

Introduction to Reinforcement Learning and RLlib

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Anyscale

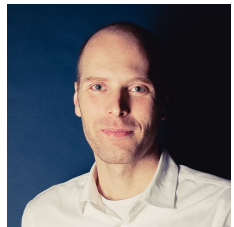
Who we are: Original creators of Ray, a unified framework for scalable, distributed computing. Part of that framework are our libraries for ML and data processing.

What we do: Scalable compute for AI and Python

Why we do it: Scaling is a necessity, scaling is hard; make distributed computing easy and simple for all developers.



RL Team @ Anyscale



Sven



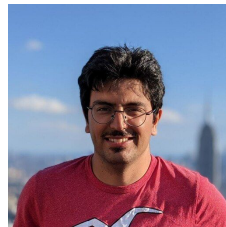
Jun



Avnish



Artur



Kourosh



Christy



Steven



Rohan



Charles





Some of RLib's Industry Users

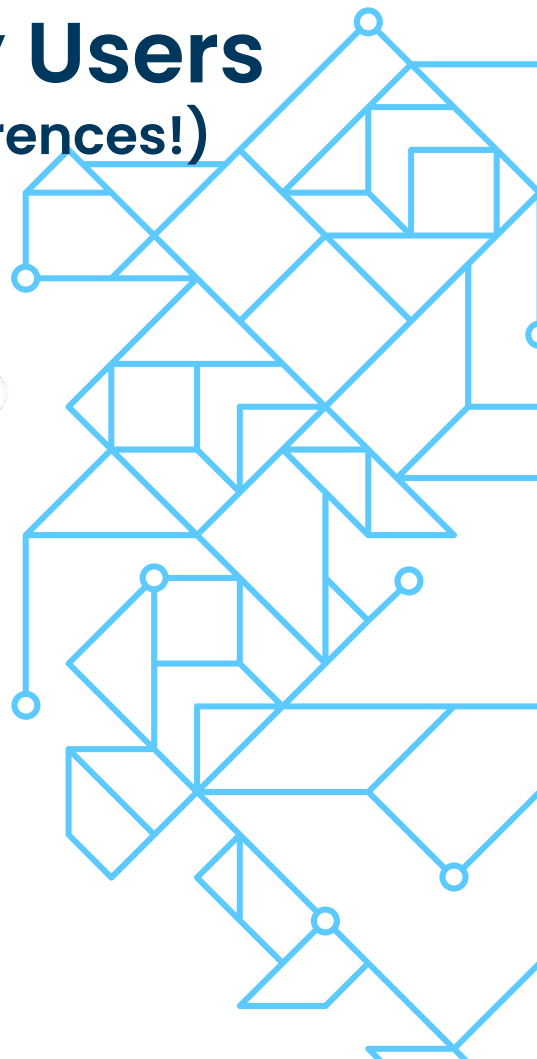
(thanks for presenting at our conferences!)



