AI⁺软件研发数字峰会
AI⁺ software Development Digital summit

AI驱动软件研发
全面进入数字化时代

中国·北京 08.18-19

AI⁺
software
Development
Digital
summit

OpenRL: A Unified Reinforcement Learning Framework

黄世宇 @ 第四范式

科技生态圈峰会 + 深度研习 ——1000 + 技术团队的共同选择

K+峰会

2023K+
全球软件研发行业创新峰会
上海站
会议时间 | 06.09-10

2023K+
全球软件研发行业创新峰会
北京站
会议时间 | 07.21-22

2024K+
全球软件研发行业创新峰会
深圳站
会议时间 | 05.17-18

K+峰会详情

AiDD峰会

会议时间 | 08.18-19
AiDD AI+软件研发数字峰会
北京站

会议时间 | 11.17-18
AiDD AI+软件研发数字峰会
深圳站

AiDD峰会详情

演讲嘉宾

黄世宇

第四范式强化学习科学家，开源强化学习OpenRL Lab负责人

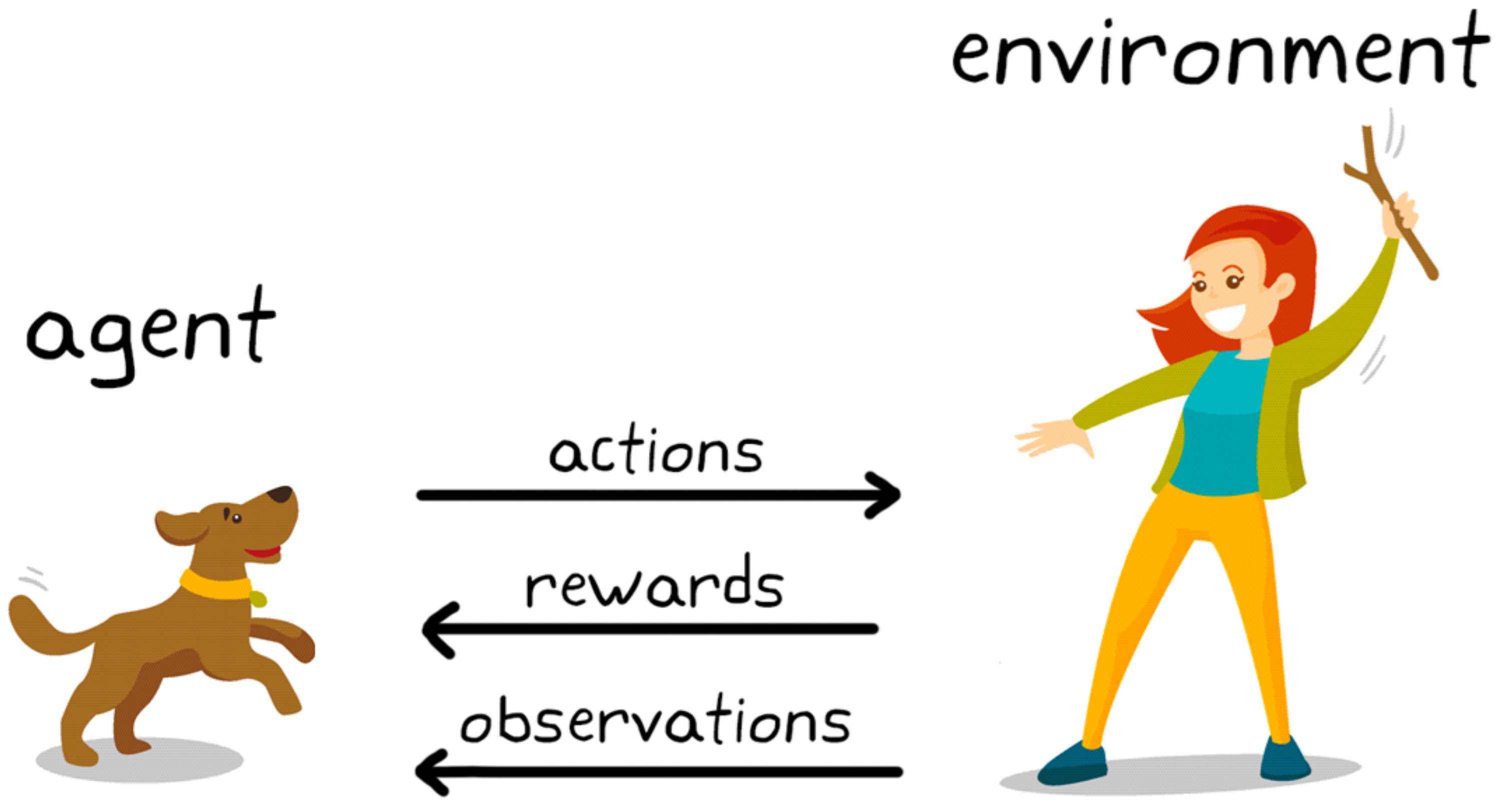
本科与博士均毕业于清华大学计算机系，导师是朱军和陈挺教授，本科期间在CMU交换，导师为Deva Ramanan教授。主要研究方向为强化学习，多智能体强化学习，分布式强化学习。曾在ICLR、CVPR、AAAI、NeurIPS, Nature Machine Intelligence, ICML, AAMAS, Pattern Recognition等会议和期刊发表多篇学术论文。其领导开发的TiZero谷歌足球游戏智能体曾在及第平台上取得排名第一的成绩。黄世宇也曾在腾讯AI Lab、华为诺亚、商汤、瑞莱智慧等工作。

目 录
CONTENTS

PART 01
Introduction & Motivation

What is Reinforcement Learning?

- **Goal of RL**: Artificial General Intelligence (**AGI**)

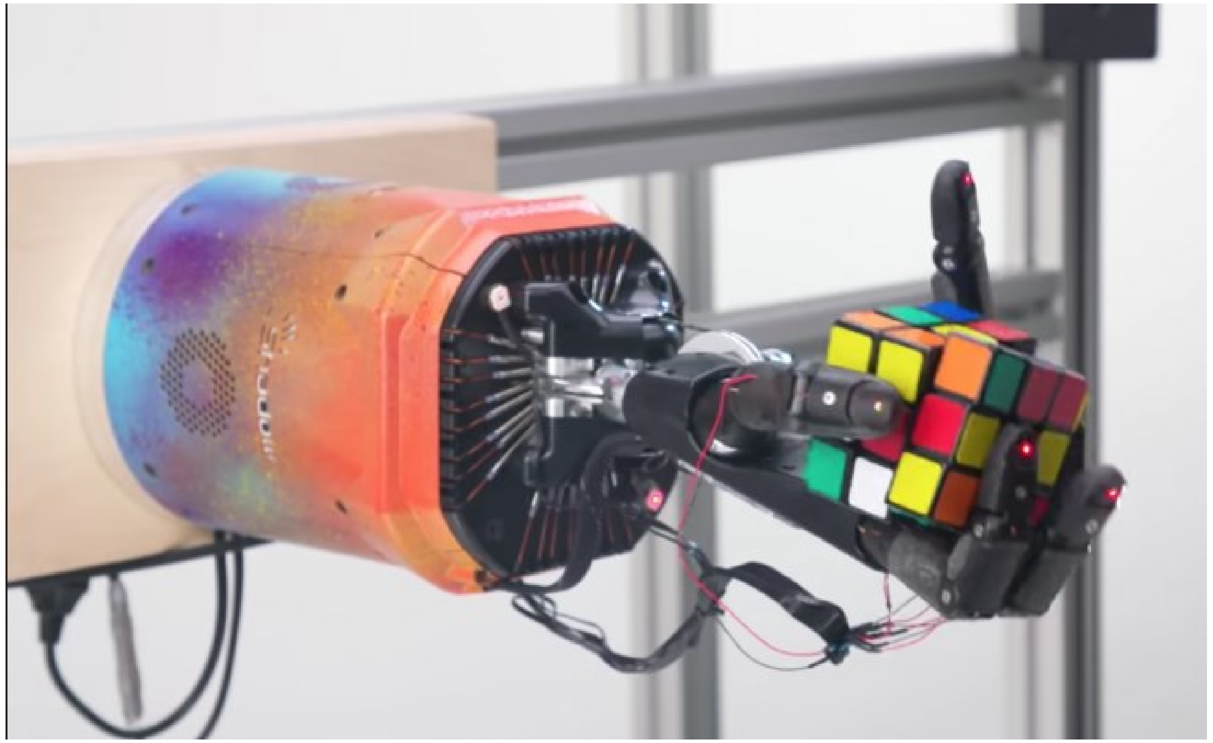


Reinforcement learning in dog training.

What else?

- **Robotics**

➢ **Autonomous Driving**

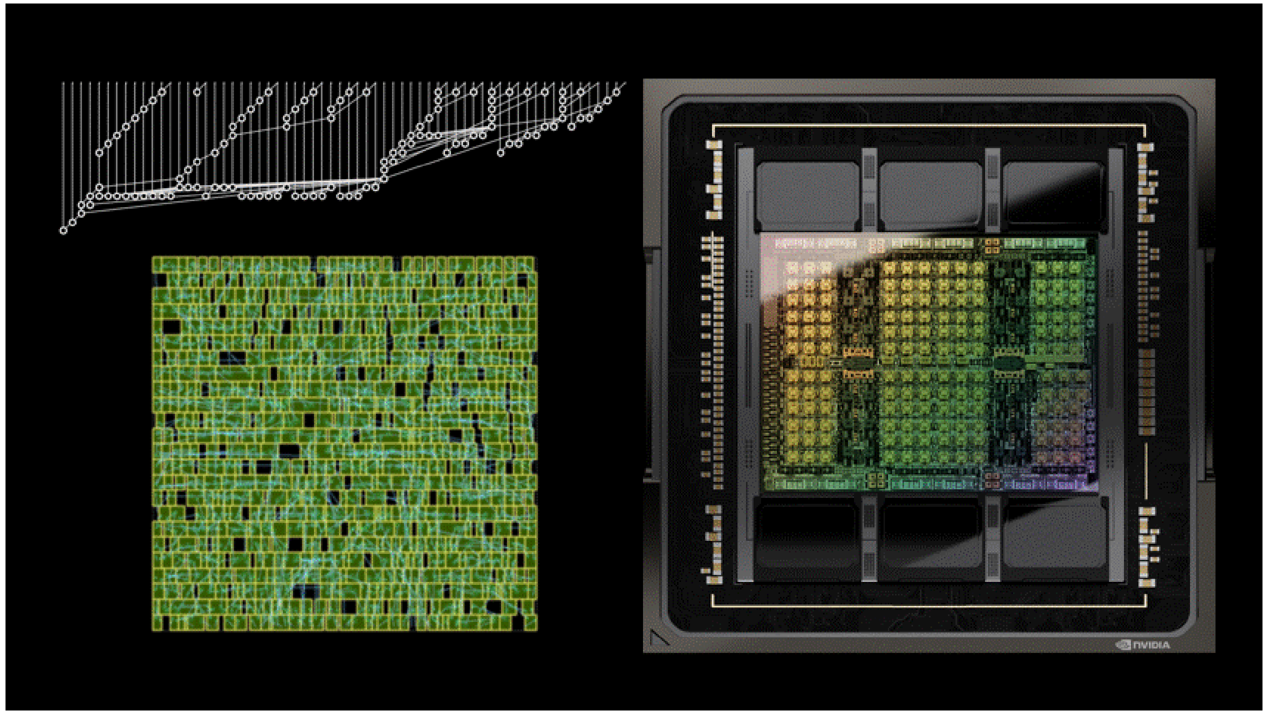


OpenAI 2019

CARLA 2017

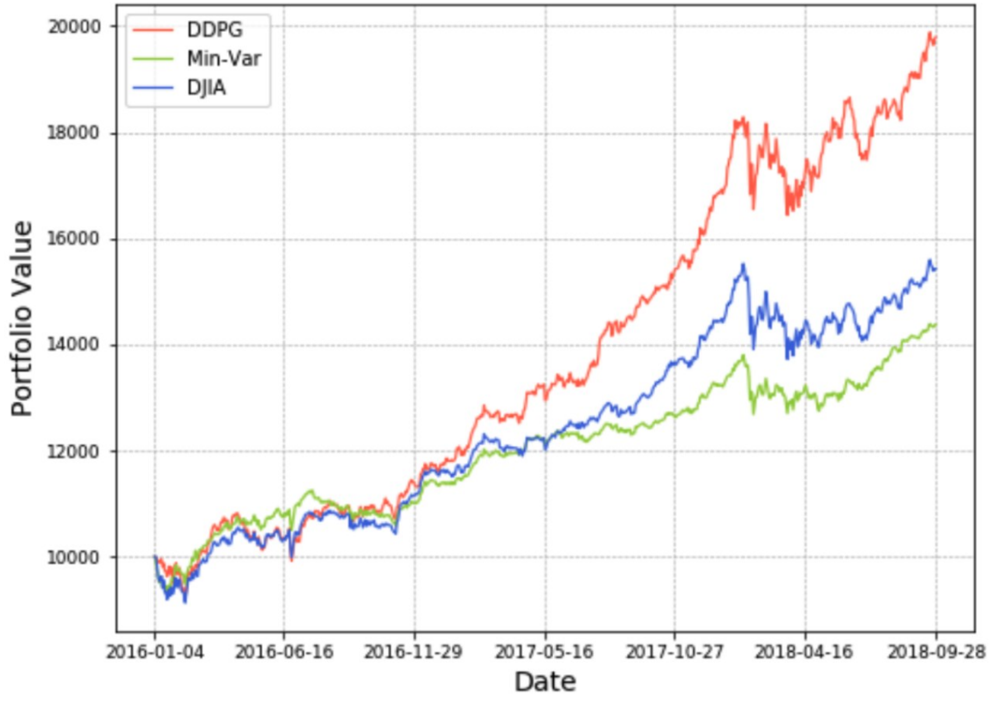
What else?

