EC2: DEMO

NAVIGATE TO EC2 AND CLICK ON INSTANCES



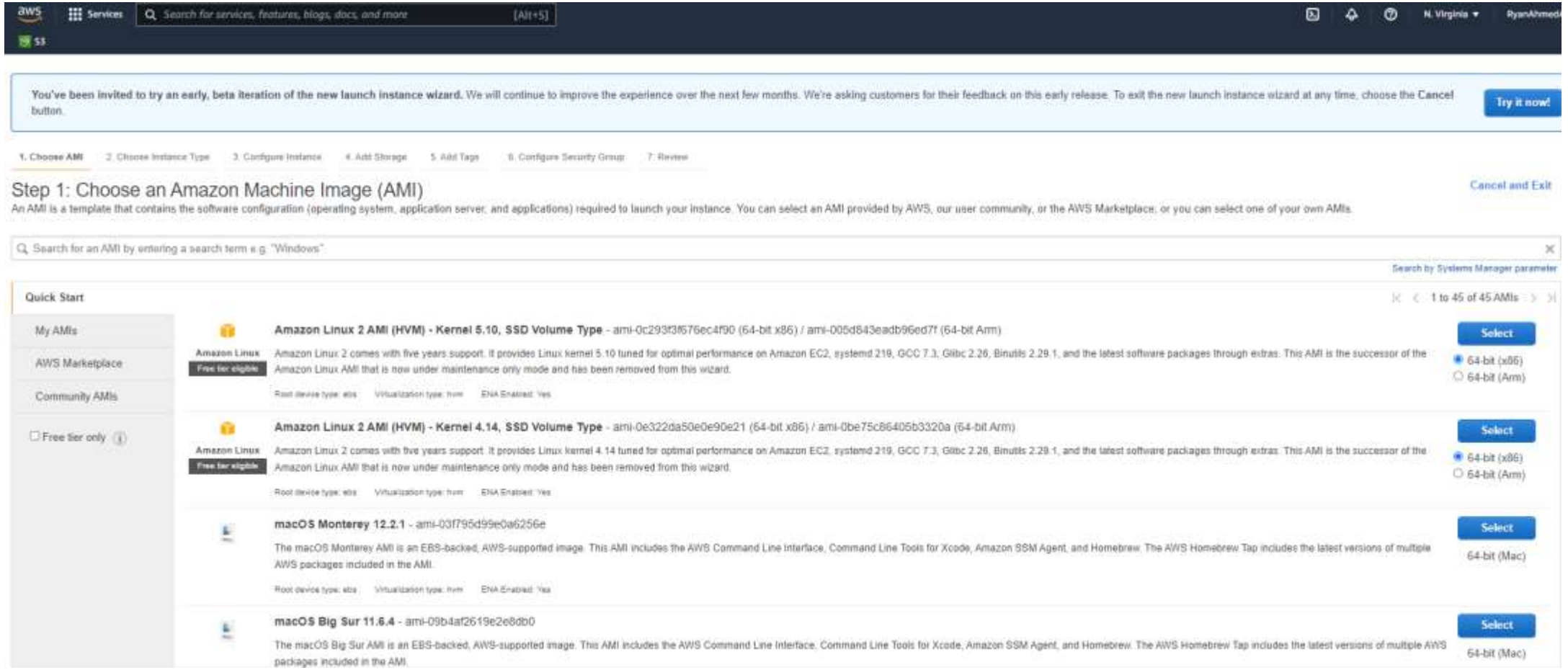
AMAZON EC2: DEMO

CLICK ON LAUNCH INSTANCES



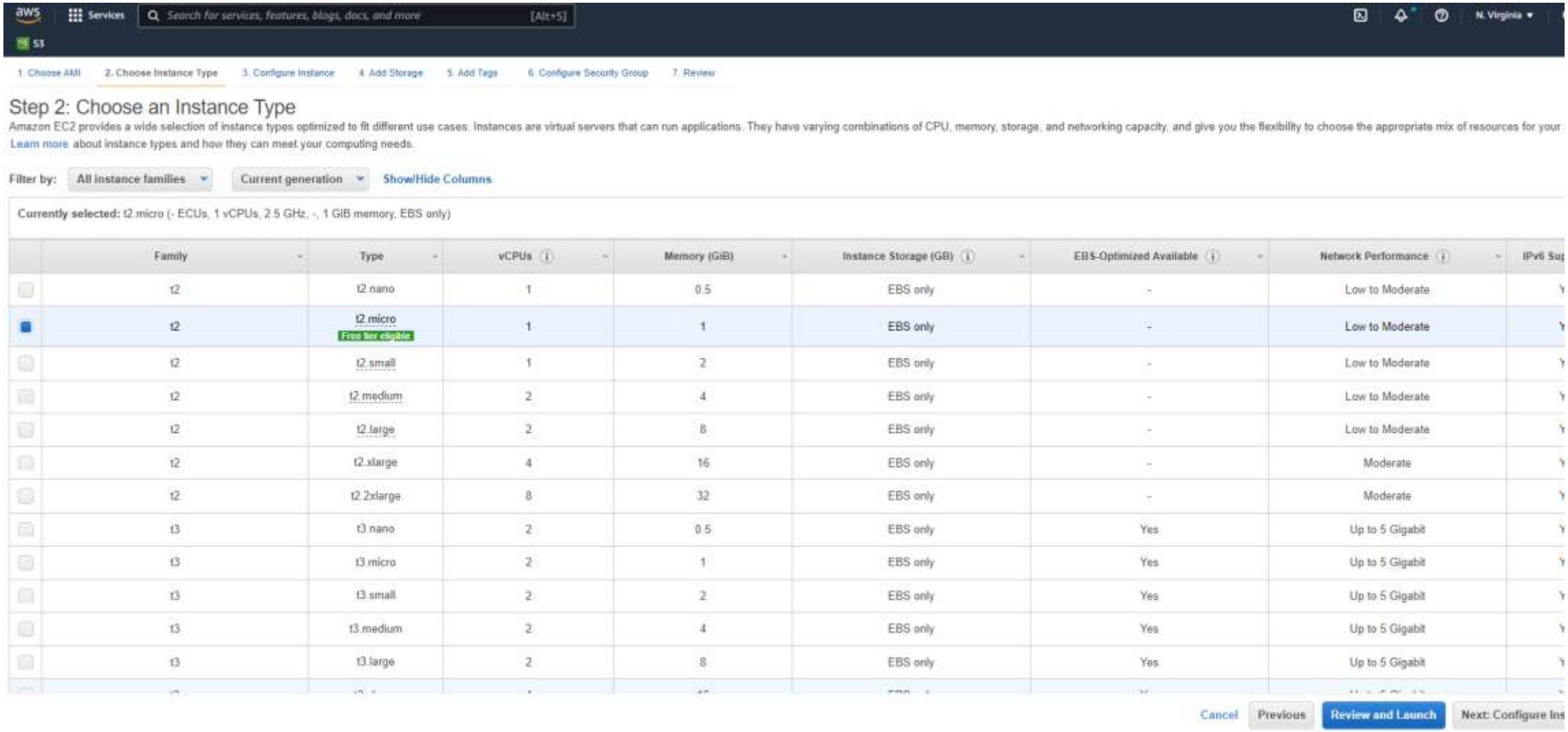
AMAZON EC2: DEMO

