AWS and OpenAI gym Tutorial

10-703: Deep Reinforcement Learning:
Recitation I

Objectives for Today

- What is AWS
- How do we use it (safely!)?
- What is OpenAI Gym
- How do we use it?

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Amazon Web Services

- On Demand Cloud Computing Resource
  - Compute
  - Storage
  - Databases
  - Analytics
  - Networking
  - Mobile
  - Developer Tools
  - Management Tools
  - IoT

Amazon Web Services

- On Demand Cloud Computing Resource
  - **Compute - EC2**
  - Storage
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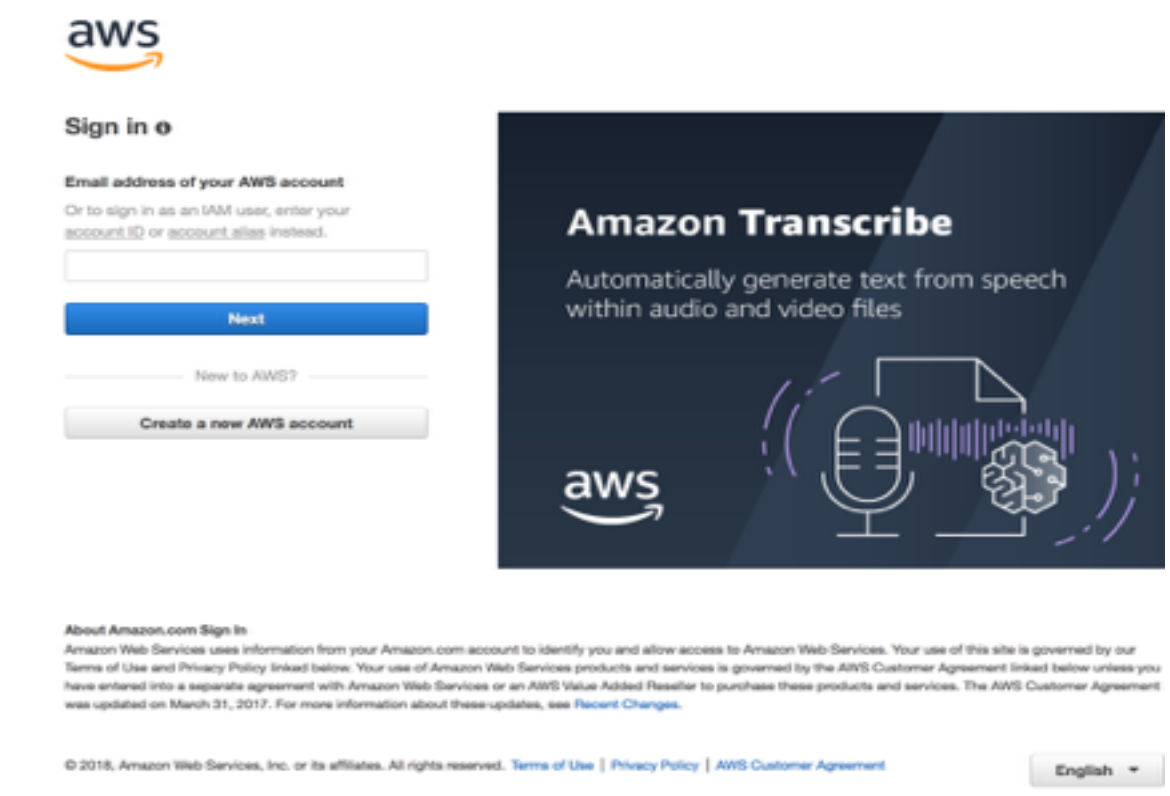
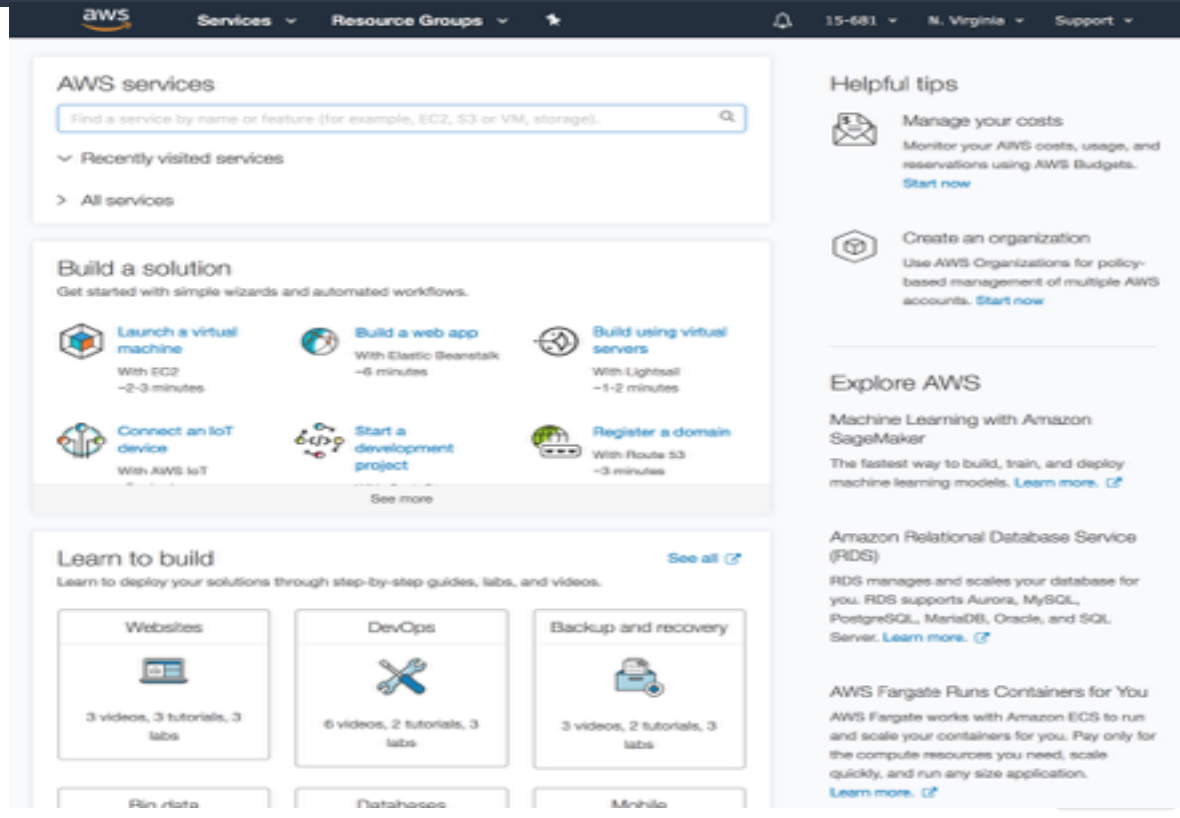
Amazon Web Services - EC2