- **Industrial Design**



PrefixRL 2022

- **Quantitative Trading**



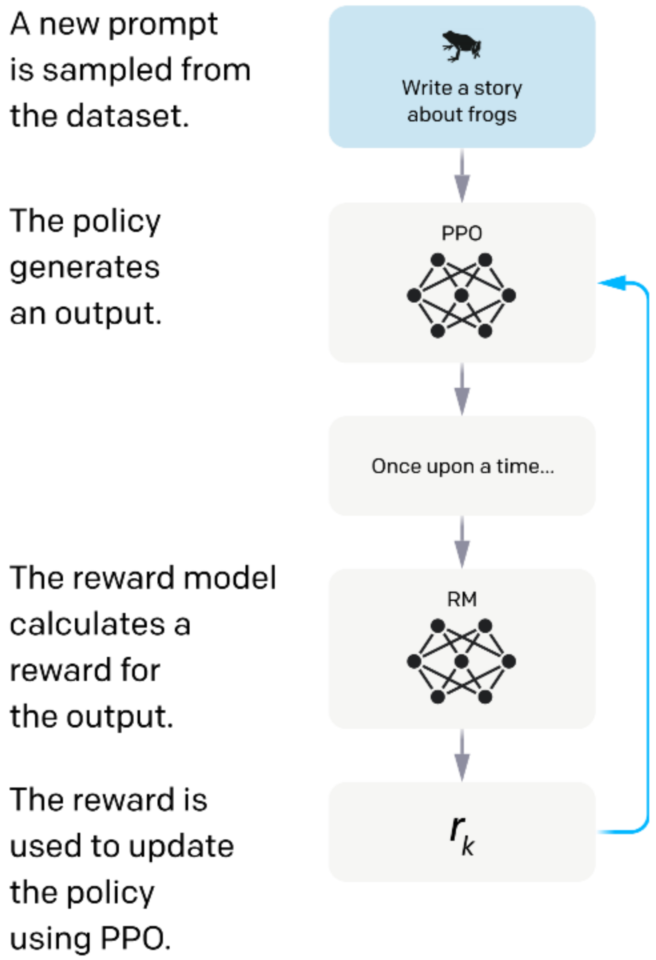
FinRL 2020

What else?

- Chat Bot

Step 3

Optimize a policy against the reward model using reinforcement learning.


A new prompt is sampled from the dataset.
Write a story about frogs
The policy generates an output.
PPO
Once upon a time...
The reward model calculates a reward for the output.
RM
r_k
The reward is used to update the policy using PPO.

What else?

- **Multi-agent RL**

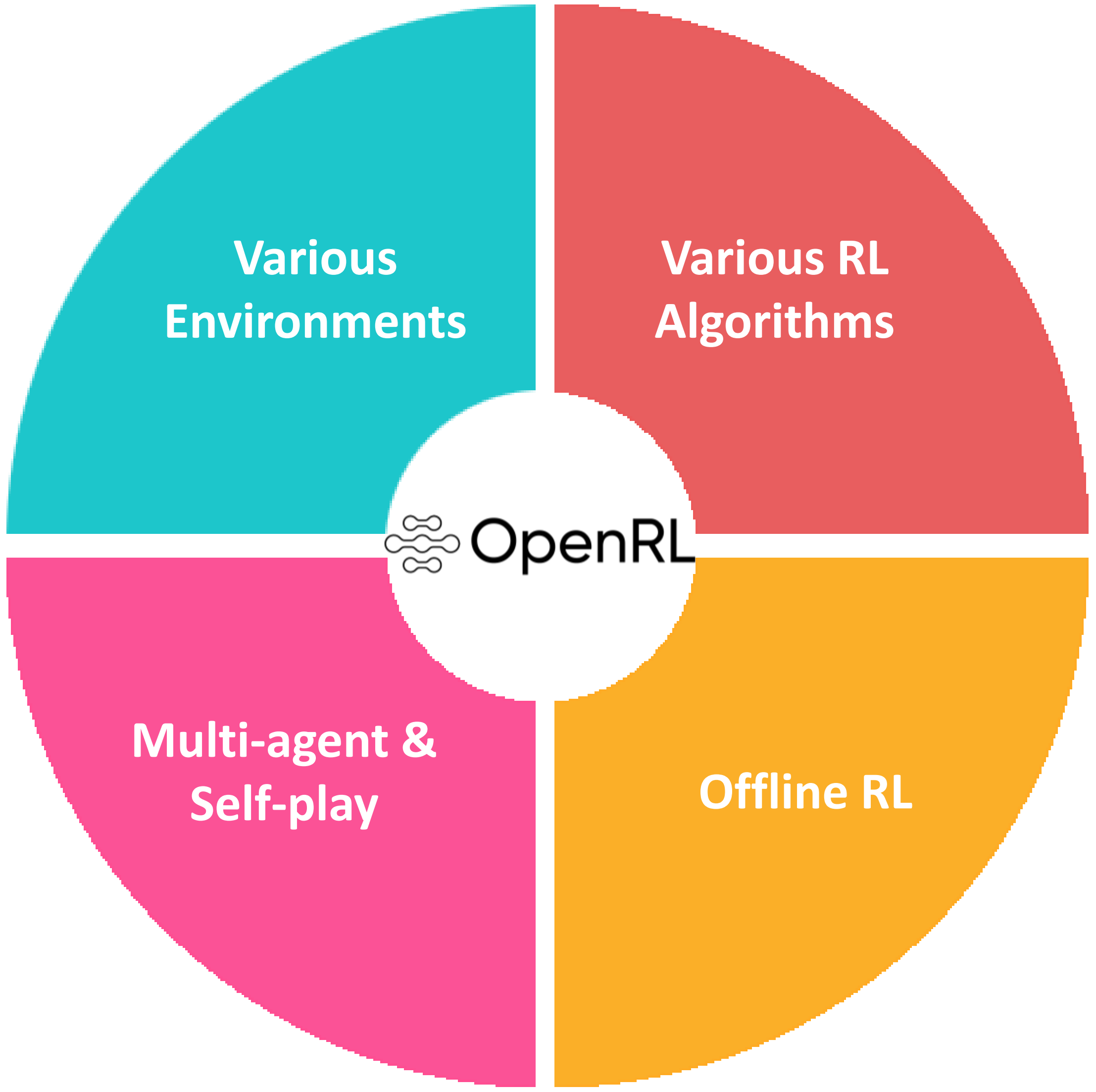
TiZero 2023

➢ **Competitive RL**

Honor of Kings Arena 2022

Do RL in a Unified Framework

```
env = make("env_name")
net = Net(env)
agent = Agent(net)
agent.train(total_time_steps=100)
obs, info = env.reset()
while True:
    action, _ = agent.act(obs)
    obs, r, done, info = env.step(action)
```



PART 02

OpenRL: An Open-Souce RL Framework

Main Features of OpenRL

Friendly to beginners

```
pip install openrl
```

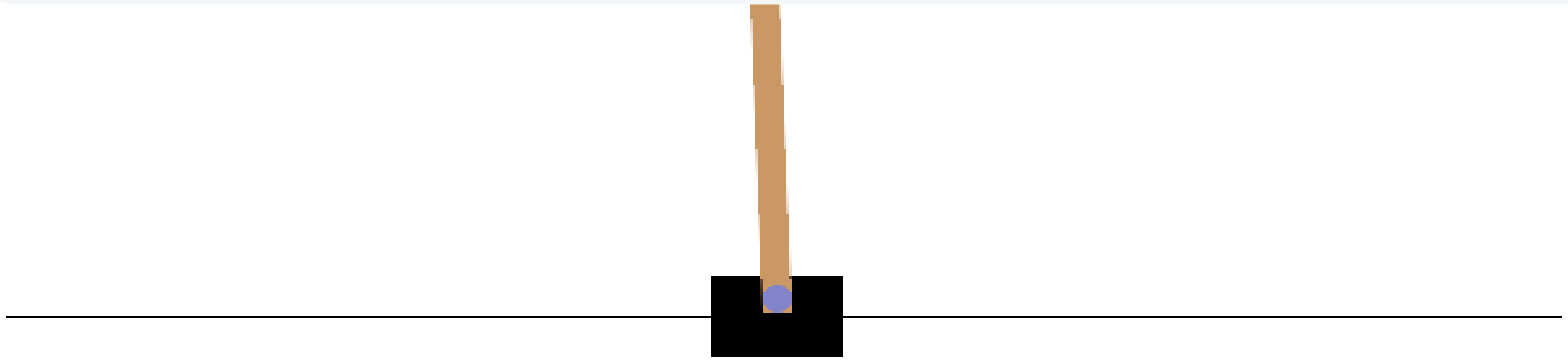
or

```
docker pull openrllab/openrl
```

Main Features of OpenRL

➢ Friendly to beginners

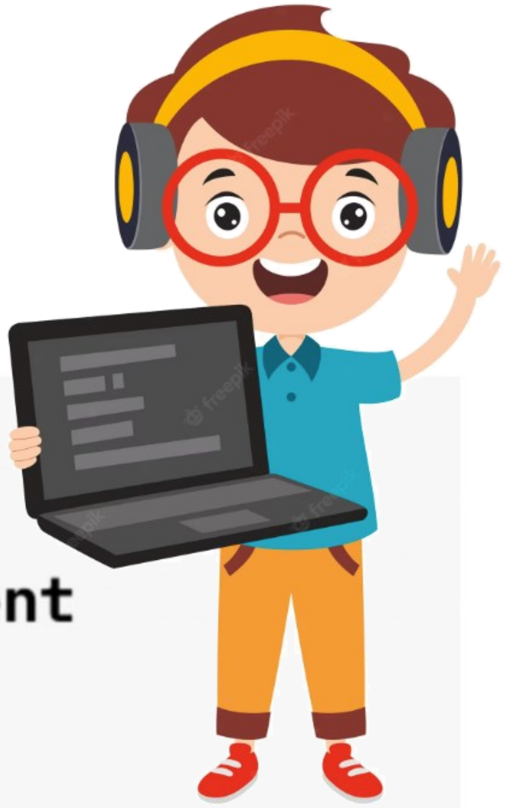
```
openrl --mode train --env CartPole-v1
```