CHOOSE THE AMI: MICROSOFT WINDOWS SERVER 2019 BASE



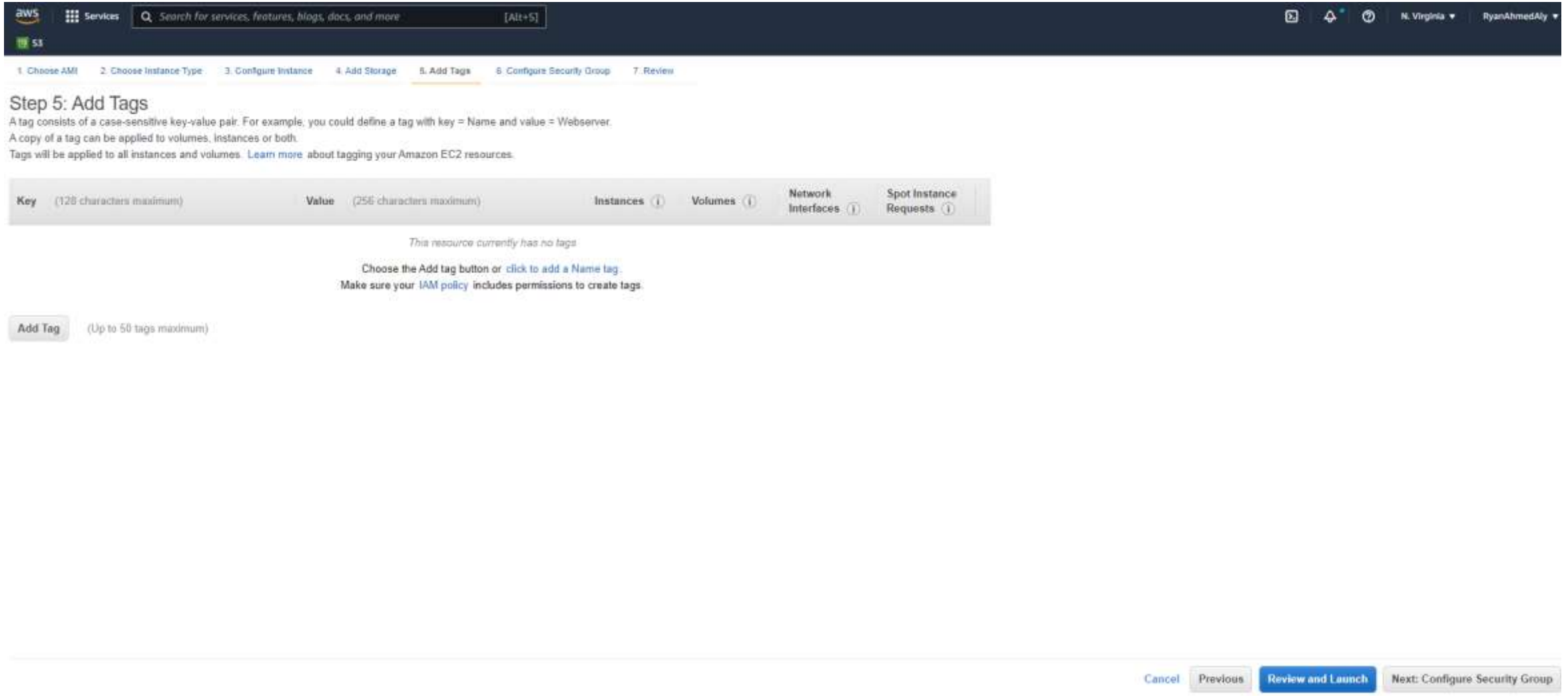
AMAZON EC2: DEMO

SELECT t2 MICRO AND CLICK CONFIGURE INSTANCE DETAILS



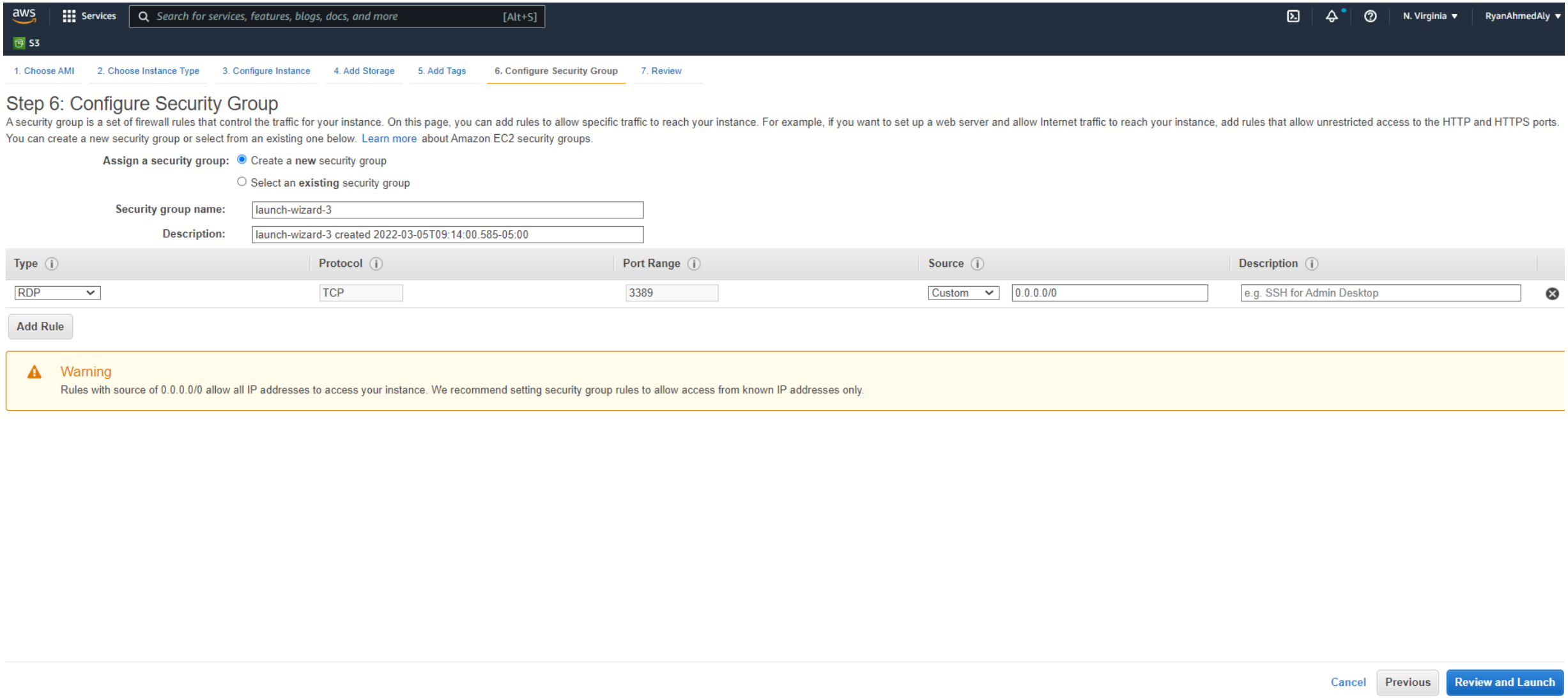