- Login to your Account
  - use your Andrew ID, preferably



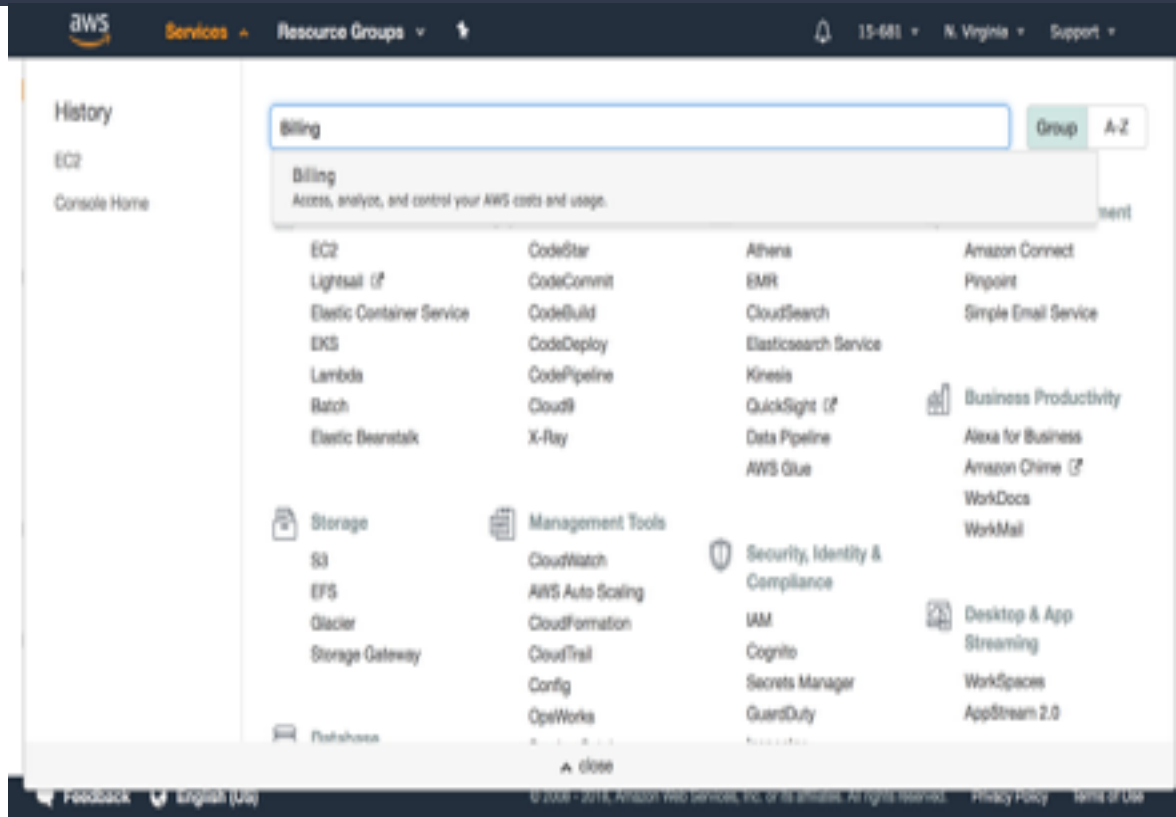
Amazon Web Services - EC2

- Click on Services



Amazon Web Services - EC2

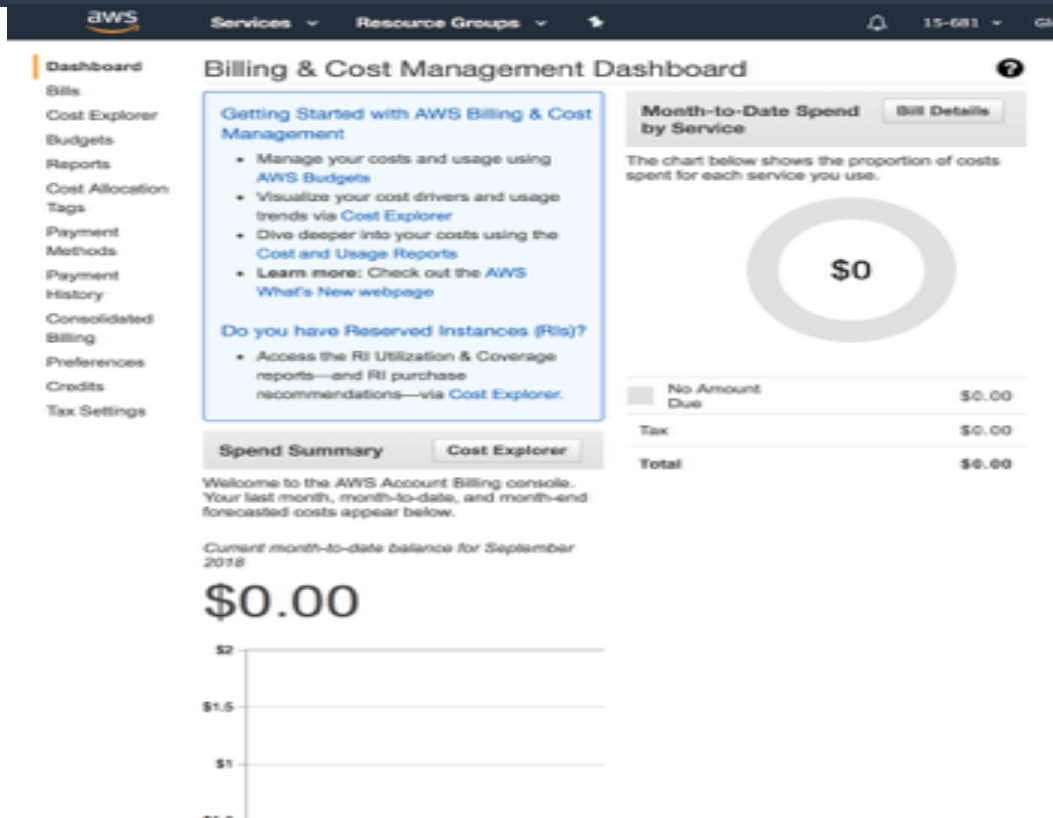
- Search for “billing”