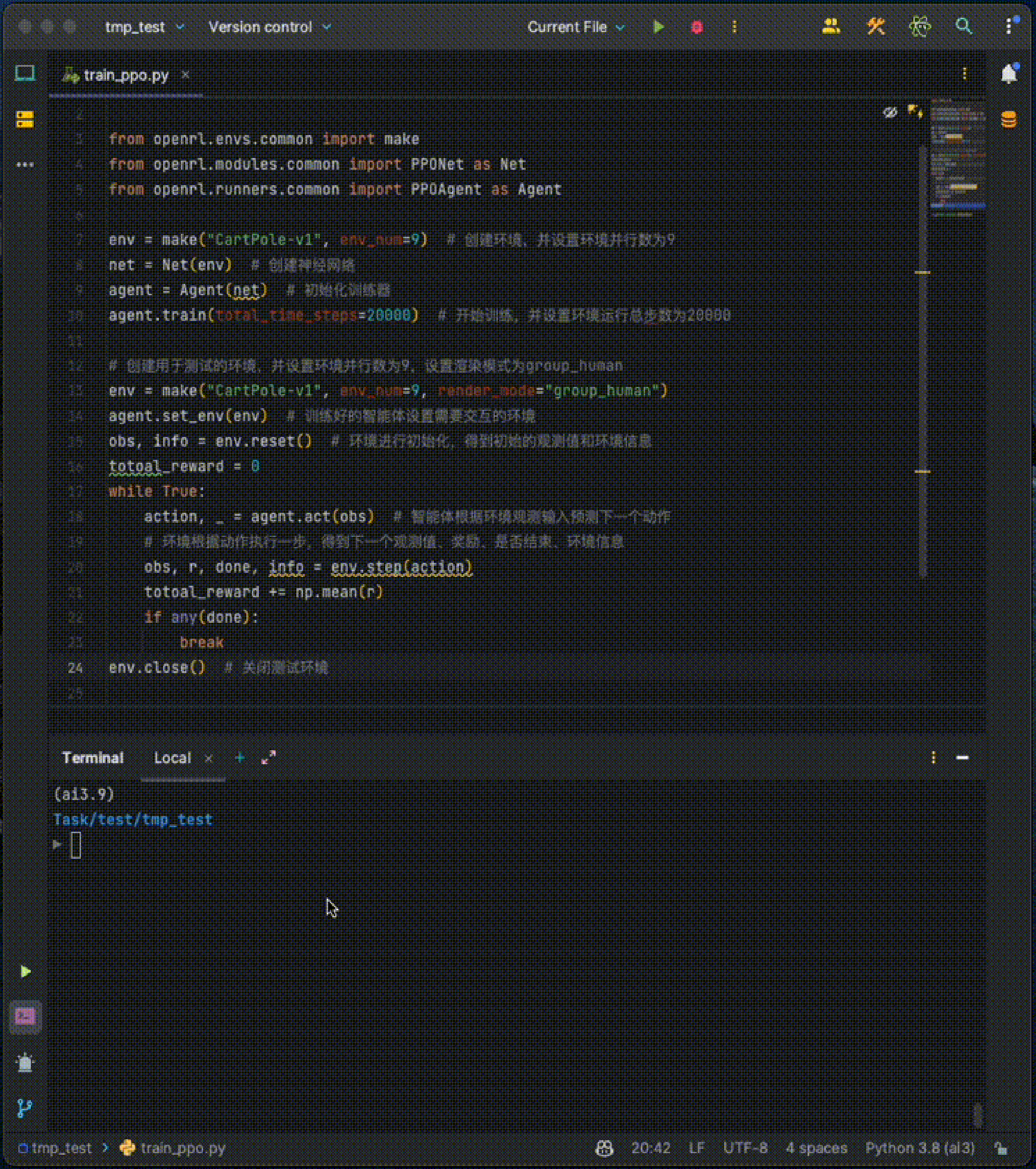


Main Features of OpenRL

➢ Friendly to beginners

```
from openrl.envs.common import make
from openrl.modules.common import PPONet as Net
from openrl.runners.common import PPOAgent as Agent
env = make("CartPole-v1", env_num=9)
net = Net(env) # create the neural network
agent = Agent(net) # initialize the trainer
# start training, set total number of training steps to 20000
agent.train(total_time_steps=20000)
```





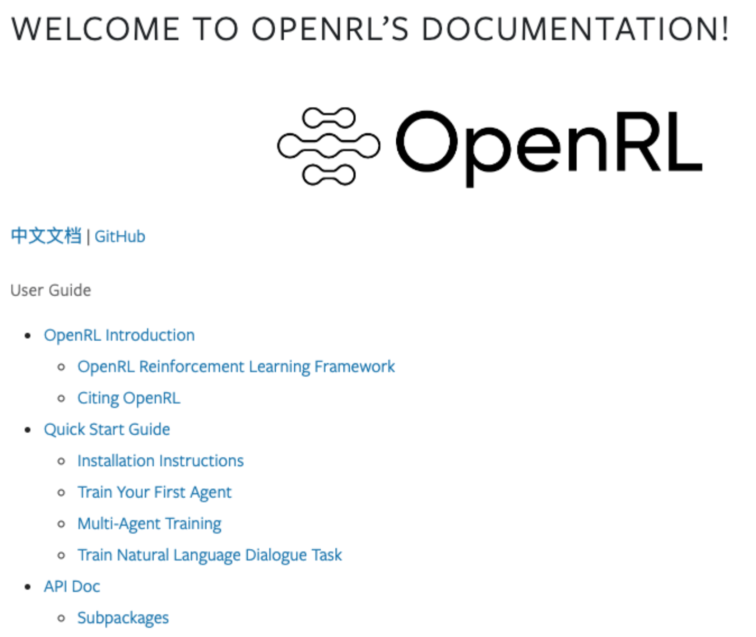
```python

from openrl.envs.common import make
from openrl.modules.common import PPONet as Net
from openrl.runners.common import PPOAgent as Agent

env = make("CartPole-v1", env_num=9)  # 创建环境，并设置环境并行数为9
net = Net(env)  # 创建神经网络
agent = Agent(net)  # 初始化训练器
agent.train(total_time_steps=20000)  # 开始训练，并设置环境运行总步数为20000

# 创建用于测试的环境，并设置环境并行数为9，设置渲染模式为group_human
env = make("CartPole-v1", env_num=9, render_mode="group_human")
agent.set_env(env)  # 训练好的智能体设置需要交互的环境
obs, info = env.reset()  # 环境进行初始化，得到初始的观测值和环境信息
totoal_reward = 0
while True:
    action, _ = agent.act(obs)  # 智能体根据环境观测输入预测下一个动作
    # 环境根据动作执行一步，得到下一个观测值、奖励、是否结束、环境信息
    obs, r, done, info = env.step(action)
    totoal_reward += np.mean(r)
    if any(done):
        break
env.close()  # 关闭测试环境

```

```
(ai3.9)
Task/test/tmp_test
▶ 
```

Main Features of OpenRL

➢ Friendly to beginners

Documentation/中文文档

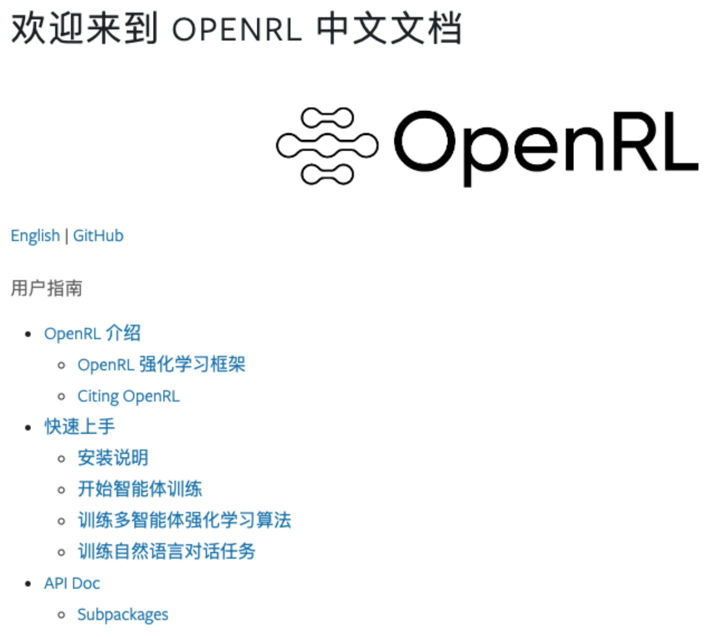

WELCOME TO OPENRL'S DOCUMENTATION!

OpenRL

中文文档 | GitHub

User Guide

- OpenRL Introduction
  - OpenRL Reinforcement Learning Framework
  - Citing OpenRL
- Quick Start Guide
  - Installation Instructions
  - Train Your First Agent
  - Multi-Agent Training
  - Train Natural Language Dialogue Task
- API Doc
  - Subpackages


欢迎来到 OPENRL 中文文档

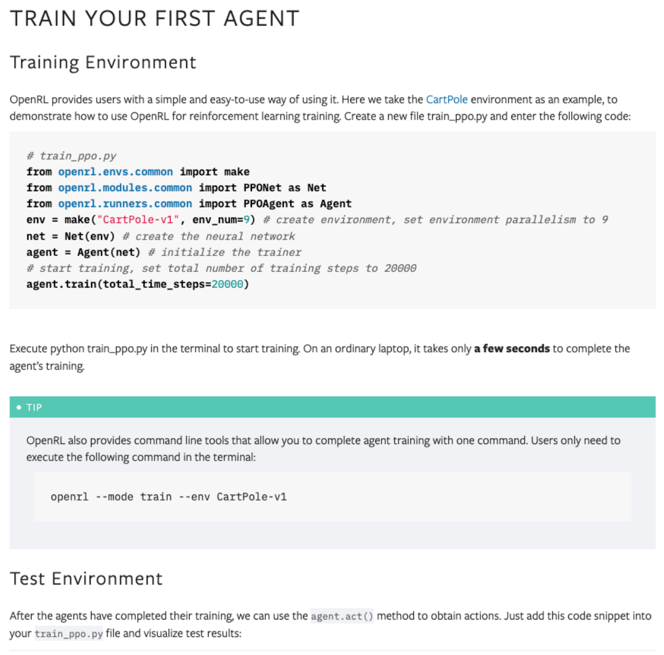
OpenRL

English | GitHub

用户指南

- OpenRL 介绍
  - OpenRL 强化学习框架
  - Citing OpenRL
- 快速上手
  - 安装说明
  - 开始智能体训练
  - 训练多智能体强化学习算法
  - 训练自然语言对话任务
- API Doc
  - Subpackages

Tutorial


TRAIN YOUR FIRST AGENT

Training Environment

OpenRL provides users with a simple and easy-to-use way of using it. Here we take the CartPole environment as an example, to demonstrate how to use OpenRL for reinforcement learning training. Create a new file train_ppo.py and enter the following code:

```python
# train_ppo.py
from openrl.envs.common import make
from openrl.modules.common import PPONet as Net
from openrl.runners.common import PPOAgent as Agent
env = make("CartPole-v1", env_num=9) # create environment, set environment parallelism to 9
net = Net(env) # create the neural network
agent = Agent(net) # initialize the trainer
# start training, set total number of training steps to 20000
agent.train(total_time_steps=20000)
```

Execute python train_ppo.py in the terminal to start training. On an ordinary laptop, it takes only **a few seconds** to complete the agent's training.

• TIP

OpenRL also provides command line tools that allow you to complete agent training with one command. Users only need to execute the following command in the terminal:

```
openrl --mode train --env CartPole-v1
```

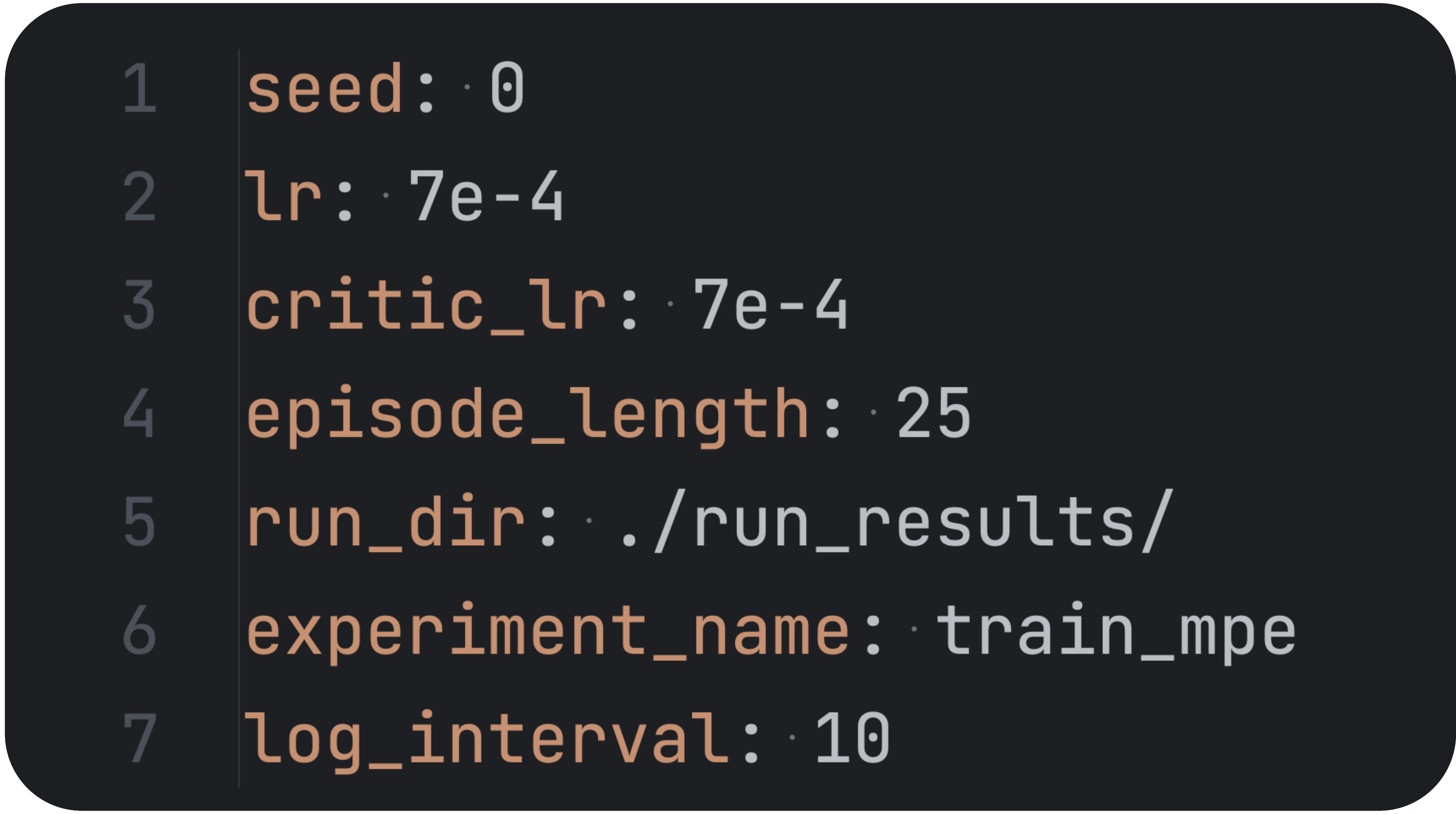
Test Environment

After the agents have completed their training, we can use the `agent.act()` method to obtain actions. Just add this code snippet into your `train_ppo.py` file and visualize test results:

Main Features of OpenRL

Customizable capabilities for professionals

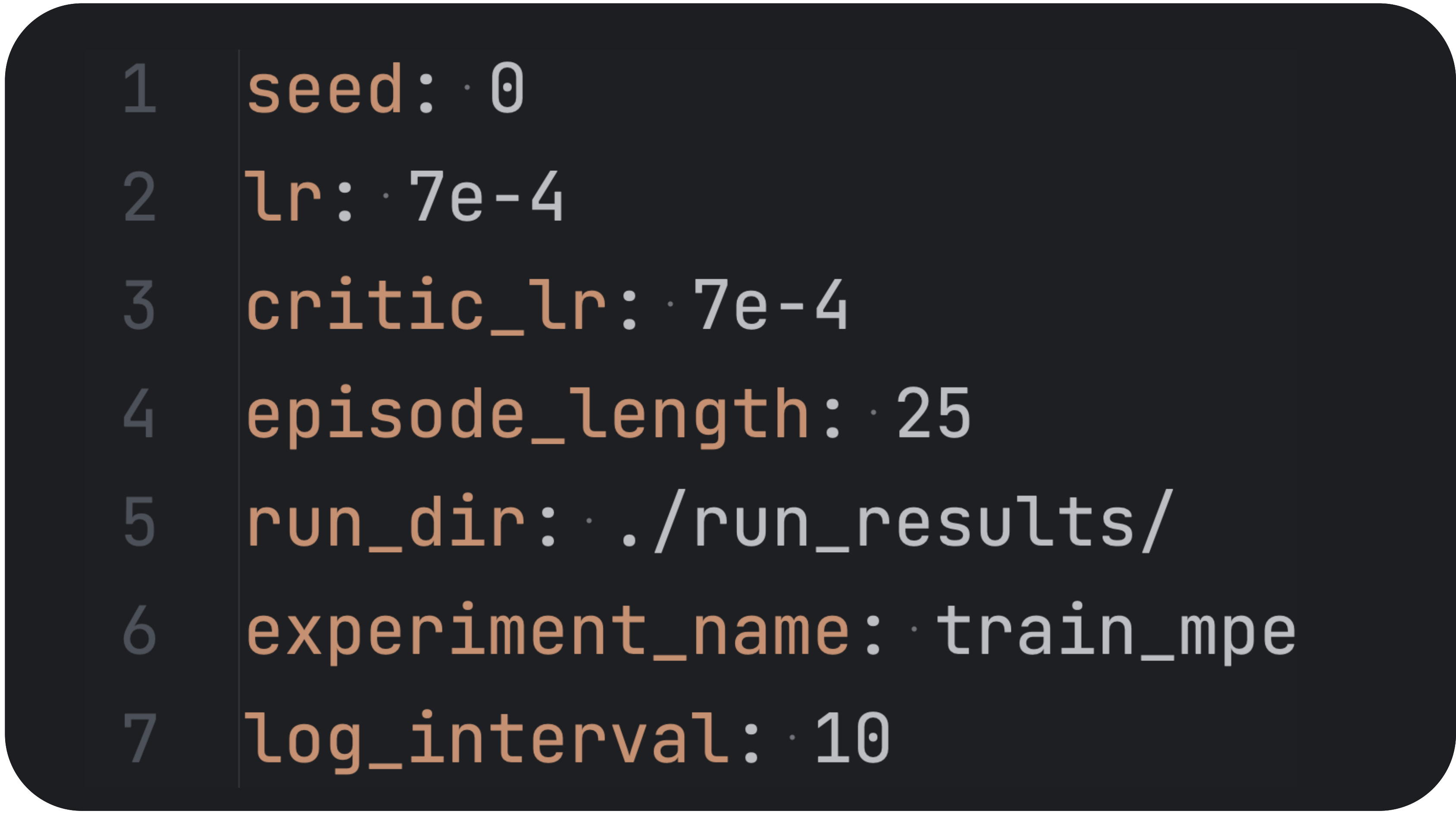
Configure everything via YAML



```yaml
seed: 0
lr: 7e-4
critic_lr: 7e-4
episode_length: 25
run_dir: ./run_results/
experiment_name: train_mpe
log_interval: 10
```

Use yaml

> python train_ppo.py --config mpe_ppo.yaml



```yaml
seed: 0
lr: 7e-4
critic_lr: 7e-4
episode_length: 25
run_dir: ./run_results/
experiment_name: train_mpe
log_interval: 10
```

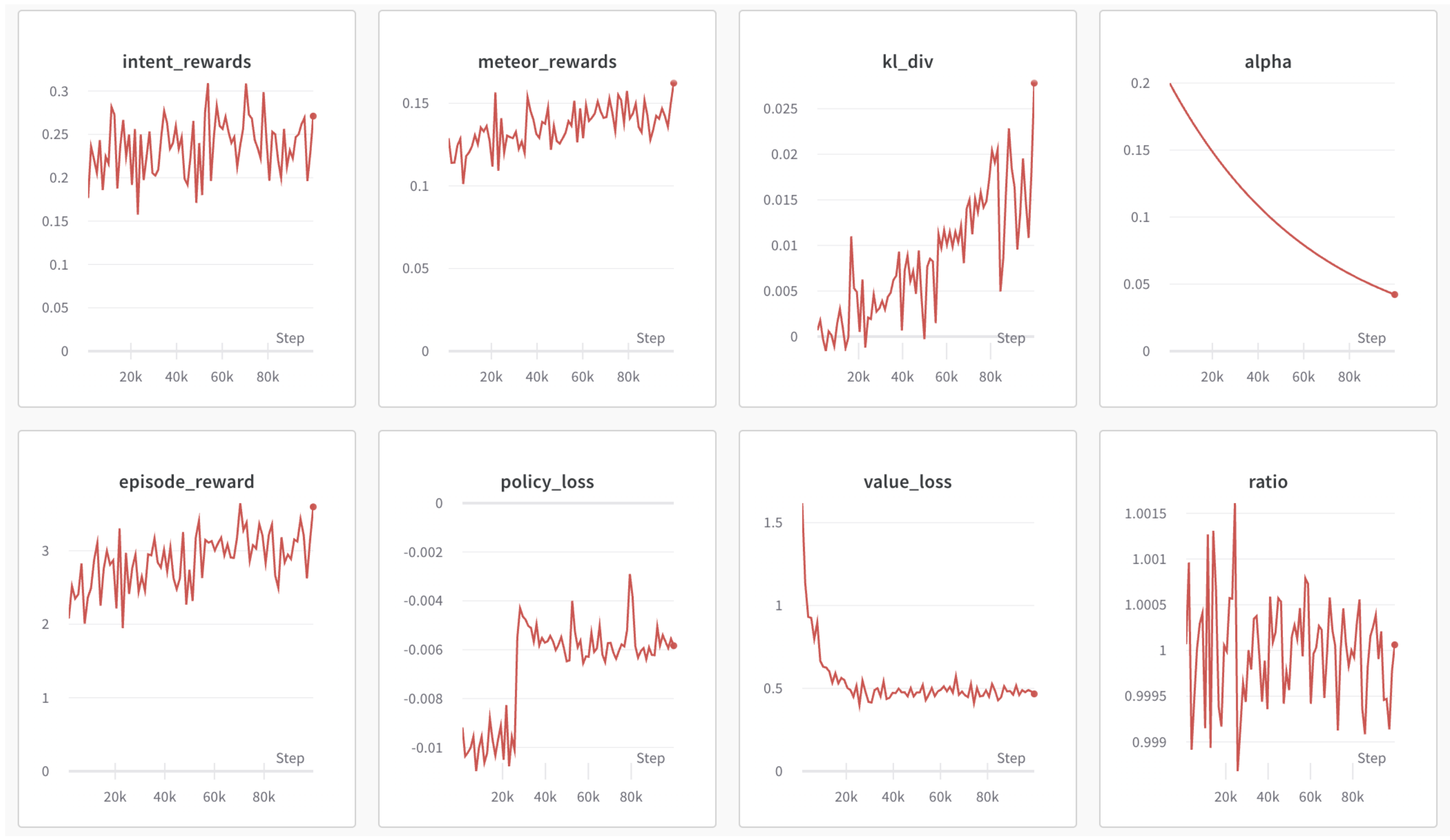
Use yaml

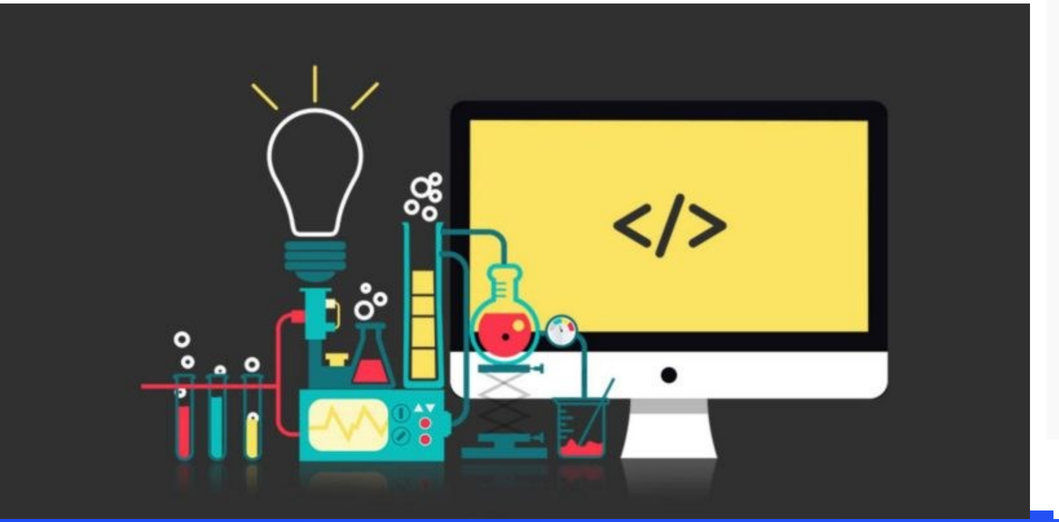
```
> python train_ppo.py --config mpe_ppo.yaml

> python train_ppo.py --seed 1 --lr 5e-4
```