AMAZON EC2: DEMO

SKIP ADD TAGS AND CLICK ON CONFIGURE SECURITY GROUP



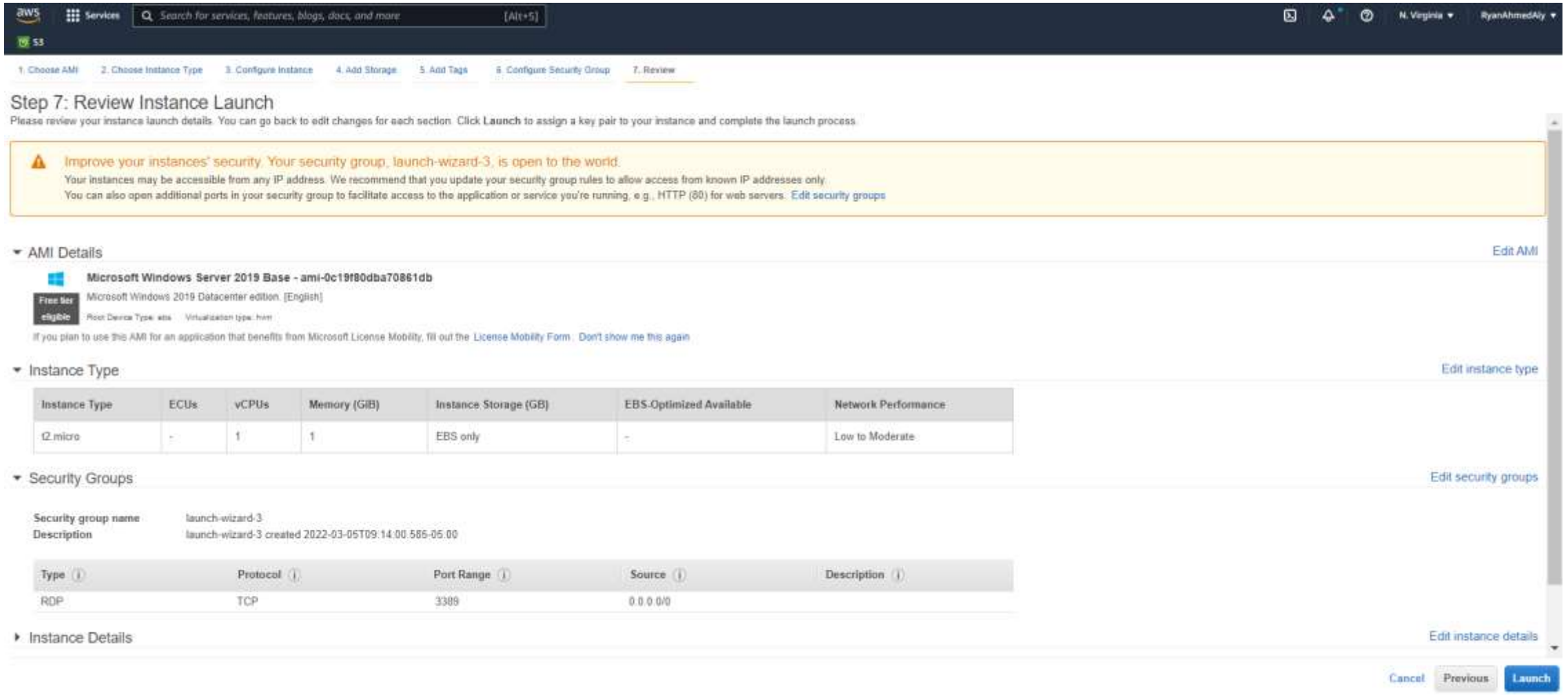
AMAZON EC2: DEMO

KEEP DEFAULT VALUES AND CLICK ON REVIEW AND LAUNCH