Amazon Web Services - Billing

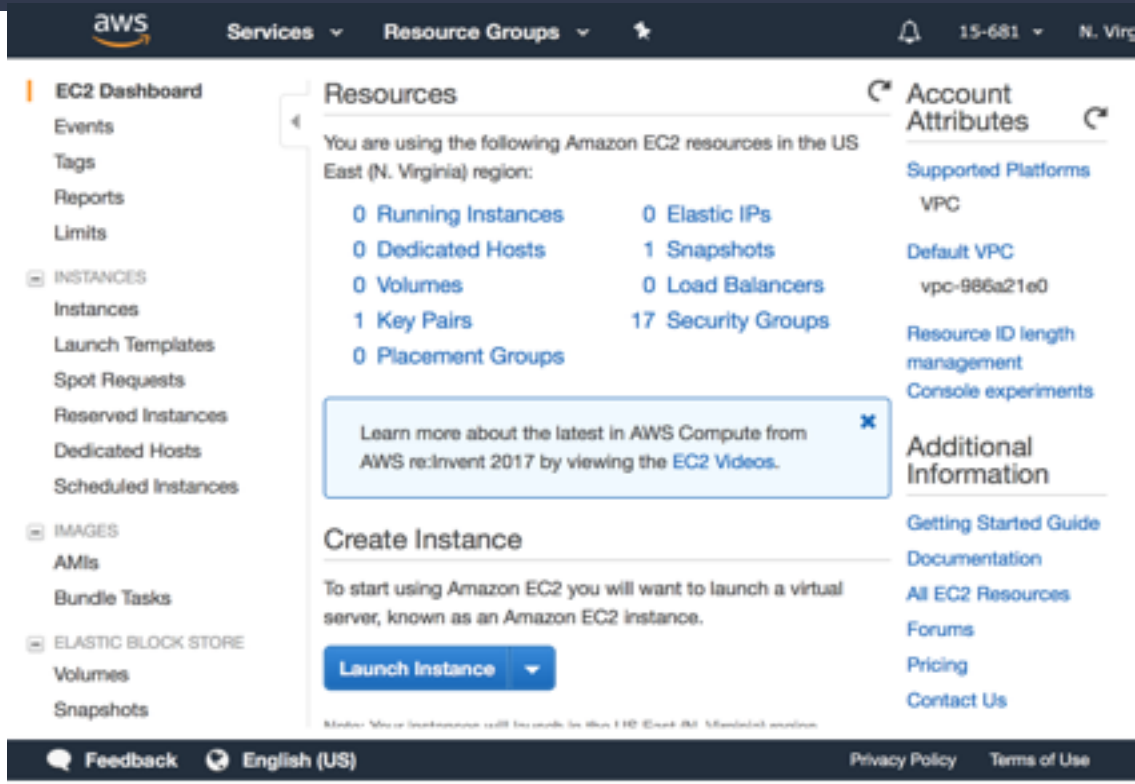
TODO

- Set spending alarm under the **Budget** section
- Add credit using the promo code we provide under the **Credits** section
- Check live spending under the **Bills** section