Main Features of OpenRL

➤ Customizable capabilities for professionals

Track your experiments via Wandb

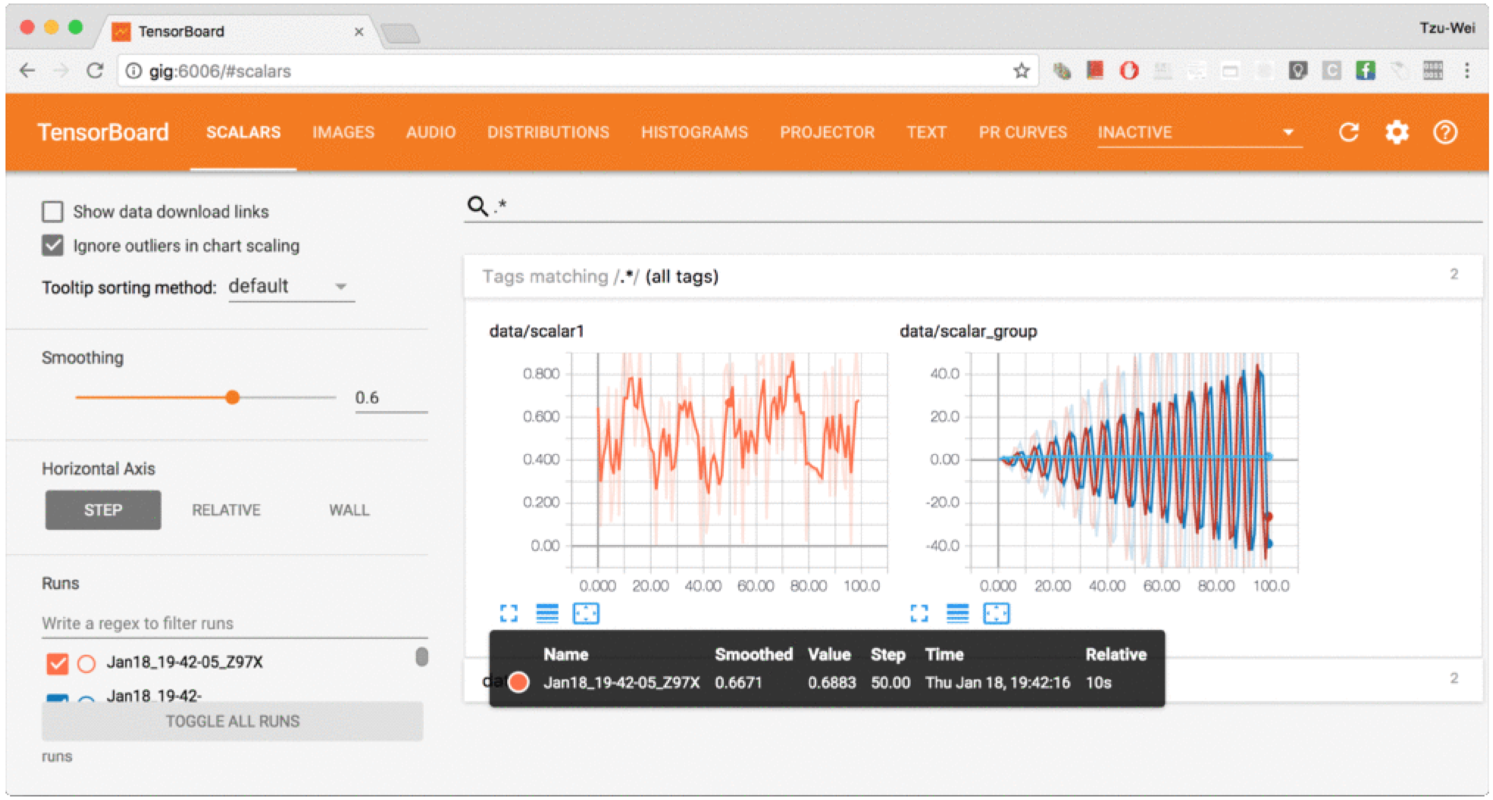




Main Features of OpenRL

Customizable capabilities for professionals

Track your experiments via Tensorboard


TensorBoard
gig:6006/#scalars
TensorBoard SCALARS IMAGES AUDIO DISTRIBUTIONS HISTOGRAMS PROJECTOR TEXT PR CURVES INACTIVE
TOGGLE ALL RUNS
STEP RELATIVE WALL

Show data download links
✓ Ignore outliers in chart scaling
Tooltip sorting method: default
Smoothing 0.6
Horizontal Axis: STEP
Runs
Write a regex to filter runs
✓ Jan18_19-42-05_Z97X
Jan18_19-42-
runs

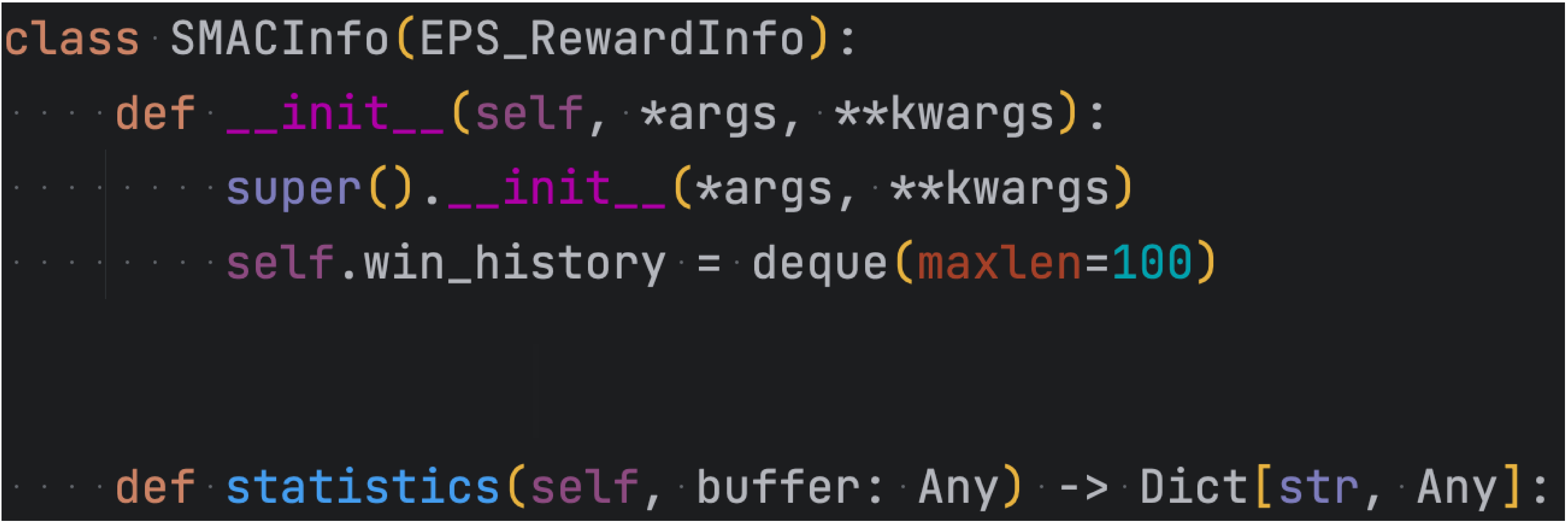
Tags matching /.*/ (all tags) 2

data/scalar1

data/scalar_group

Name	Smoothed	Value	Step	Time	Relative
Jan18_19-42-05_Z97X	0.6671	0.6883	50.00	Thu Jan 18, 19:42:16	10s

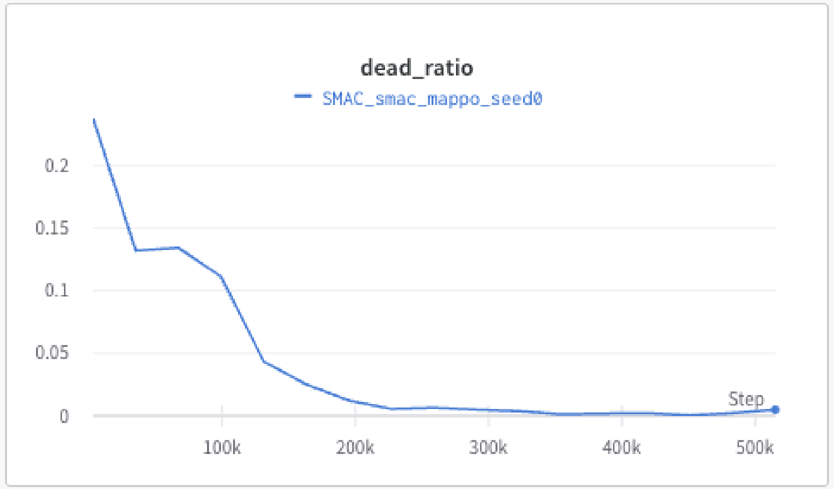
Customize Wandb Output

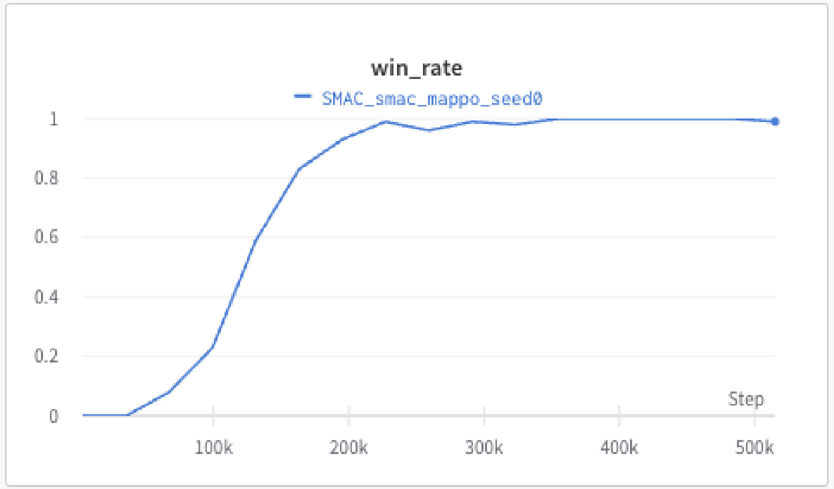


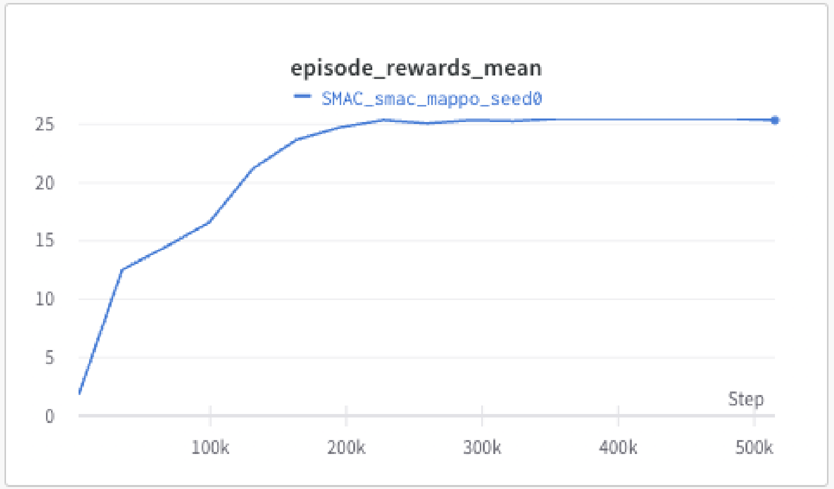
```
class SMACInfo(EPS_RewardInfo):
    def __init__(self, *args, **kwargs):
        super().__init__(*args, **kwargs)
        self.win_history = deque(maxlen=100)


    def statistics(self, buffer: Any) -> Dict[str, Any]:
```

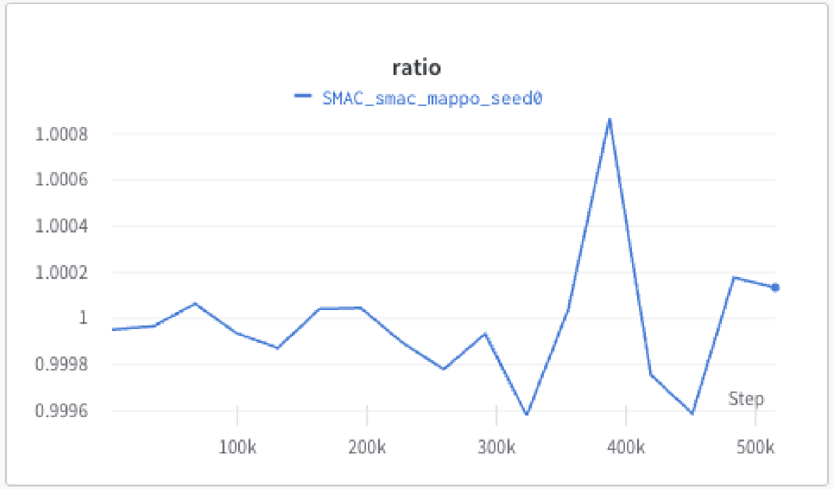
https://github.com/OpenRL-Lab/openrl/blob/main/examples/smac/custom_vecinfo.py