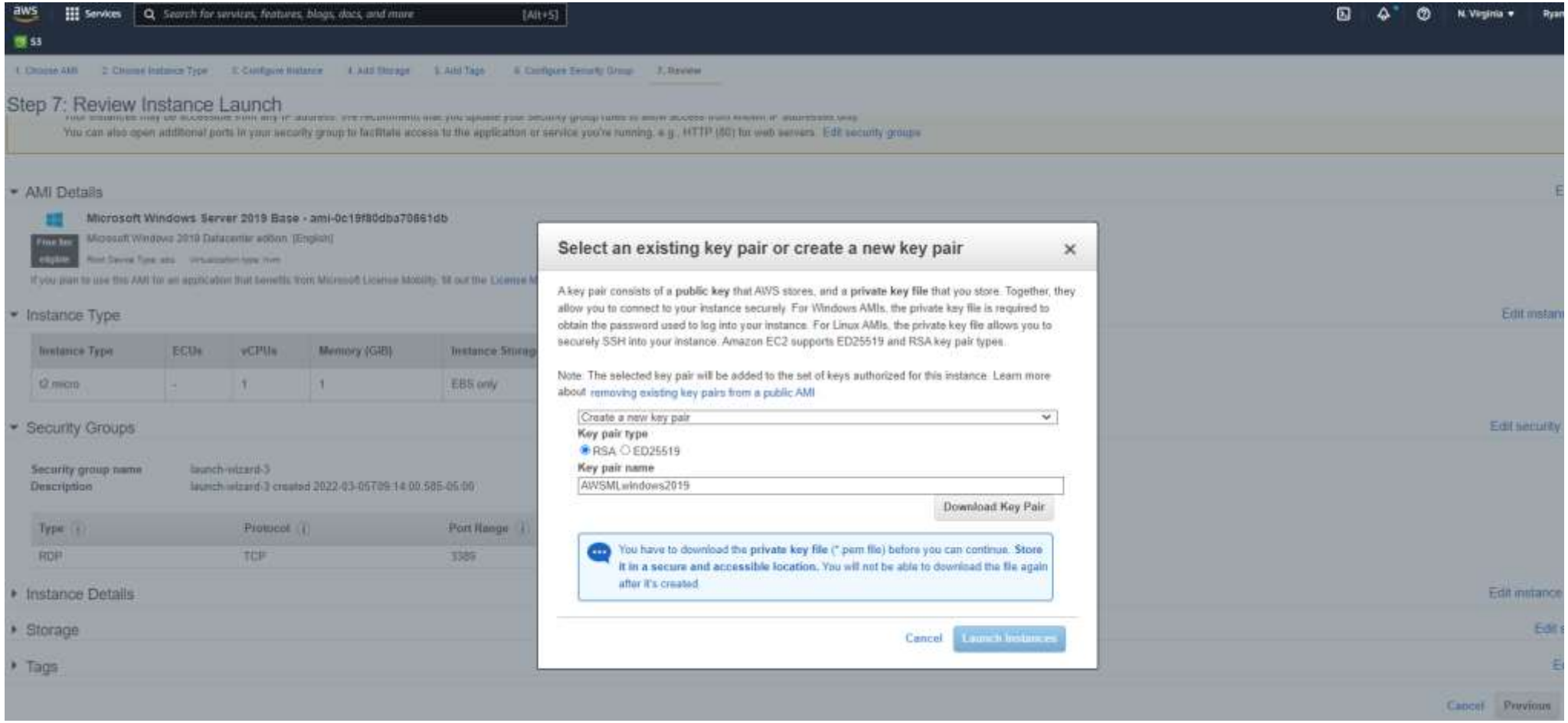
AMAZON EC2: DEMO

CLICK ON LAUNCH



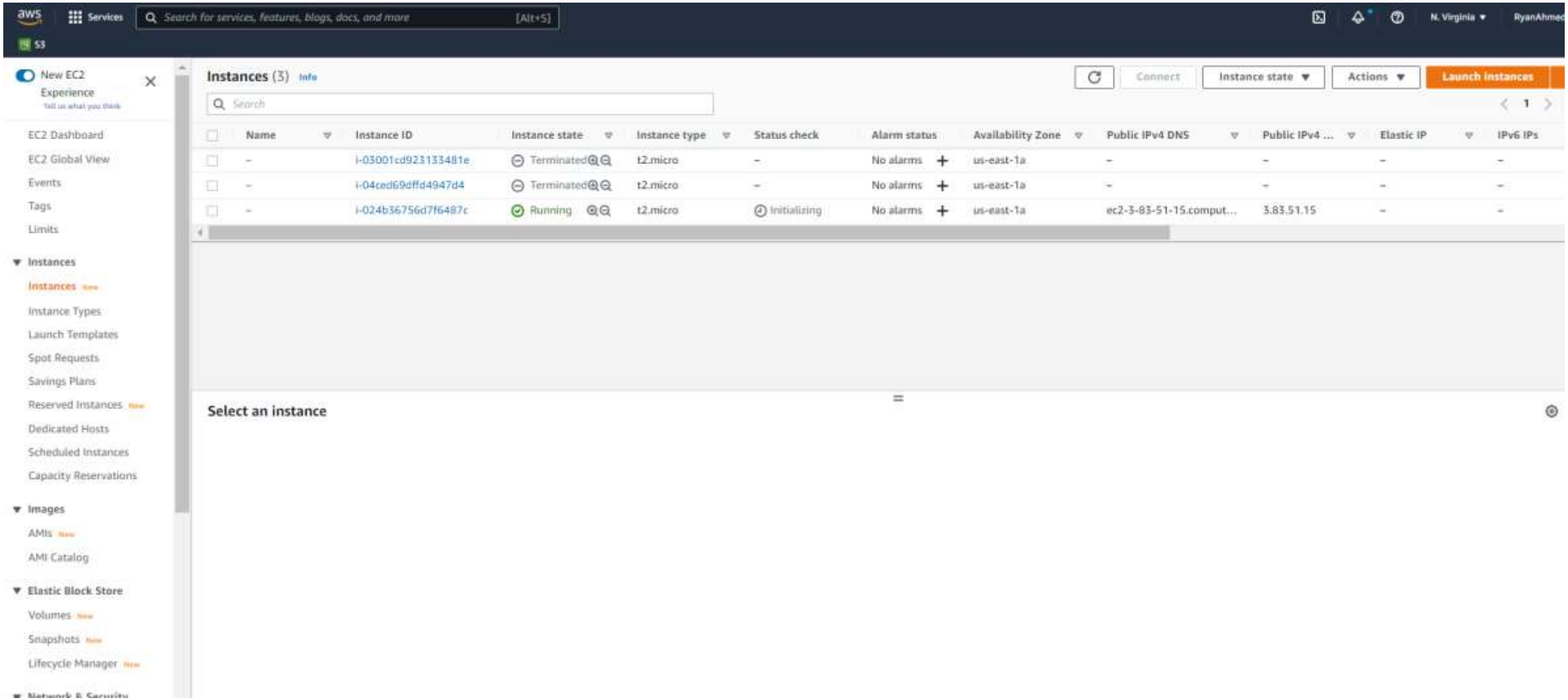
AMAZON EC2: DEMO

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