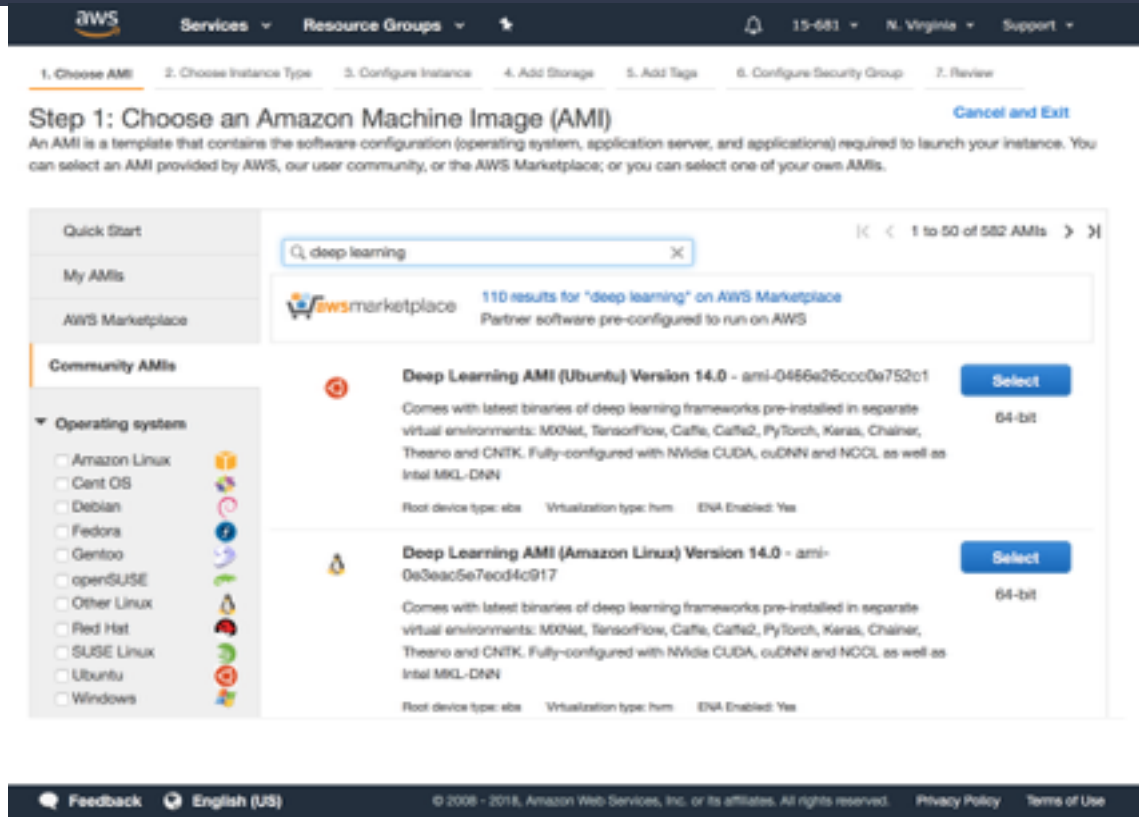
Amazon Web Services - Dashboard

- Go to Launch Instance



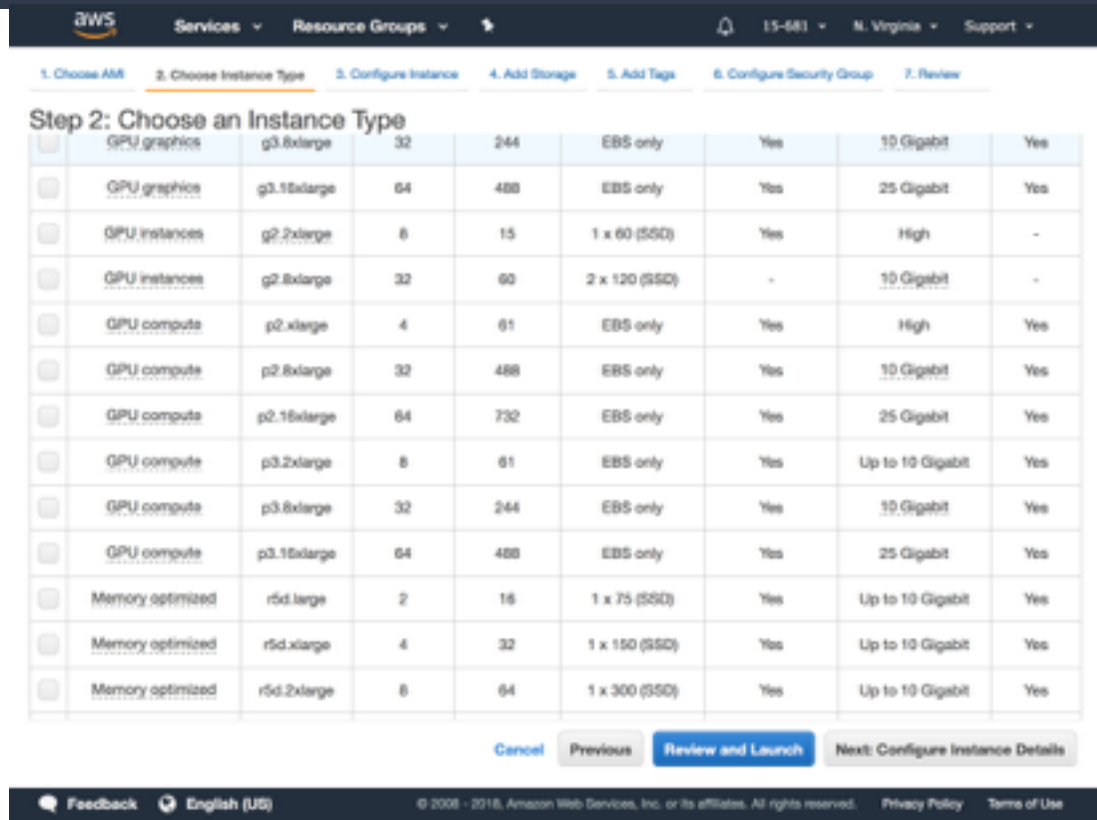
Amazon Web Services - Choose an AMI

- AMIs have pre-installed deep learning frameworks
- Go to Community AMIs and choose the that fits your need



Amazon Web Services - Choose Instance Type

- Which instance to choose?



Amazon Web Services - Choose Instance Type