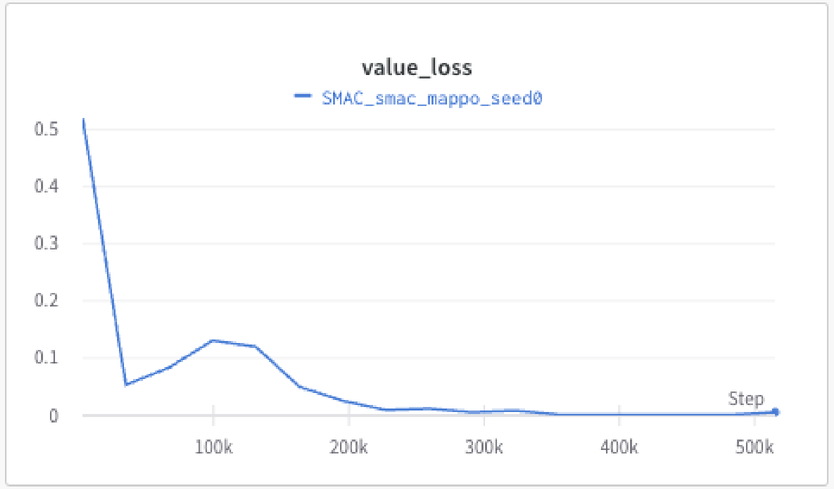
Customize Wandb Output

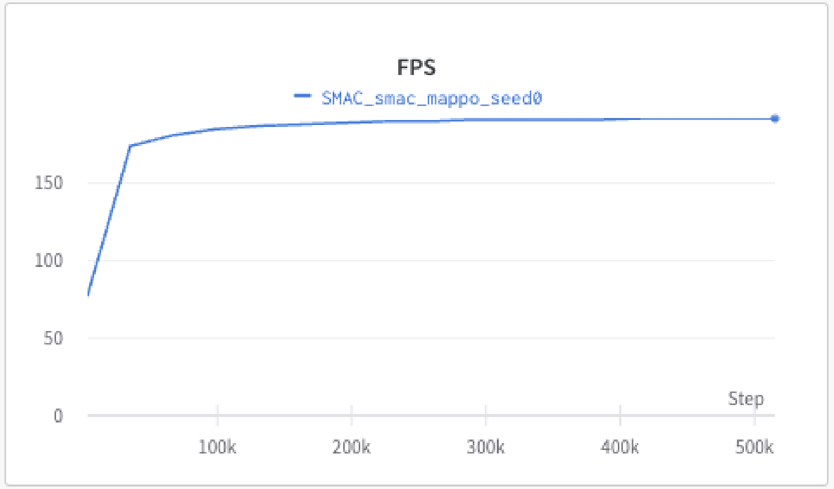








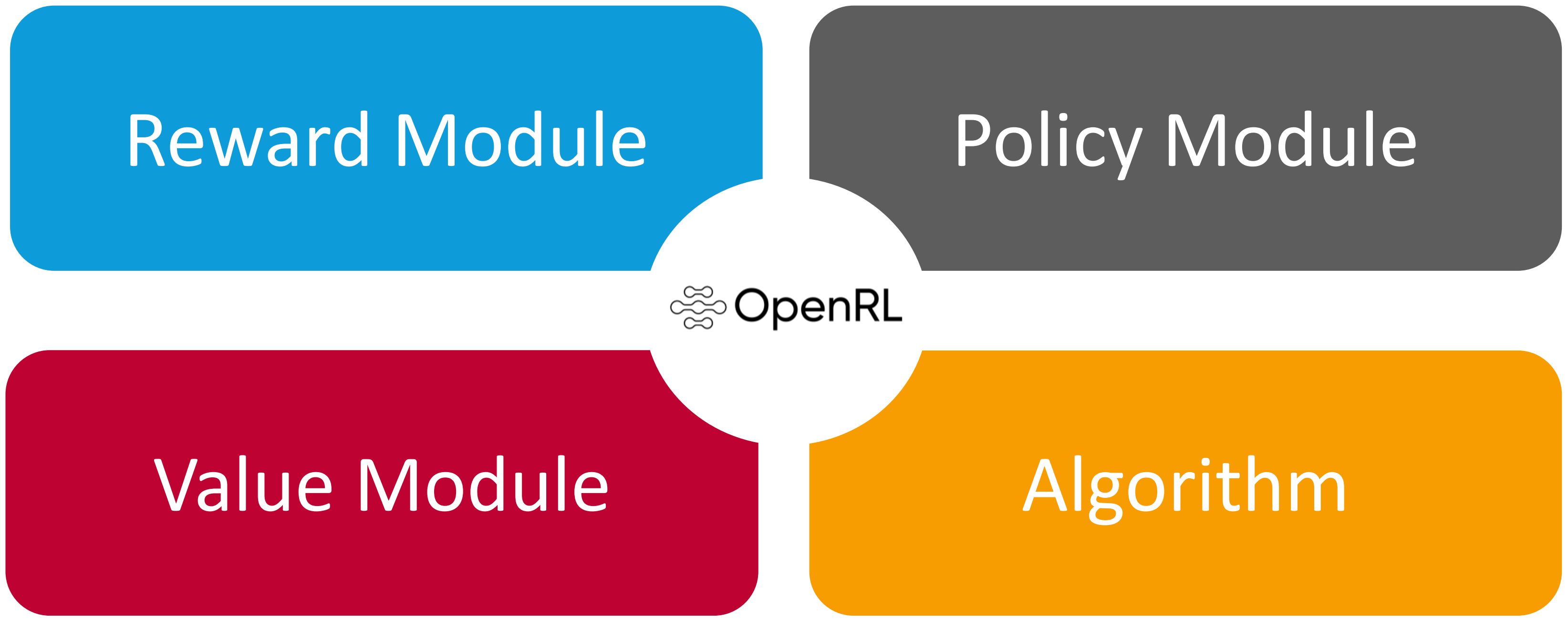




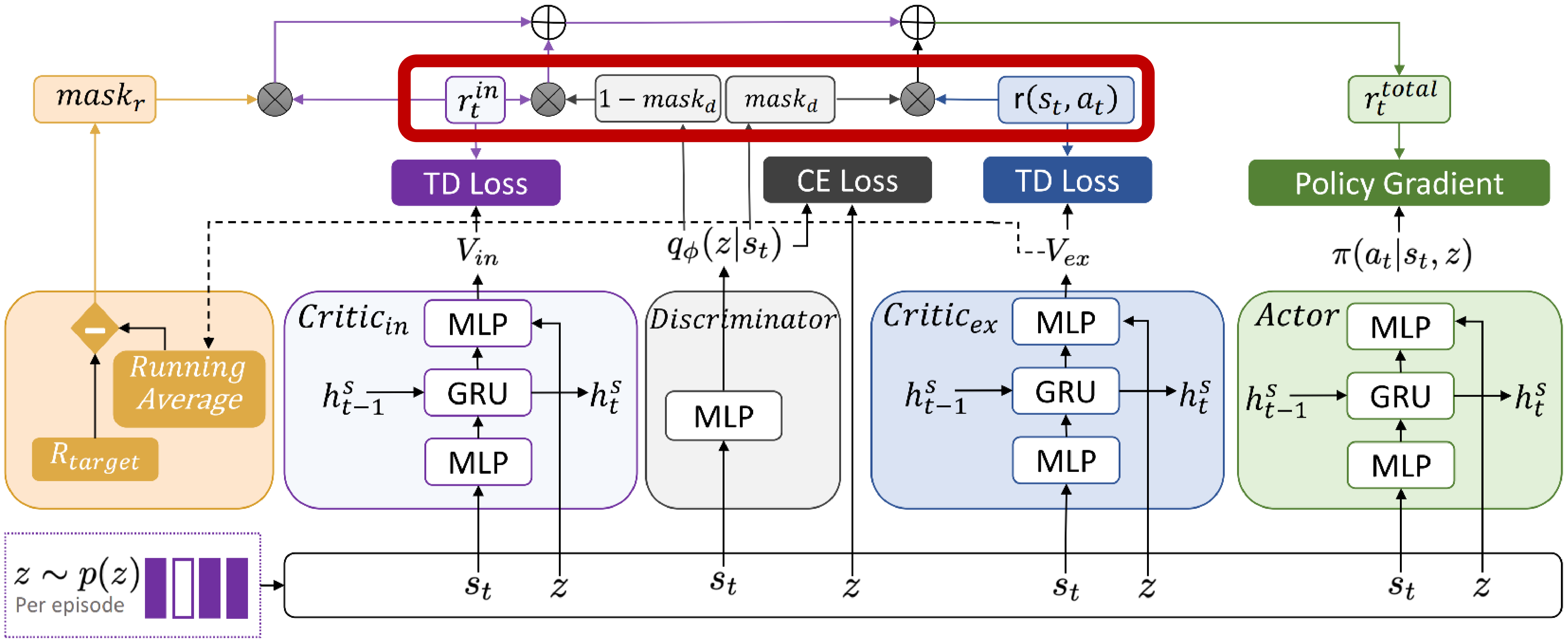
Main Features of OpenRL

➢ Customizable capabilities for professionals

Abstract & Modularized Design

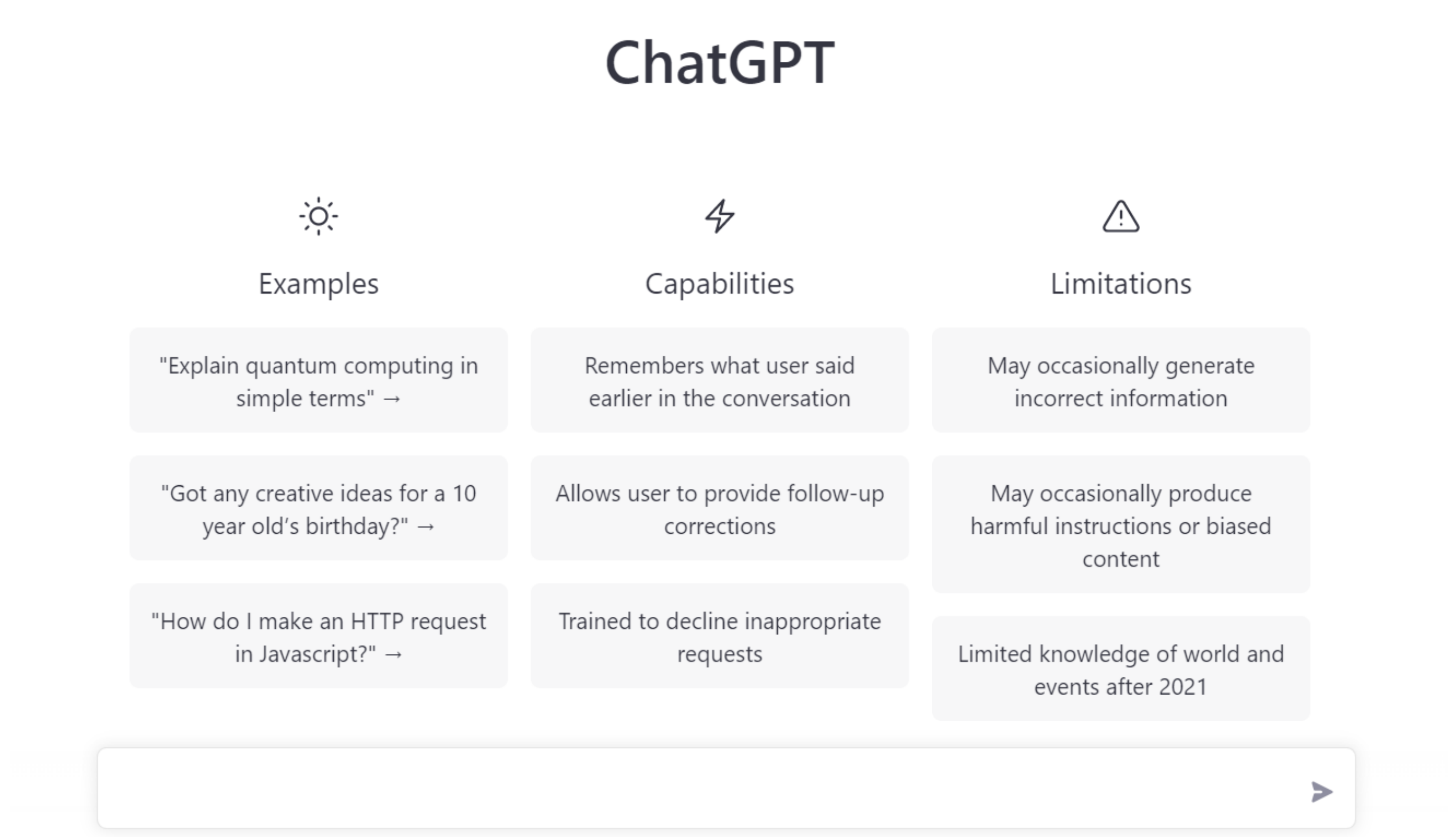


Customize Reward Model



Chen, Wenze, et al. "DGPO: Discovering Multiple Strategies with Diversity-Guided Policy Optimization." arXiv preprint arXiv:2207.05631 (2022).

Customize Reward Model



ChatGPT

Examples

"Explain quantum computing in simple terms" →

"Got any creative ideas for a 10 year old's birthday?" →

"How do I make an HTTP request in Javascript?" →

Capabilities

Remembers what user said earlier in the conversation

Allows user to provide follow-up corrections

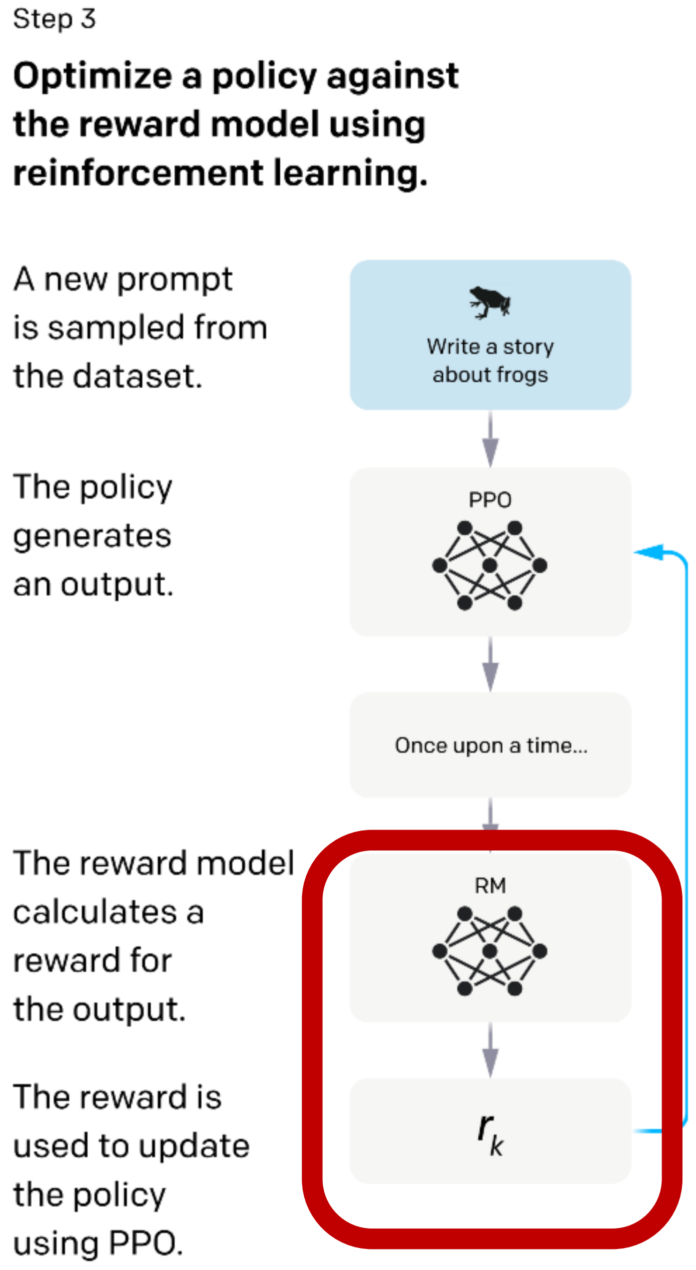
Trained to decline inappropriate requests

Limitations

May occasionally generate incorrect information

May occasionally produce harmful instructions or biased content

Limited knowledge of world and events after 2021


Step 3

Optimize a policy against the reward model using reinforcement learning.