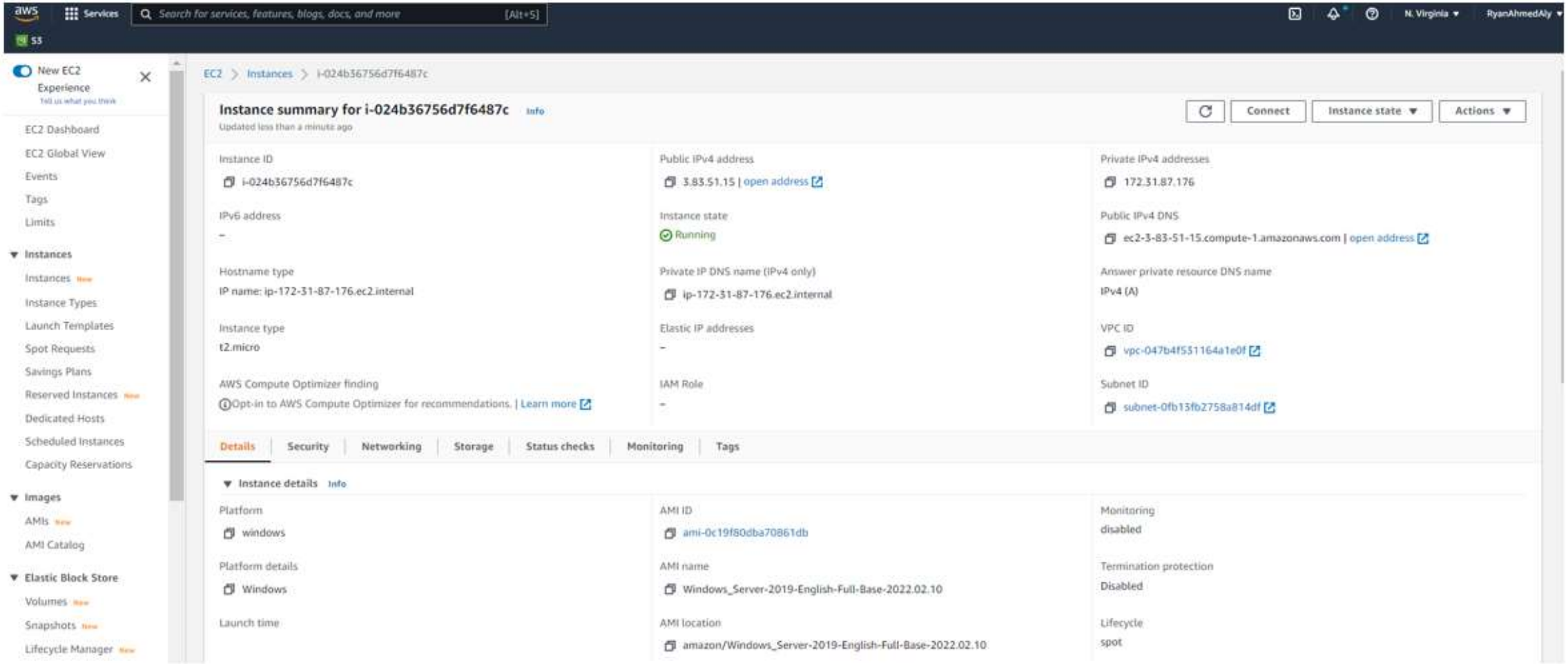
AMAZON EC2: DEMO

UNDER ISTANCES, YOU SHOULD FIND OUR NEWLY CREATED INSTANCE



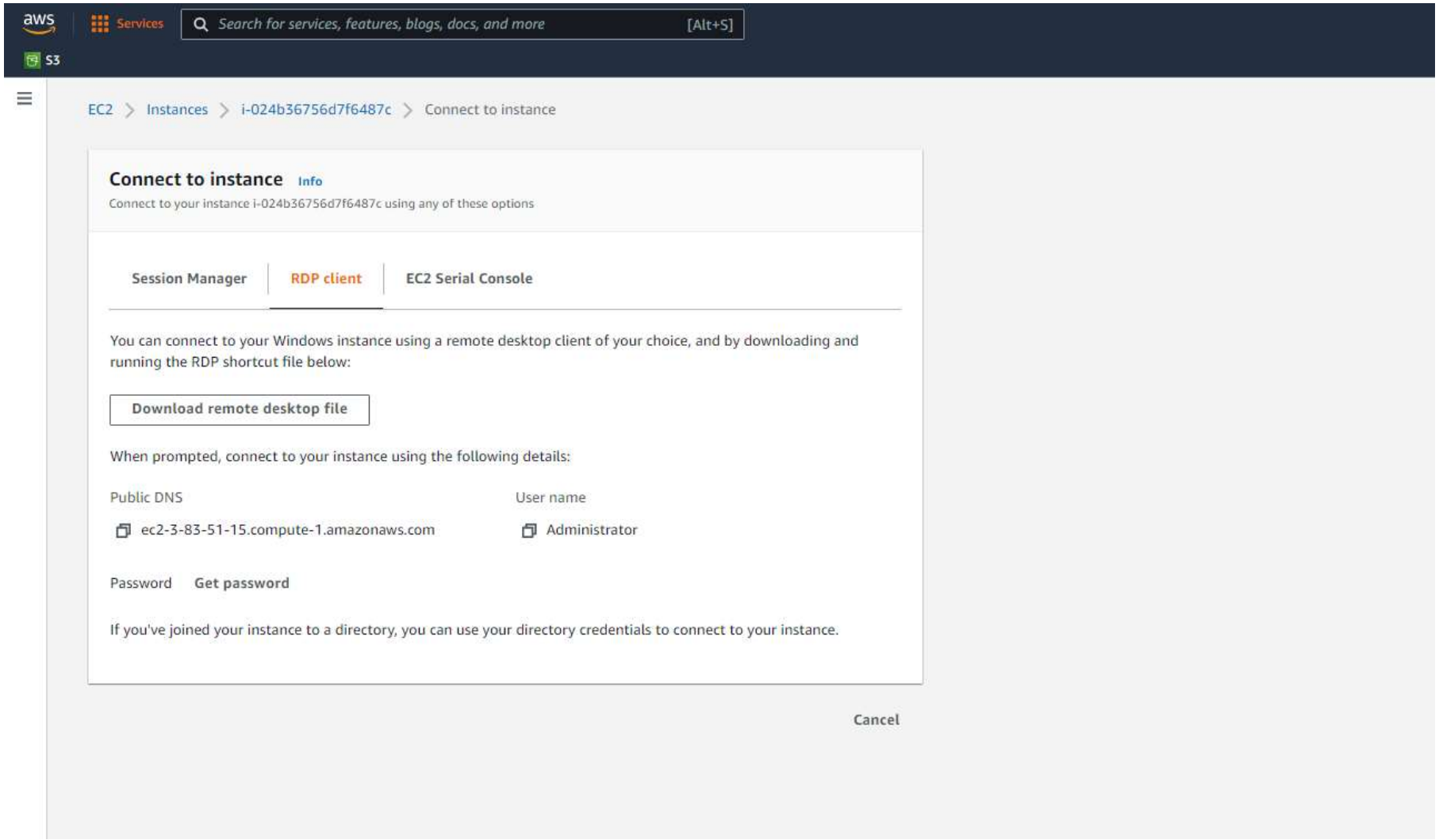
AMAZON EC2: DEMO

GO TO THE INSTANCE AND CLICK CONNECT.