Instance Name	Number/GPU Type	Price (on-demand) per hour	Architecture /Speed
p2.xlarge	1 K80	$0.9	Kepler (Slow)
p2.8xlarge	8 K80	$7.2	Kepler (Slow)
p2.16xlarge	16 K80	$14.4	Kepler (Slow)

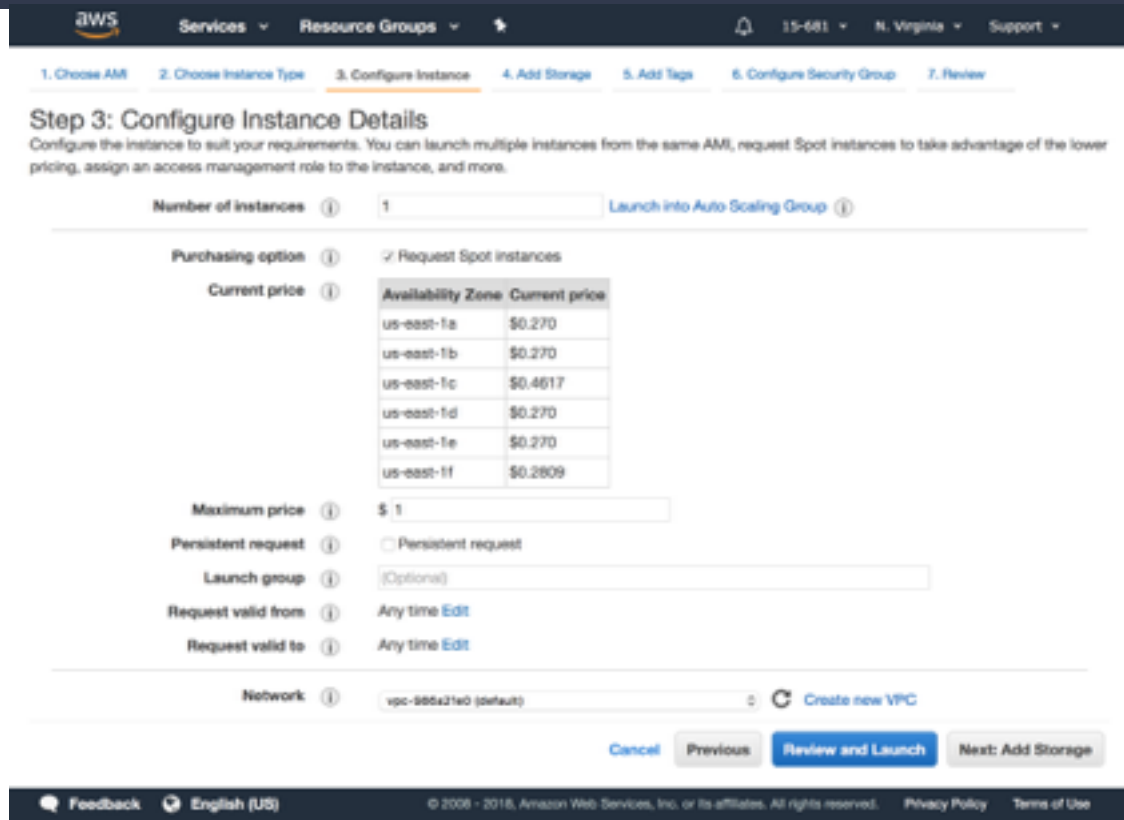
Instance Name	Number/GPU Type	Price (on-demand) per hour	Architecture/ Speed
g3.4xlarge	1 M60	$1.14	Maxwell (medium speed)
g3.8xlarge	2 M60	$2.28	Maxwell (medium speed)
g3.16xlarge	4 M60	$4.56	Maxwell (medium speed)