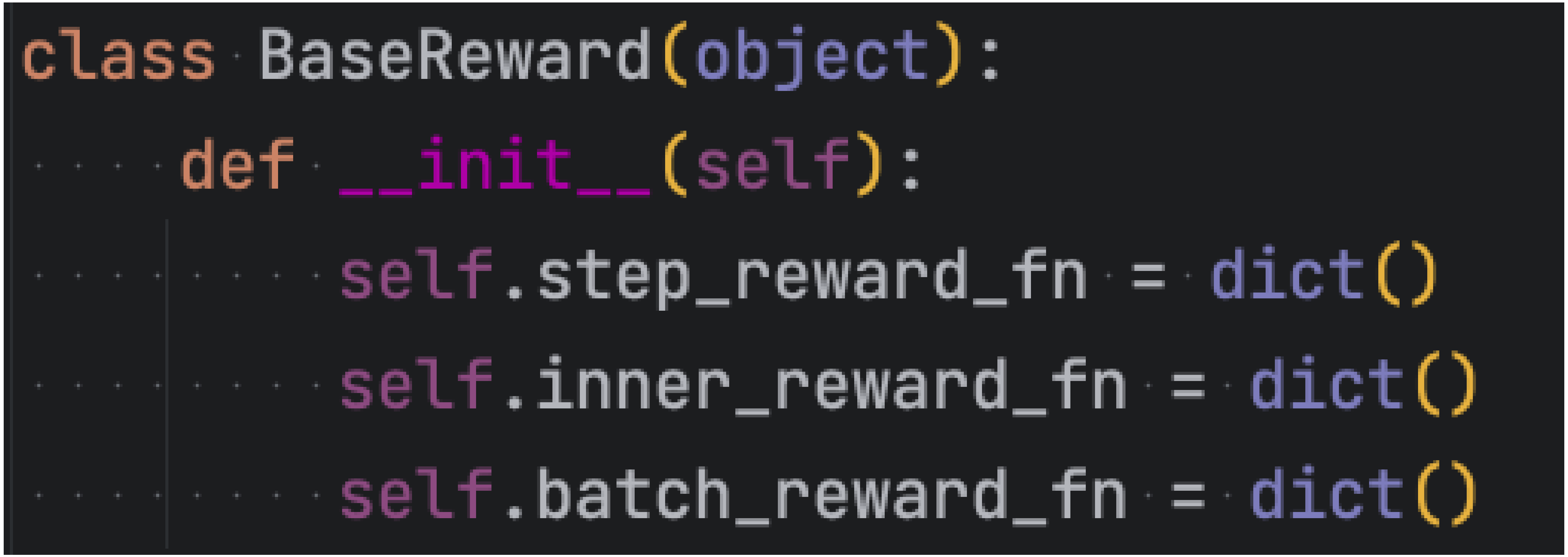
A new prompt is sampled from the dataset.

The policy generates an output.

The reward model calculates a reward for the output.

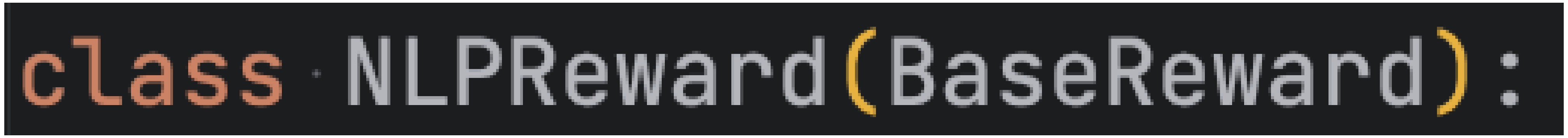
The reward is used to update the policy using PPO.

Customize Reward Model



```python
class BaseReward(object):
    def __init__(self):
        self.step_reward_fn = dict()
        self.inner_reward_fn = dict()
        self.batch_reward_fn = dict()
```

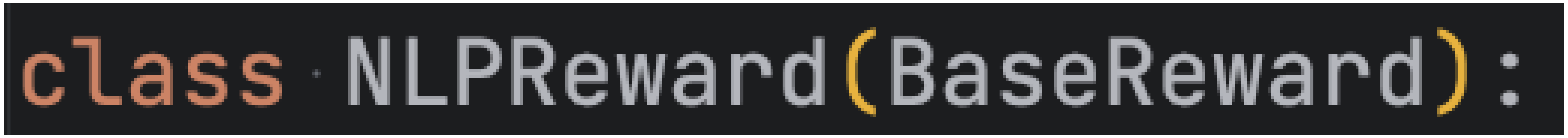
Customize Reward Model



```
class NLPReward(BaseReward):
```

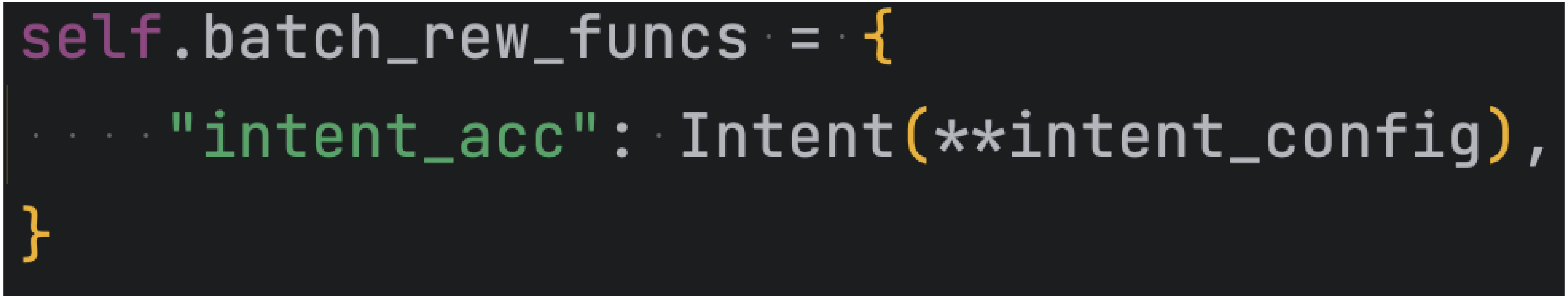
- **Intent Reward**： When the generated text by the agent is close to the expected intent, the agent can receive higher rewards.
- **METEOR Metric Reward**： METEOR is a metric used to evaluate text generation quality and can be used to measure how similar generated texts are compared with expected ones. We use this metric as feedback for rewards given to agents in order to optimize their text generation performance.
- **KL Divergence Reward**： This reward is used to limit how much text generated by agents deviates from pre-trained models and prevent issues of reward hacking.

Customize Reward Model



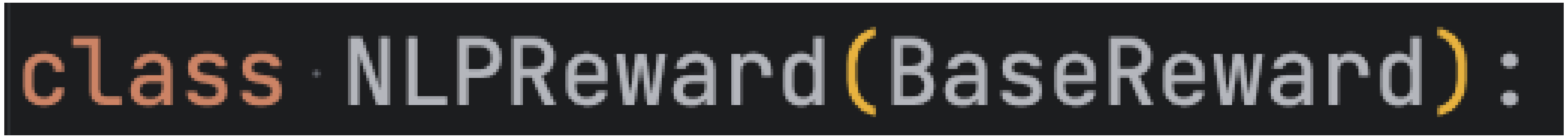
```
class NLPReward(BaseReward):
```

- **Intent Reward**： When the generated text by the agent is close to the expected intent, the agent can receive higher rewards.

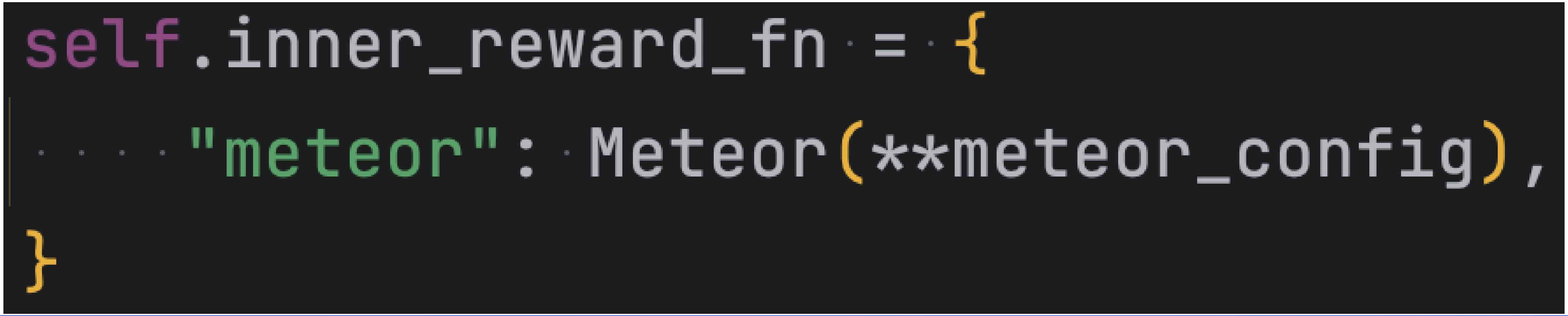


```
self.batch_rew_funcs = {
    "intent_acc": Intent(**intent_config),
}
```

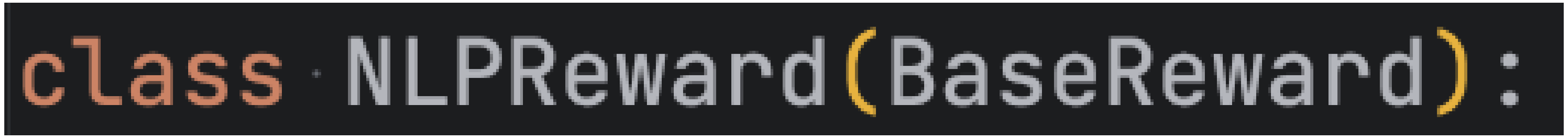
Customize Reward Model


```
class NLPReward(BaseReward):
```

- **METEOR Metric Reward**： METEOR is a metric used to evaluate text generation quality and can be used to measure how similar generated texts are compared with expected ones. We use this metric as feedback for rewards given to agents in order to optimize their text generation performance.

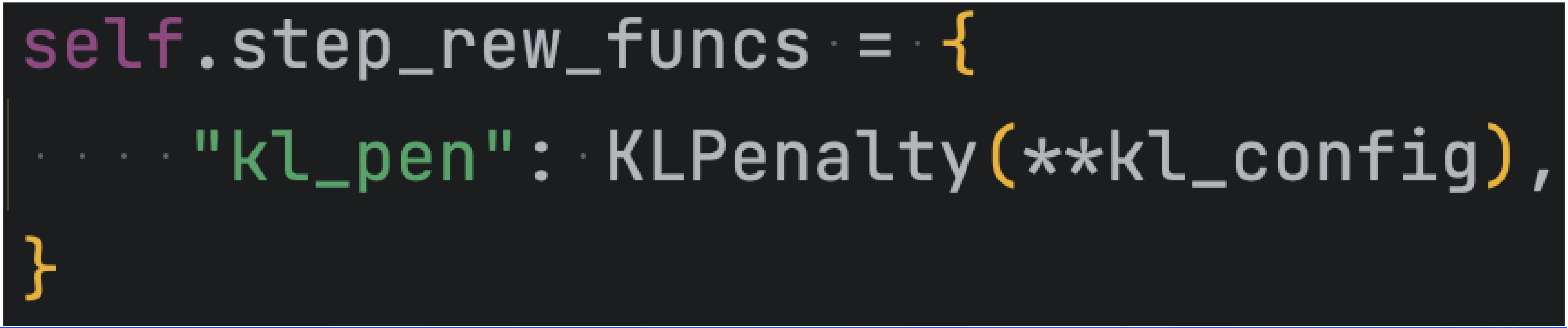

```
self.inner_reward_fn = {
    "meteor": Meteor(**meteor_config),
}
```

Customize Reward Model



```python
class NLPReward(BaseReward):
```

- **KL Divergence Reward**： This reward is used to limit how much text generated by agents deviates from pre-trained models and prevent issues of reward hacking.