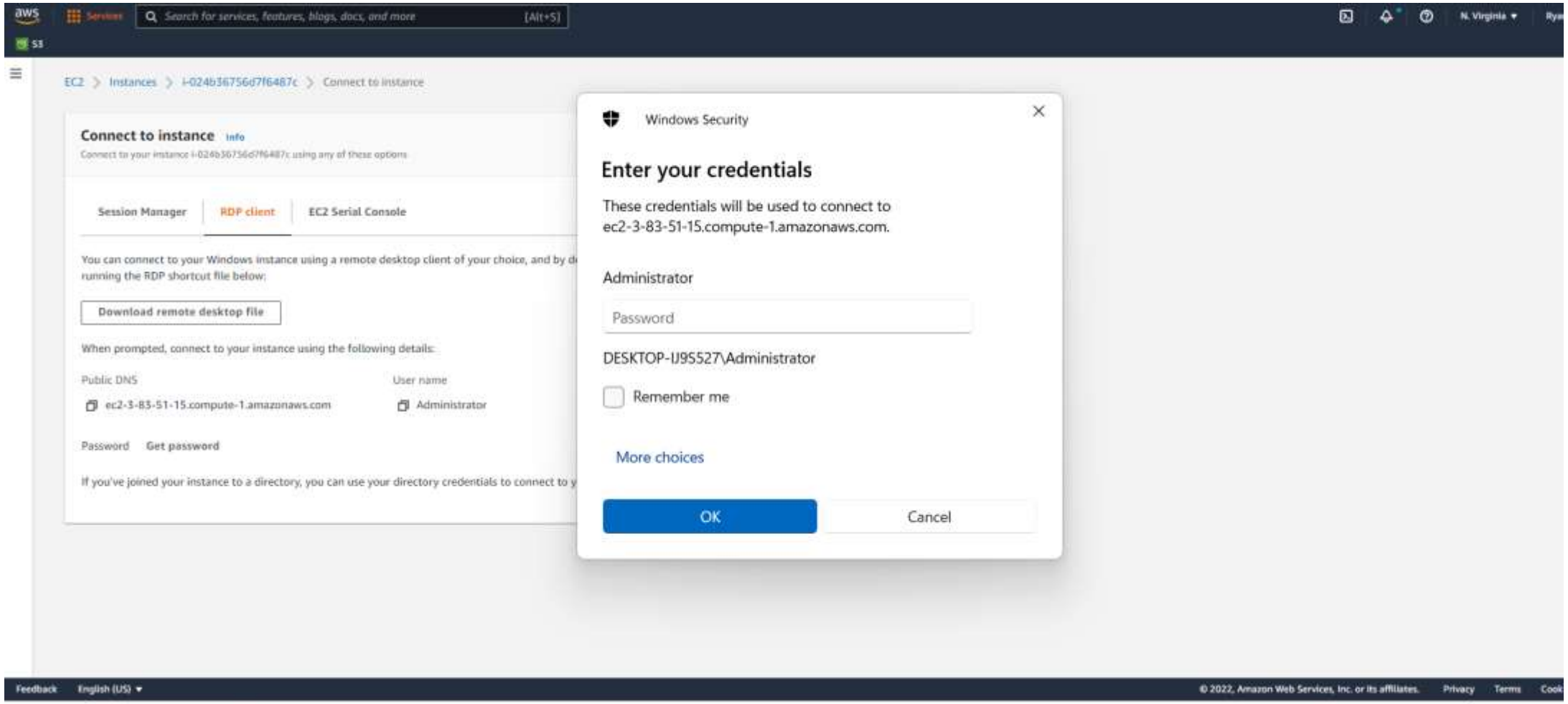
AMAZON EC2: DEMO

SELECT RDP CLIENT AND CLICK ON DOWNLOAD REMOTE DESKTOP FILE



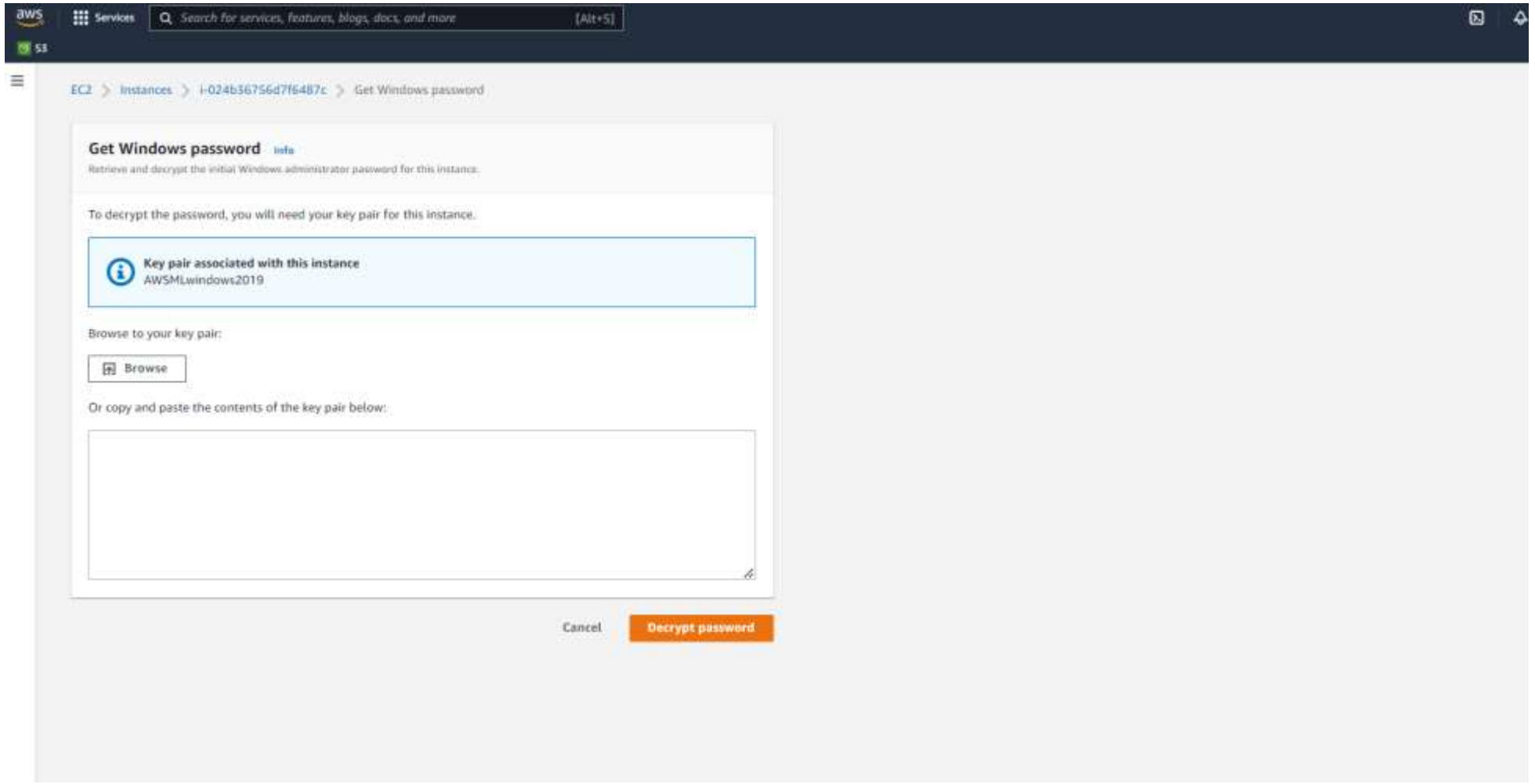
AMAZON EC2: DEMO

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