Amazon Web Services - Choose Instance Type

Instance Name	Number/GPU Type	Price (on-demand) per hour	Architecture/Speed
p3.2xlarge	1 V100	$3.06	Volta (fastest architecture so far!)
p3.8xlarge	4 V100	$12.24	Volta (fastest architecture so far!)
p3.16xlarge	8 V100	$24.48	Volta (fastest architecture so far!)

Amazon Web Services - Configure Instance

- Check “Request Spot Instances”
- Enter maximum price of $1



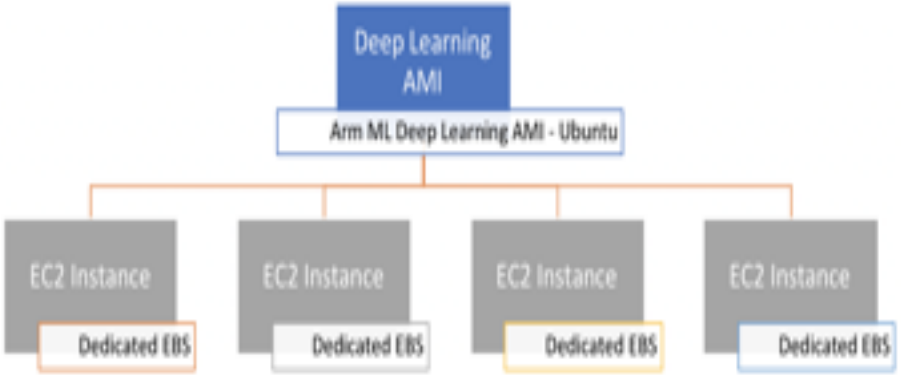
Amazon Web Services - Add Storage

Three types:

- EBS: Local storage per instance
- EFS: Common file sharing among instances
- S3 buckets

Configure EBS before launching the Instance

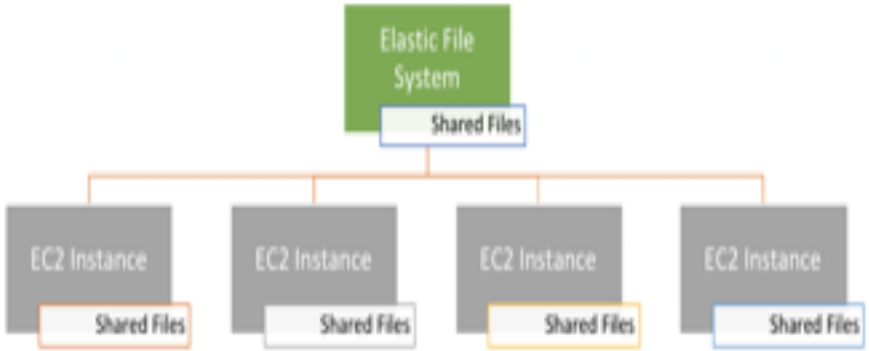
EFS can be configured/accessed once we are within the instance



Amazon Web Services - Setting up EFS

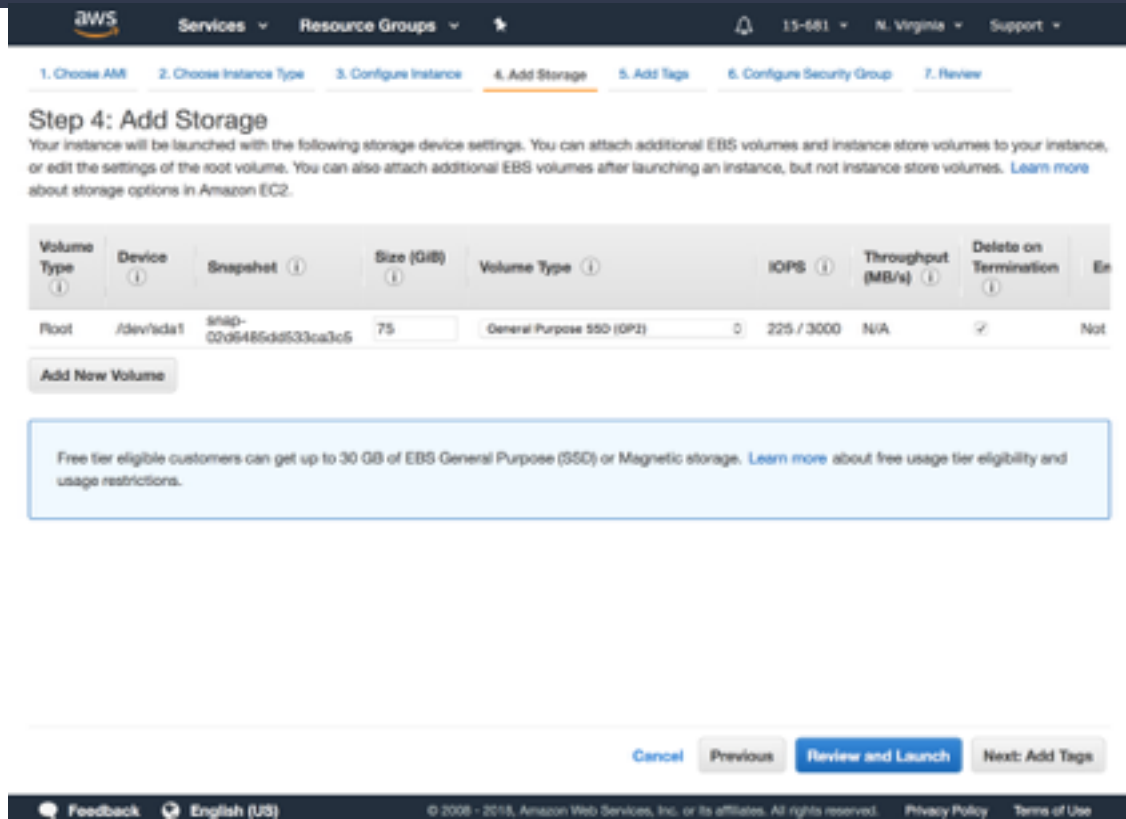
Only three commands to mount EFS:

- sudo apt-get install nfs-common
- sudo mkdir efs
- sudo mount -t nfs4 -o nfservers=4.1, rsize=1048576, wsize=1048576, hard, timeo=600, retrans=2 fs-ff38fd86..efs.us-east-2.amazon.aws.com:/ efs



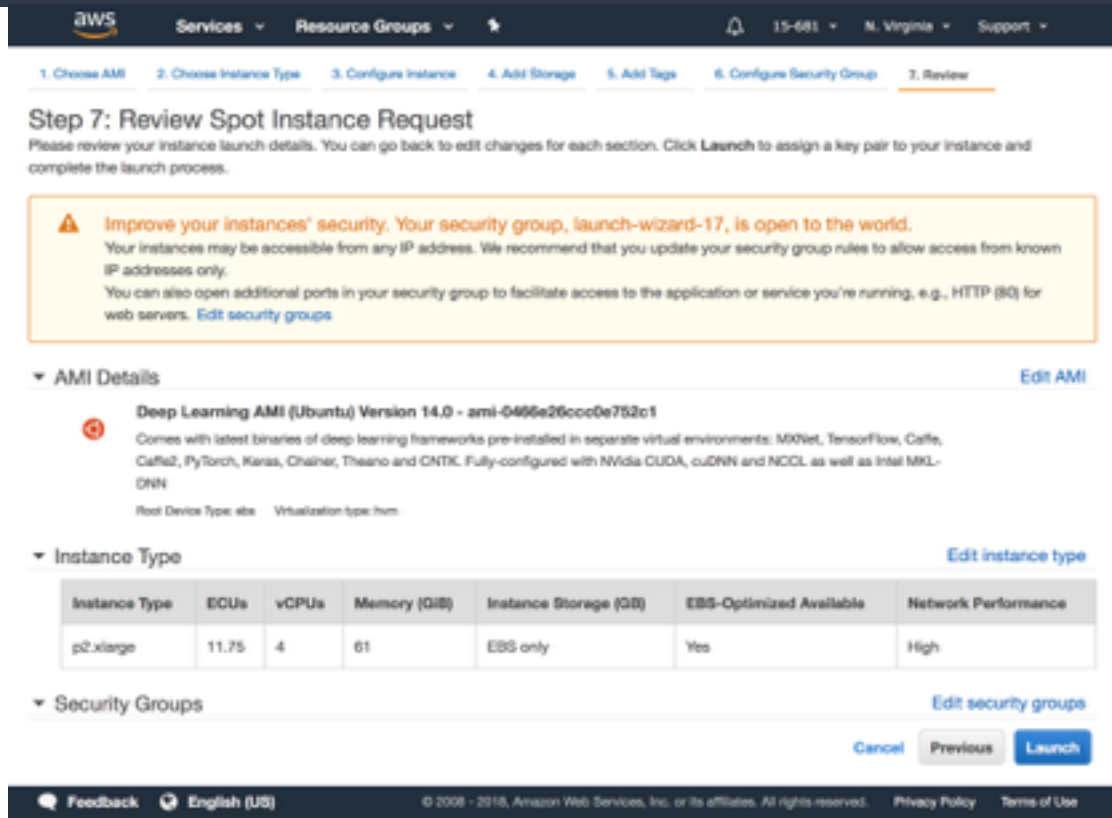
Amazon Web Services - Add Storage

- Keep in mind that ~50GB of the default 75GB is occupied by AMI Image files



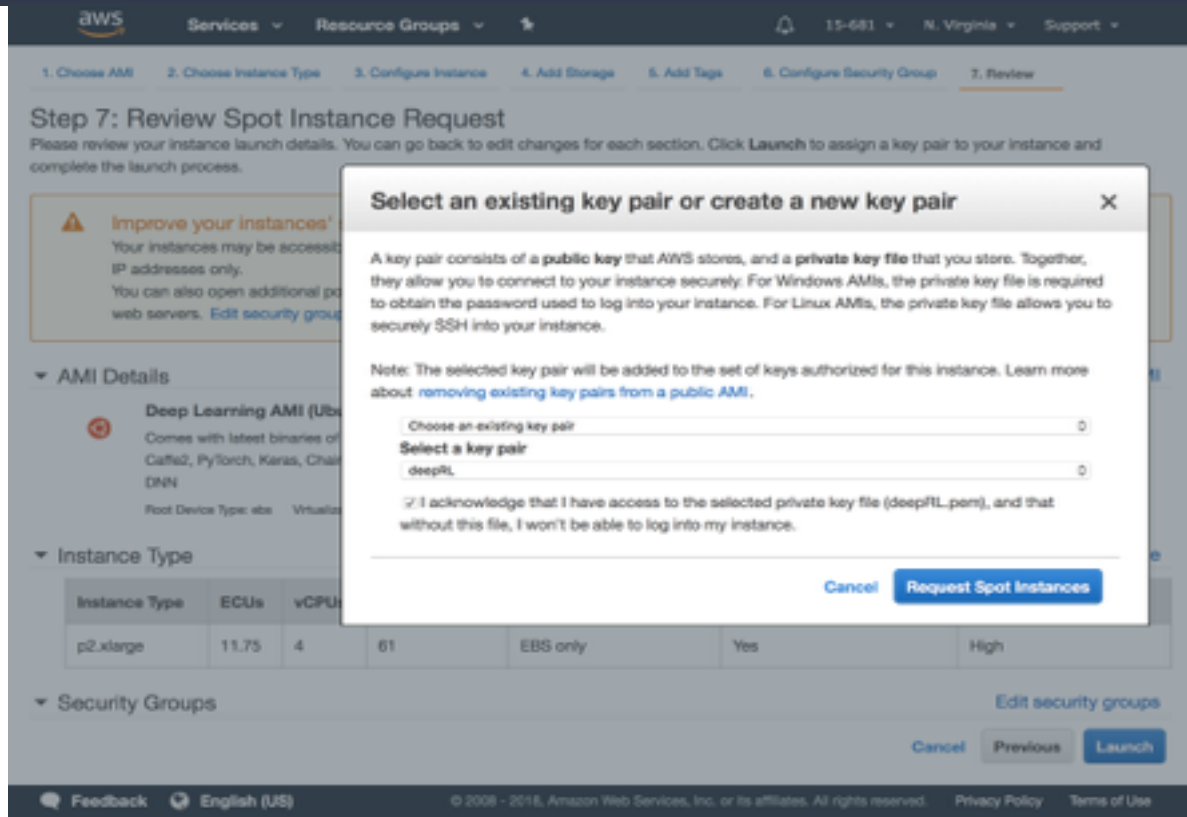
Amazon Web Services - Review & Launch

- Time to Launch



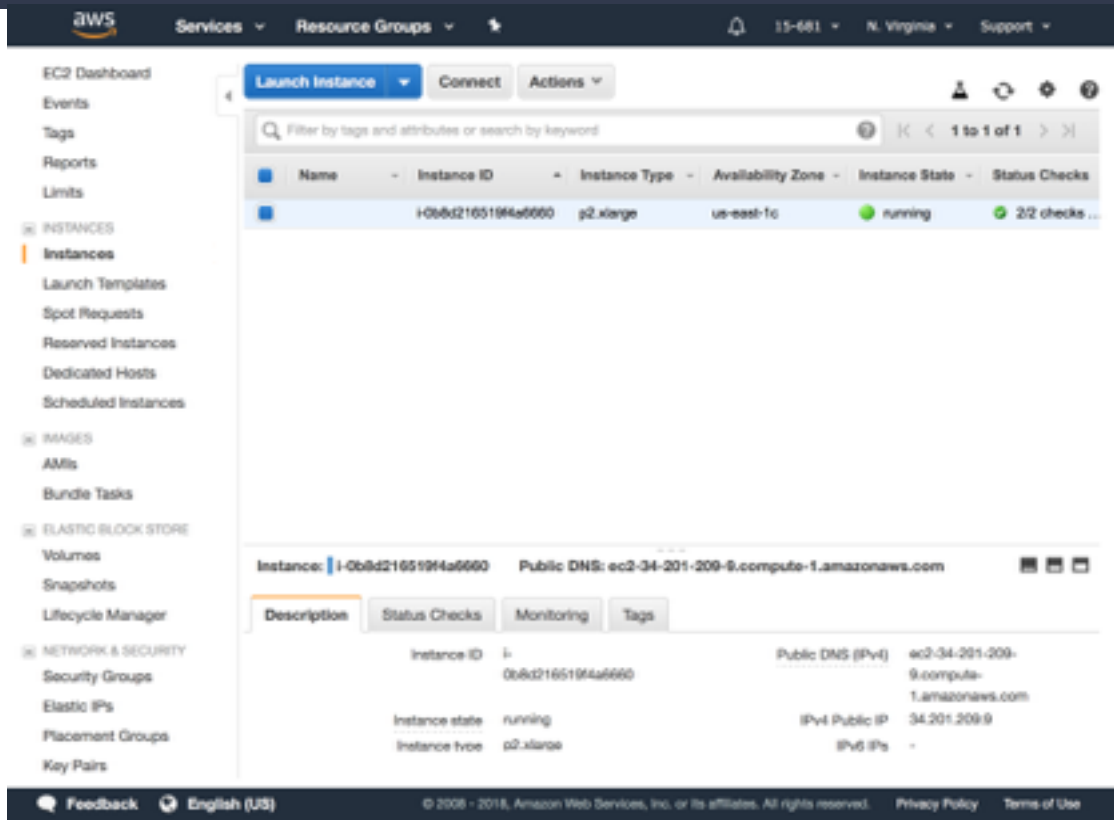
Amazon Web Services - Review & Launch

- **First time users**: Select create a new key pair from drop down menu
- Download key and put it in some location on your machine (e.g., ~/.aws/key_name.pem)