J.P.Morgan

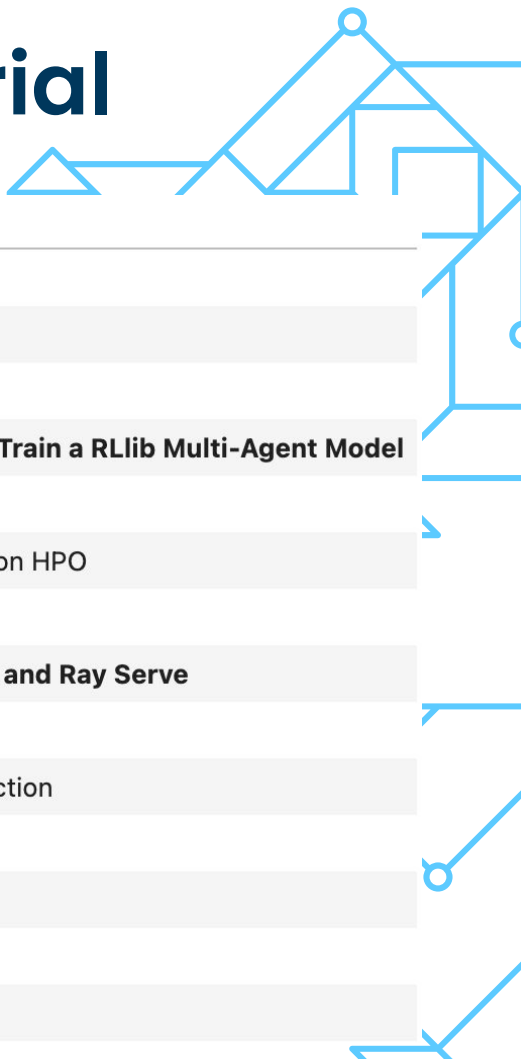




TWO SIGMA





Overview of the Tutorial



Lesson	Description
Module 1	Introduction to Gym Environments & RLlib APIs
01 OpenAI Gym and RLlib	Introduction to OpenAI Gym and Ray RLlib
BREAK	
Module 2	Create a Custom RLlib Multi-Agent Environment and Train a RLlib Multi-Agent Model
02 Multiagent RLlib Environment	Create a Custom Multi-Agent Environment in RLlib
03 Train a RLlib Multi-Agent model using Ray Tune	Introduction to Ray Tune and hyperparameter optimization HPO
BREAK	
Module 3	Offline RL, Remote Class distributed stateful pattern and Ray Serve
04 Introduction to Offline RL	Introduction to Offline RL with RLlib
05 Ray Serve and RL	Using RLlib with Ray Serve to deploy a policy into production
4:30pm HAPPY HOUR + Meetup	
Module 4 (take home)	Extra Notebooks, Depending on Class Timing
06 End-to-end Demo	End-to-End Demo of what you built in this tutorial
07 Introduction to RLlib in RecSys	Introduction to RL applied to Recommender Systems



Happy Hour @ 4:30pm & Ray Meetup @ 6pm – Seacliff foyer

Meetup

Ray Summit Meetup Community Talks

Monday, August 22
6:00 PM – 8:00 PM

We are delighted to host an exclusive Ray Summit Meetup, hosted by Anyscale with Ray community talks, on the eve of the summit. Invited Ray community speakers will share how they use Ray to scale and solve challenging ML problems.

You don't have to be registered for the Ray Summit to attend. The meetup is free for the community. Join us for the Ray Summit Happy Hour from 5:00 – 6:00 p.m., followed immediately by the meetup.

Agenda (The times are not strict; they may vary slightly.)

- 5:00 – 6:00 p.m. Ray Summit Community Happy Hour (in Seacliff Foyer)
- 6:00 p.m. Welcome remarks, announcements, and agenda – Jules Damji, Anyscale
- 6:05 p.m. Talk 1: Ray + Arize: Close the ML infrastructure loop – Aparna Dhinakaran, Arize AI
- 6:35 p.m. Q & A
- 6:40 p.m. Talk 2: Maintaining long-running distributed Ray clusters – Jaehyun Sim, Ikigai Labs
- 7:20 p.m. Q & A
- 7:25 p.m. Talk 3: Large-scale distributed approximate nearest neighbor search with Ray – Daniel Acuna, Syracuse University
- 7:50 p.m. Q & A

Talk 1: Ray + Arize: Close the ML infrastructure loop Detecting, diagnosing, and resolving ML model performance can be difficult for even the most sophisticated ML engineers. As more machine learning models are deployed into production, it is imperative we have tools to monitor, troubleshoot, and explain model decisions. Join Aparna Dhinakaran, chief product officer at Arize AI, in a discussion on the state of commonly seen ML production monitoring challenges. Learn how to use ML Observability from training through production environments to find upstream model issues faster, monitor your models in real time at scale, and improve model interpretability and explainability.



Daniel Acuna
Associate Professor, Computer
Science Department, University of
Colorado



Jaehyun Sim
Director of Engineering, Ikigai Labs,
Inc.



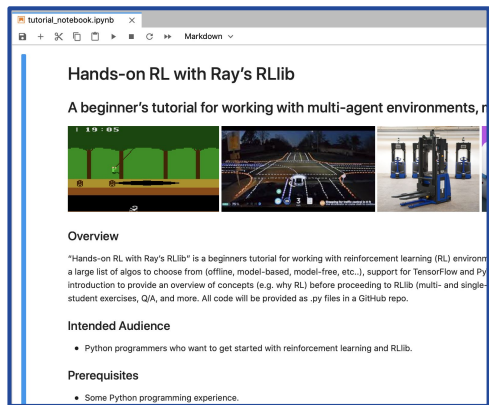
Aparna Dhinakaran
Chief Product Officer, Arize AI