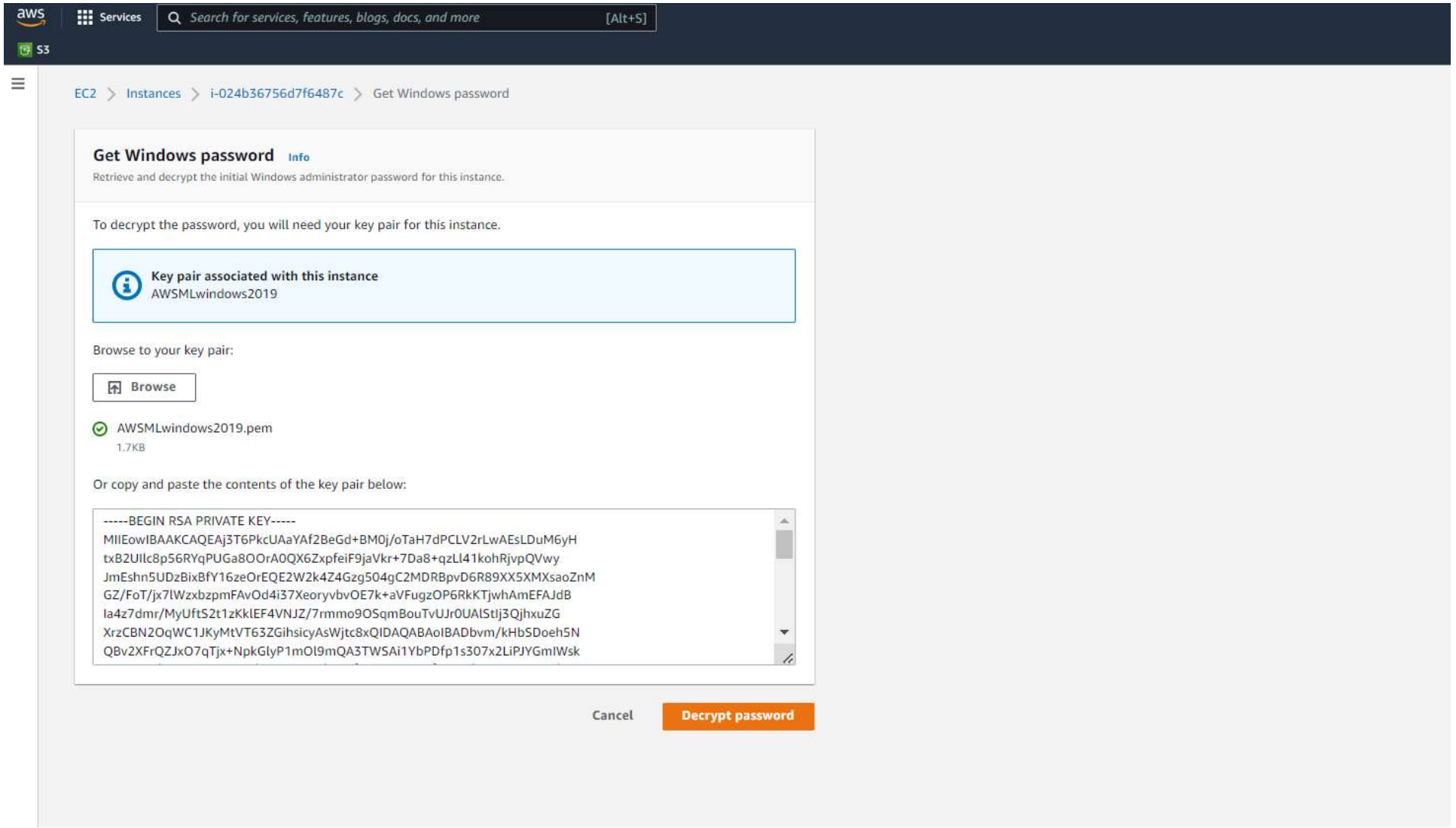
AMAZON EC2: DEMO

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



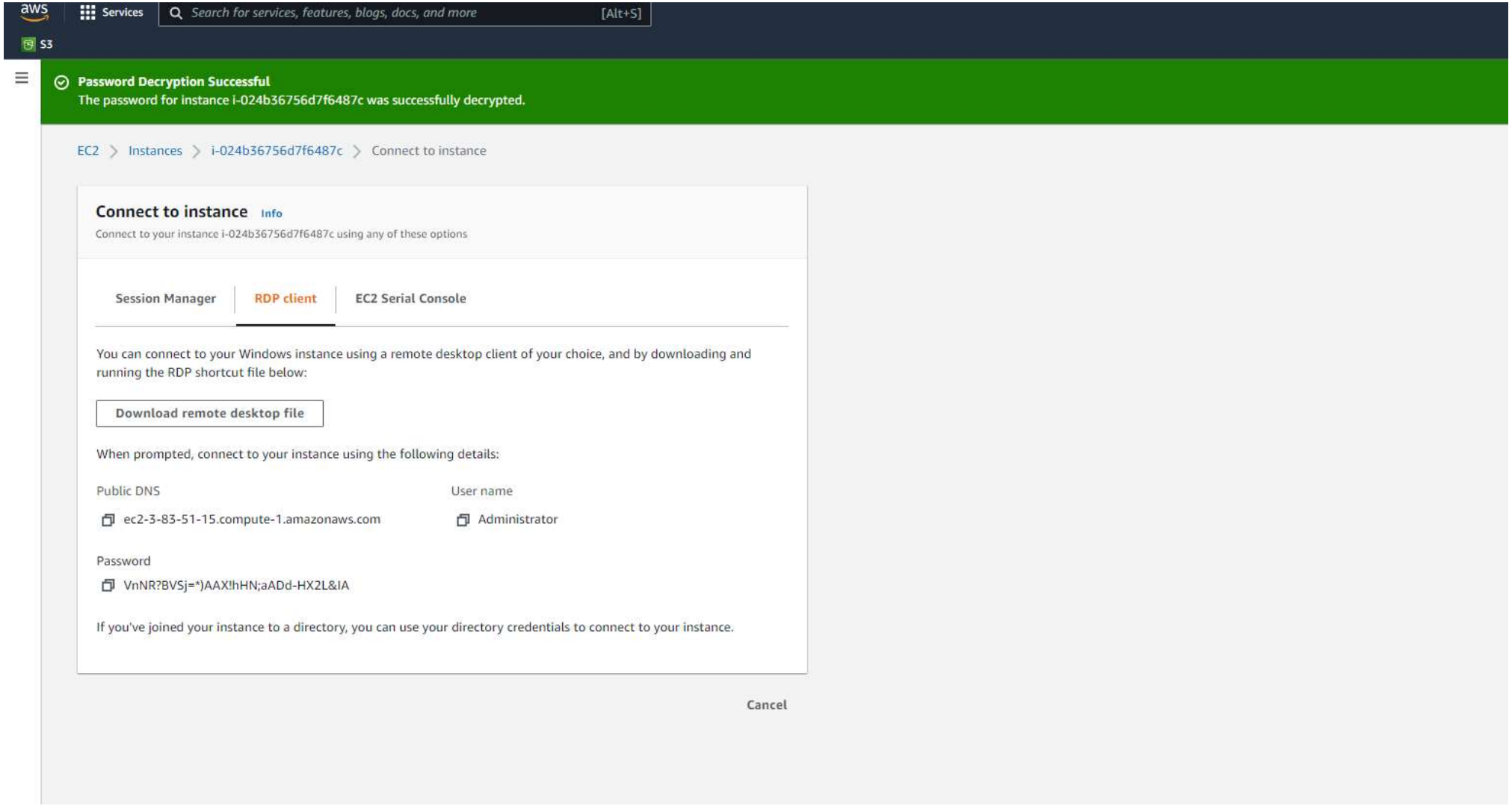
AMAZON EC2: DEMO

DECRYPT PASSWORD