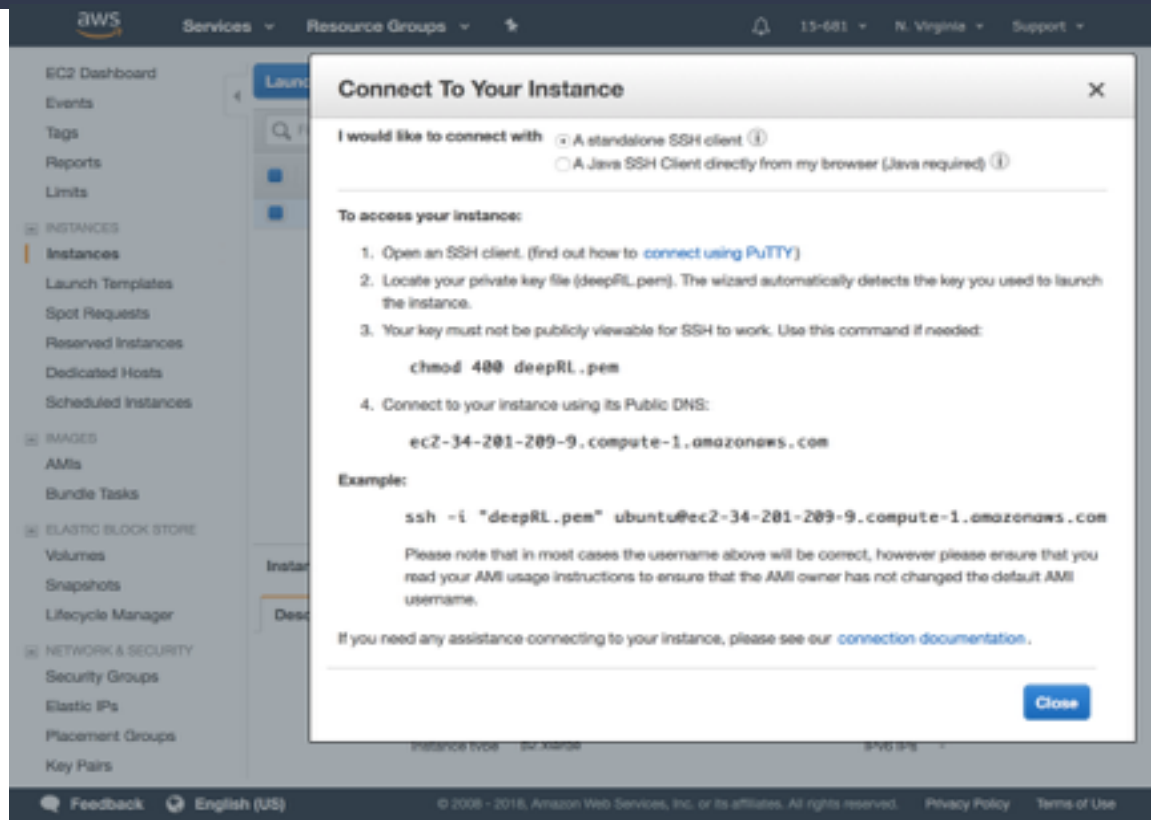
Amazon Web Services - Launch Instance

- Click on Connect



Amazon Web Services - Launch Instance

- Remember to change permissions for the key file
- ssh into the instance from your terminal: use the complete path of the key file



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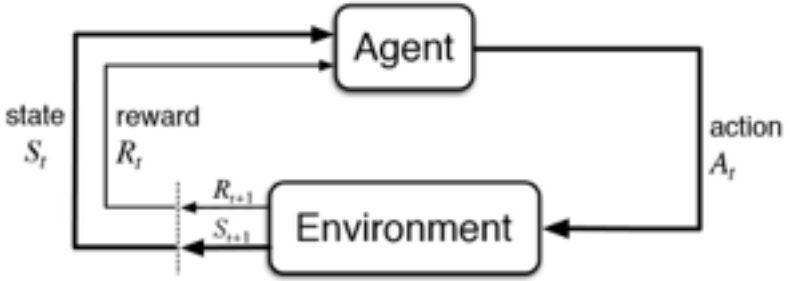
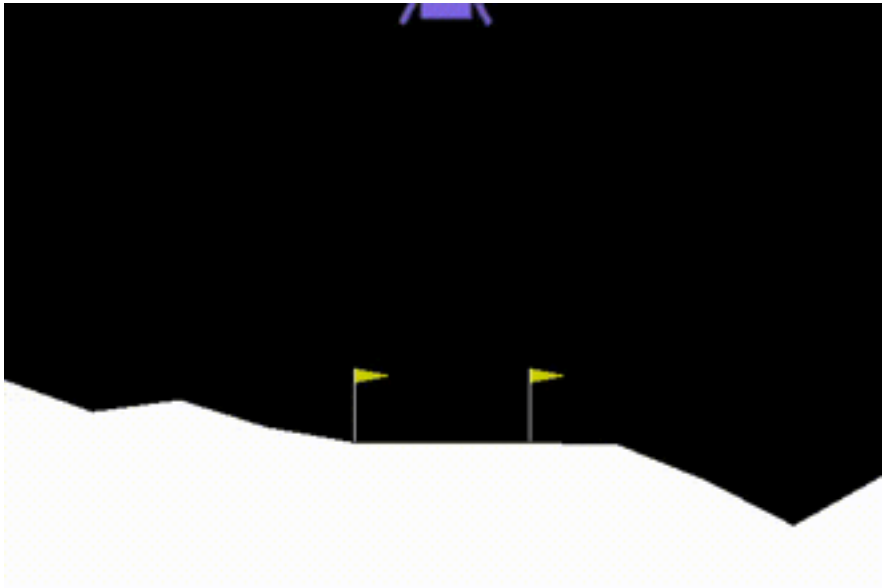
OpenAI Gym





OpenAI Gym - Biggest Contribution

To solve such a problem, **you need the ability to**:

- Define the environment
- Generate samples from the environment
- Sample an action from the action space
- Retrieve the next state after taking an action
- Retrieve the reward of taking an action
- Check if the episode has ended
- Reset the episode when the episode ends

OpenAI gym **gives you the ability to**:

- DO ALL OF THESE THINGS !

OpenAI Gym - Getting Started

Install directly using pip:

```
pip install gym
```

Build from source

```
git clone https://github.com/openai/gym
cd gym
pip install -e . #minimal install
```

Add new environment

```
cd gym
Pip install -e .[box2d] #installs all box2d environments
```

OpenAI Gym - Basic Concepts

Define the environment

```
env = gym.make('LunarLander-v2')
```

Sample an action from the action space

```
action = env.action_space.sample()
```

Reset the episode when the episode ends

```
state = env.reset()
```

Retrieve the next state, reward and the indicator of the episode termination

```
next_state, reward, done, info = env.step(action)
```

OpenAI Gym - Additional Features

Render the environment

```
env.render()
```

Record the environment

```
env = gym.wrapper.Monitor(env, '.', force=True)
```

Check out the state space and action space

```
Print (env.action_space)
Print (env.observation_space)
```

Let’s look at a demo.