Jules Damji
Lead Developer Advocate, Anyscale



And now ... Moving to our Jupyter Notebook





Anyscale User/Password



<https://bit.ly/rsummit2022-class-logins>

- Choose any line from spreadsheet under your class name: "Introduction to Ray RLLib"
- In column "Account" switch "Not Available"
- For example, Username/password: `yinhaonan55+520@gmail.com/tutorialpassword520`



Your Anyscale Cluster

- Console: <http://console.anyscale.com/>
- User name: <username@gmail.com>
- Password : password

anyscale

Scale your application from your laptop to the cloud

Get started

Work email

Next

1

anyscale

Scale your application from your laptop to the cloud

Log in

Email

Password

Forgot your password?

Log in

2



Your Anyscale Cluster

← → ↻ console.anyscale.com/o/ray-summit-tutorial-2022-test/clusters

anyscale

- Home
- Projects
- Interactive sessions
- Jobs
- Services
- Clusters**
- Configurations

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Clusters

+ Create ▶ Start ⏸ Terminate 🔄 Resume

🔍 Search names

Cluster status Created by Include archived

<input type="checkbox"/>	Name	Status ↓	Active resources	Cost ⓘ ↕	Cluster environment	Project	Cloud	Created by	Created
<input type="checkbox"/>	cluster-0	Terminated	None	\$0.80	ray_tutorial_app_config_allentest200:1	Ray-Tutorial	ray-summit-test-cloud (GCP)	Me	7/18

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Your Anyscale Cluster

console.anyscale.com/o/ray-summit-tutorial-2022-test/projects/prj_U1G82gWidjDMen5JRWsNejaN/clusters/ses_QSpdJDjX3pu4Xz93iD9Sb7p

5

Ray-Tutorial > cluster-0

Jupyter Dashboard Grafana Terminate <> Connect

About this cluster

Status	ID	Created by
Active (auto-suspend in 2880 minutes)	ses_QSpdJDjX3pu4Xz93iD9Sb7p	yinhaonan55+200@gmail.com
Created at	Access	Project
Jul 18, 2022, 2:13:41 PM	Only admins and you can view and edit	Ray-Tutorial

Resource usage

CPU	Object store memory	GPU
0 utilized / 8 running	0 B utilized / 6.87 GiB running	-
Cost since last start	Cost since creation	
\$0.80	\$0.80	

Configuration

Cluster environment	Compute config	Cloud
ray_tutorial_app_config_allintest200:1	autogenerated-config-2022-07-18T14:13:41.023925	ray-summit-test-cloud (gcp, us-central1)
Network access		
Public with auth token		

Terminal

Tab 1

```
exec env ZDOTDIR=/tmp zsh
(base) ray:~%
```



Your Anyscale Cluster

dashboards-ses-qspddjdjx3pu4xz93id9sb7p.anyscale-hxyrj8r-g28hqzi-0000.anyscale-test-production.com/jupyter/lab

File Edit View Run Kernel Tabs Settings Help

Filter files by name

Name	Last Modified
anaconda3	2 months ago
Ray-Tutorial	2 minutes ago
requireme...	2 months ago

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Notebook

Python 3 (pykernel)

Console

Python 3 (pykernel)

Other

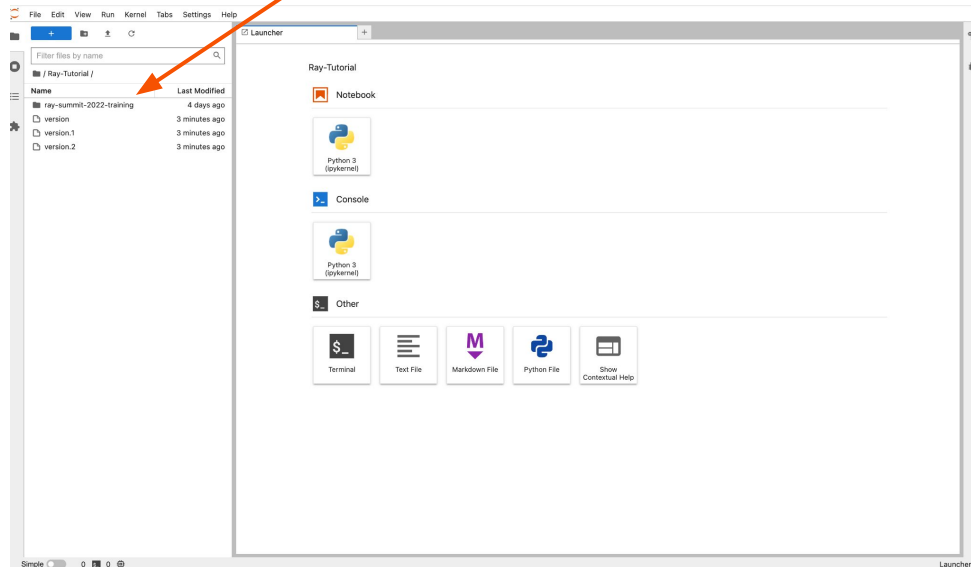
Terminal Text File Markdown File Python File Show Contextual Help