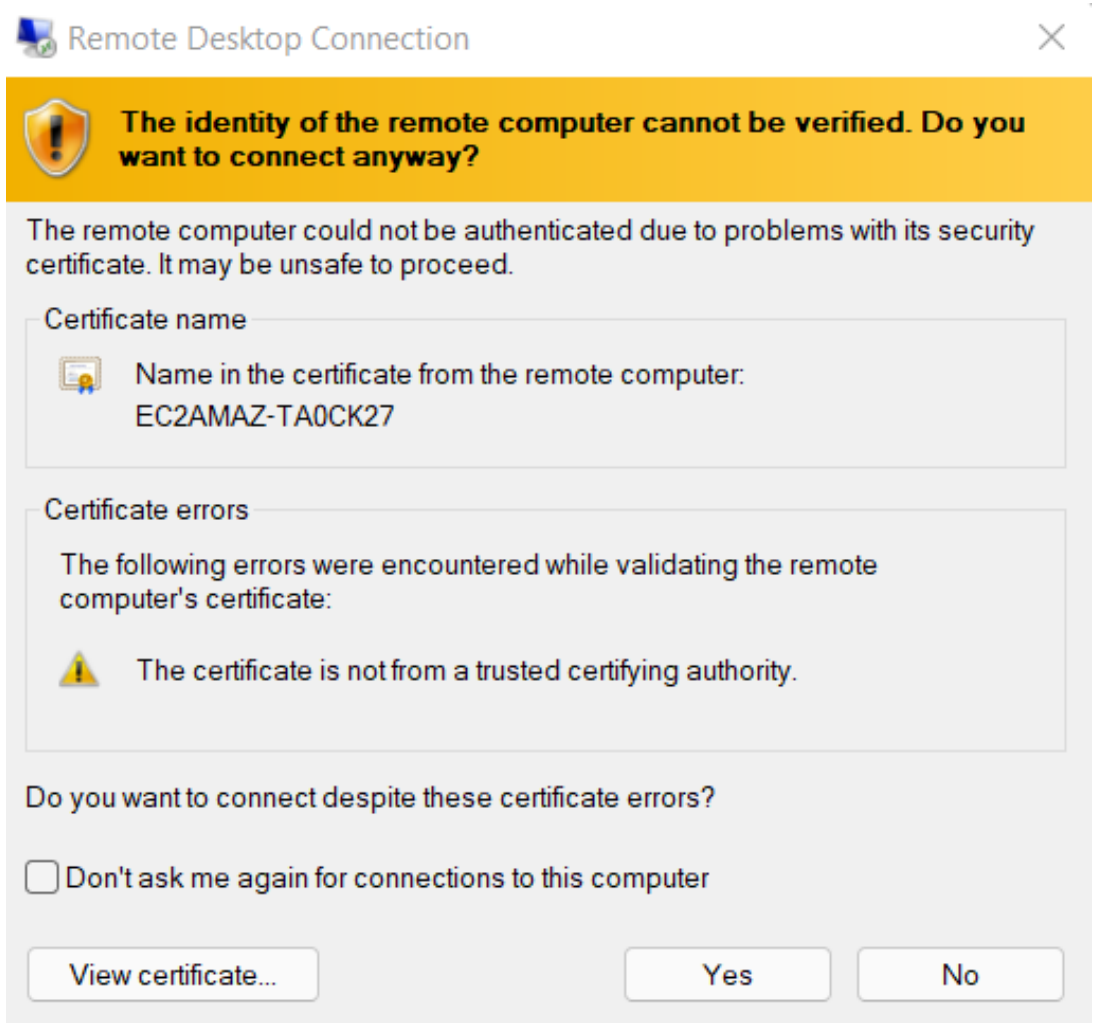
AMAZON EC2: DEMO

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



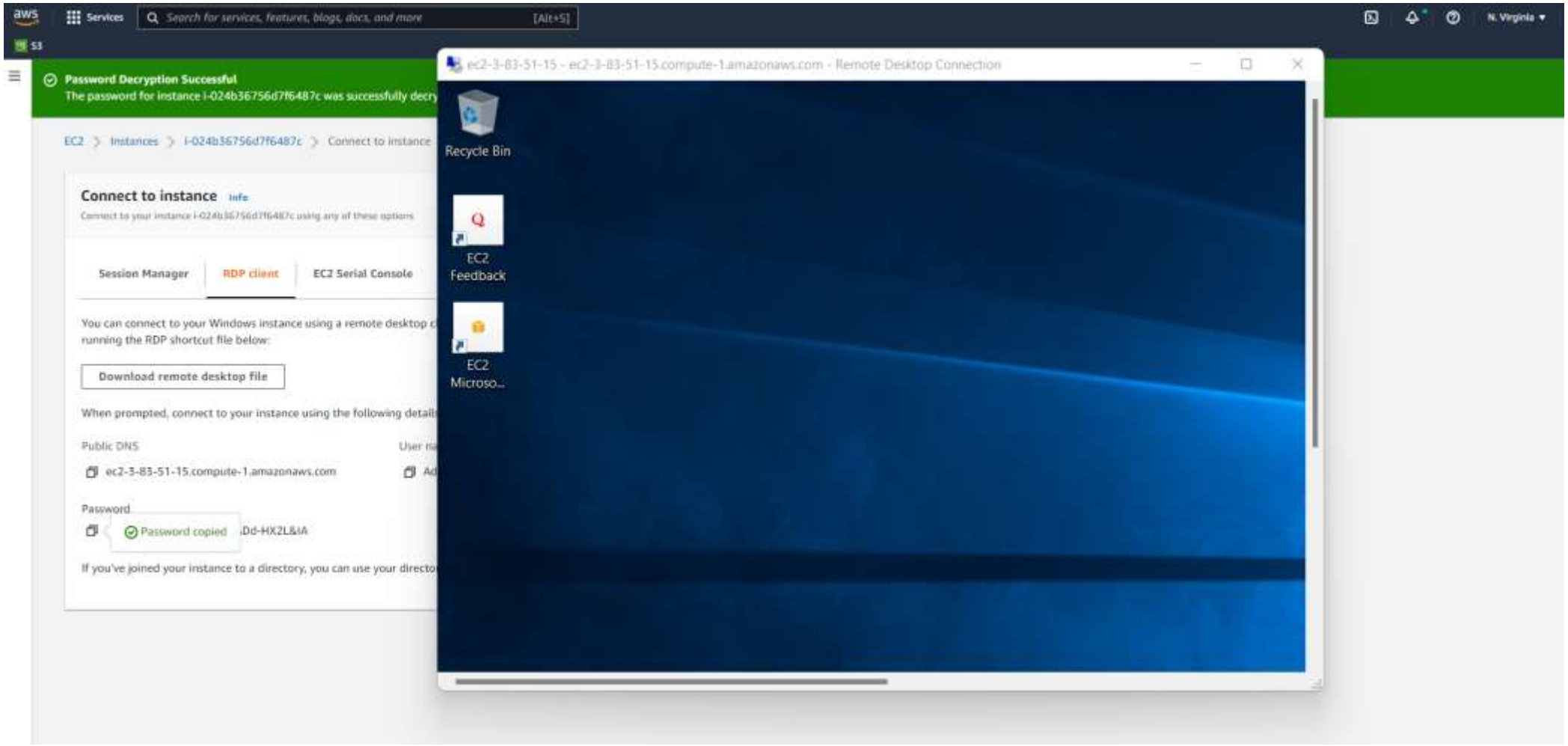
AMAZON EC2: DEMO

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