Simple 0 0 0 0 Launcher

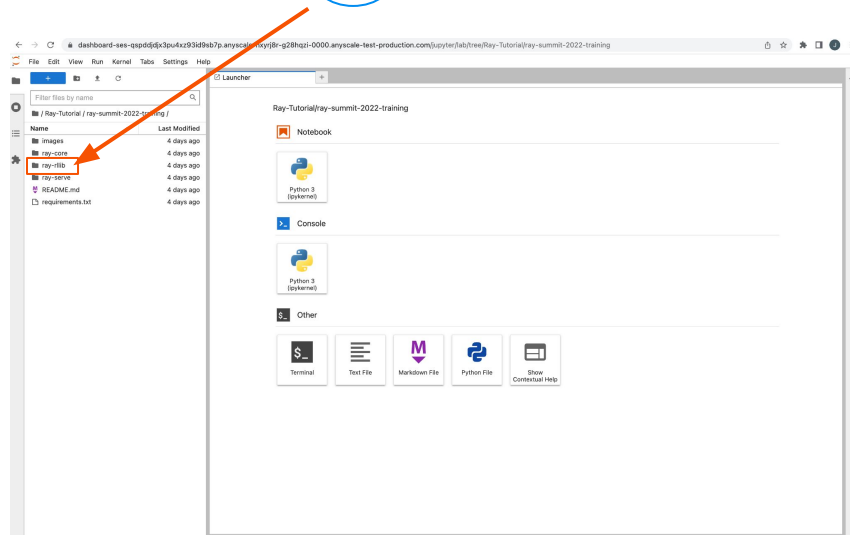


Your Anyscale Cluster



7



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Tell us what you think + Ask questions

Survey	Q&A Doc
https://bit.ly/ray_summit2022_rllib	https://bit.ly/ray_summit2022_rllib_qa
	

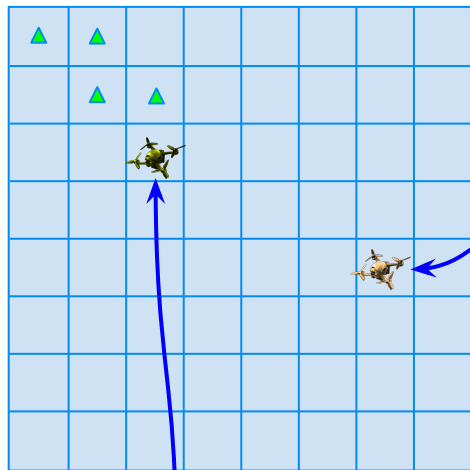
Thank you.

Tell us what you think...

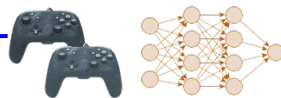
https://bit.ly/ray_summit2022_rllib



Environment 1 (Game)



Init-Bot
(playing the game)



\$\$\$?



Human players

\$\$\$?

Environment 1 (Game)



RecSys-Bot
(learning to recommend
prices)



class **Algorithm**(tune.Trainable)

WorkerSet
(trainer.workers)

“local worker”
class **RolloutWorker**

Policy Map

Pol1

Mo
del

Pol2

Mo
del

```
config.rollouts(  
    num_rollout_workers=0  
)
```

@ray.remote
class **RolloutWorker**

@ray.remote
class **RolloutWorker**

Scalability (e.g.
num_workers=100)

@ray.remote
class **RolloutWorker**

Policy Map

Pol1

Model

Pol2

Model

```
config.rollouts(  
    num_rollout_workers > 0  
)
```

Sampler

Vector Env

Ag1

Ag2

```
config.rollouts(  
    num_envs_per_worker  
)
```