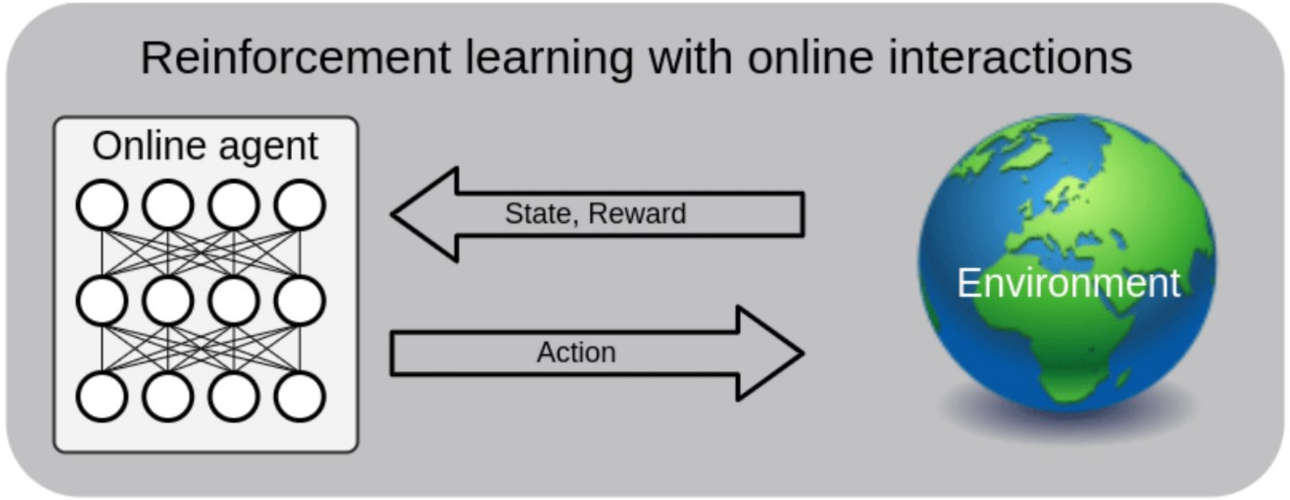


```python
self.step_rew_funcs = {
    "kl_pen": KLPenalty(**kl_config),
}
```

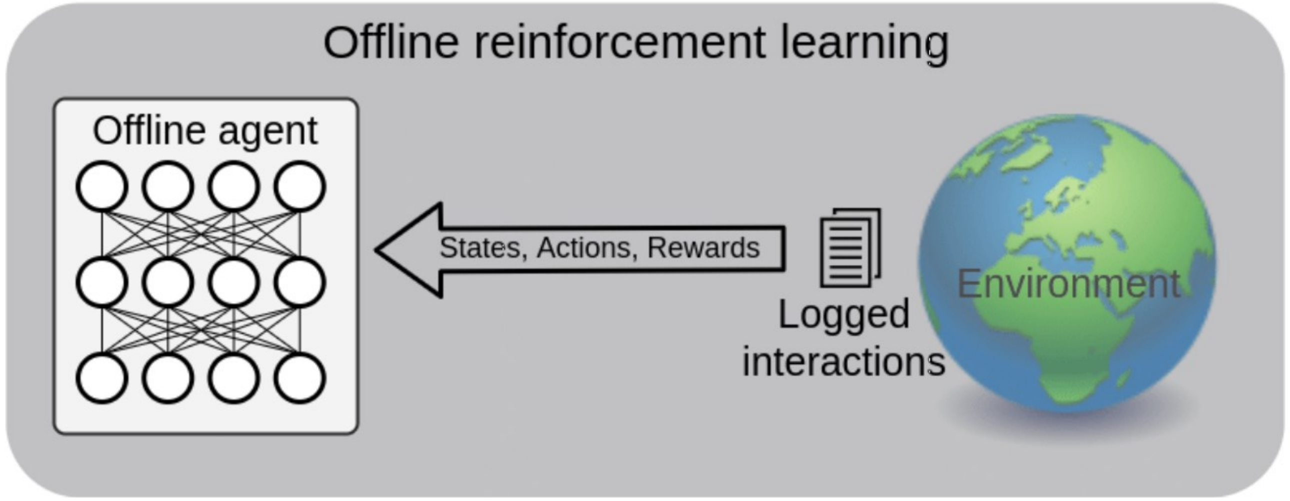
Main Features of OpenRL

➢ Support Offline RL

Learn from Iteraction

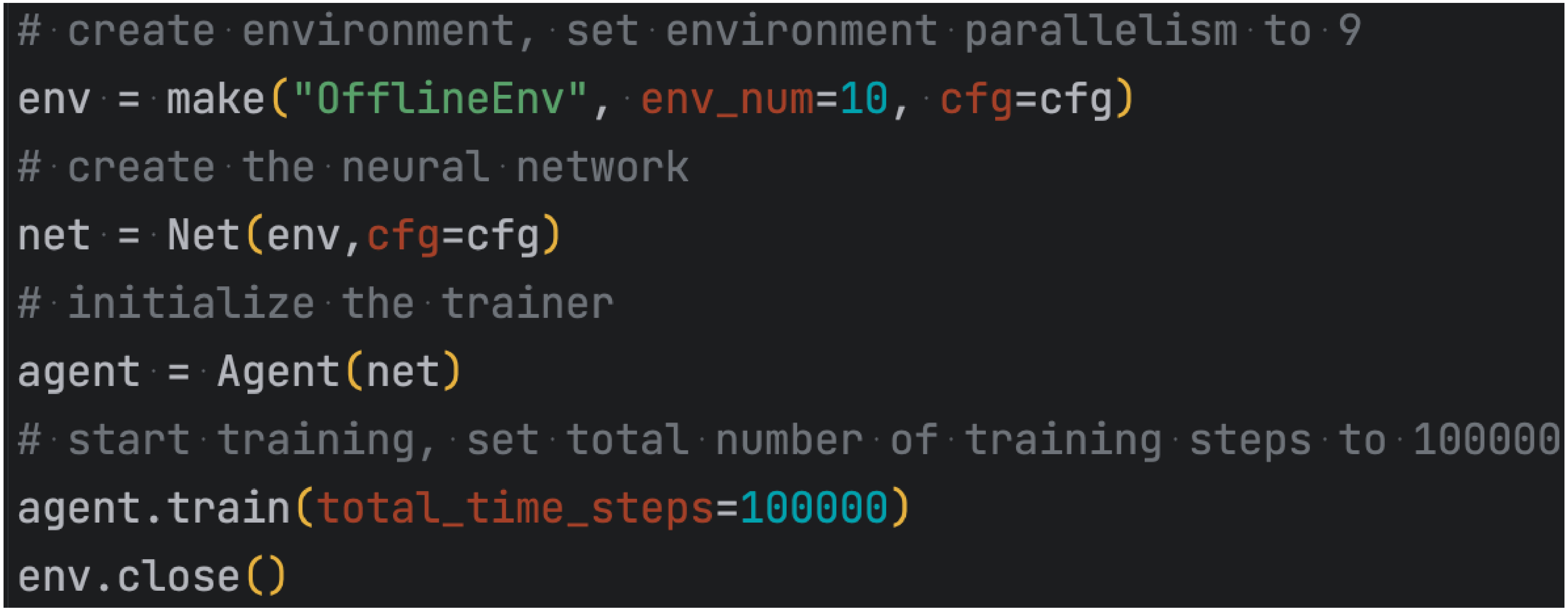


Learn from Expert Data



Main Features of OpenRL

➢ Support Offline RL



```python
# create environment, set environment parallelism to 9
env = make("OfflineEnv", env_num=10, cfg=cfg)
# create the neural network
net = Net(env,cfg=cfg)
# initialize the trainer
agent = Agent(net)
# start training, set total number of training steps to 100000
agent.train(total_time_steps=100000)
env.close()
```

Main Features of OpenRL

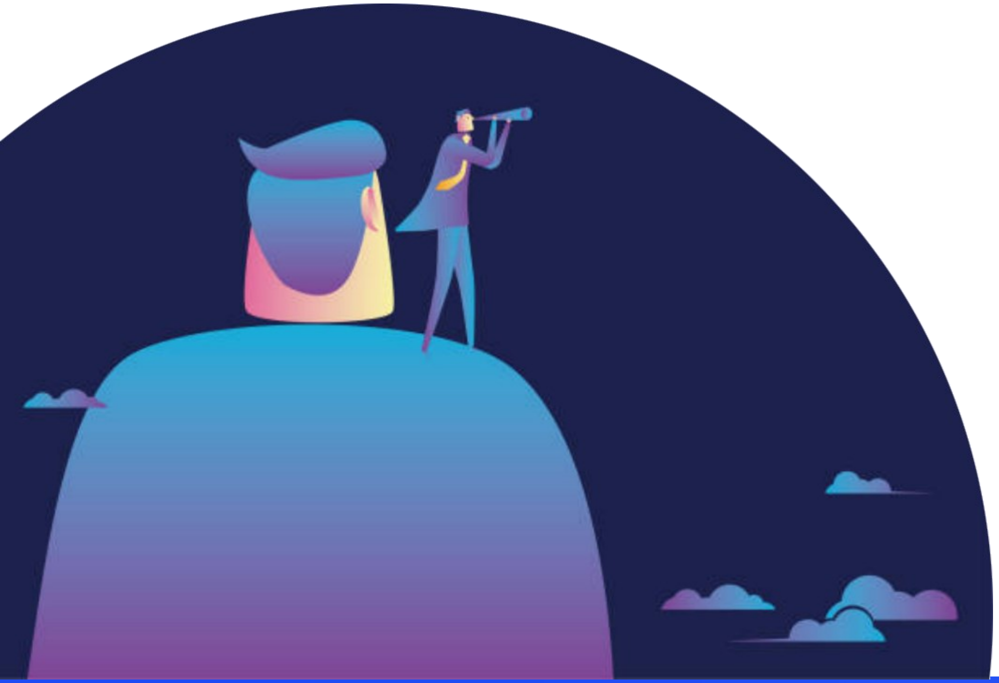
Find out more ▶

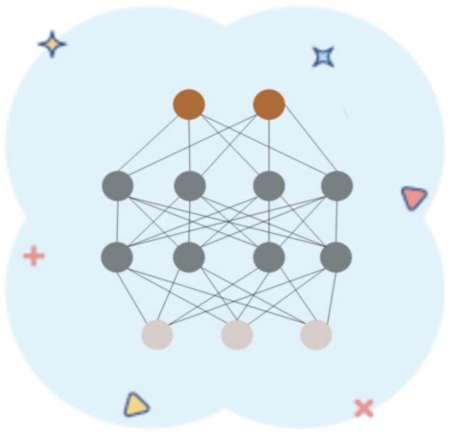
- **Customizable capabilities for professionals**
  - **Dictionary observation** space support
  - **Serial** or **parallel** environment training
  - Support for models such as **LSTM**, **GRU**, **Transformer** etc.
  - Automatic mixed precision (**AMP**) training
  - Data collecting wth **half precision policy** network

Main Features of OpenRL

➢ **Build on top of others**

Hugging Face



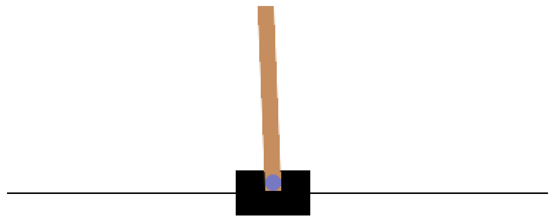
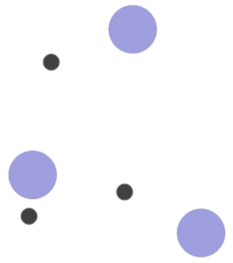
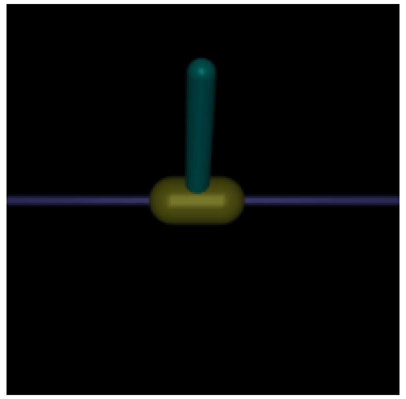


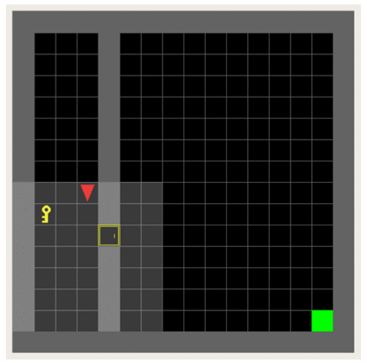
Models

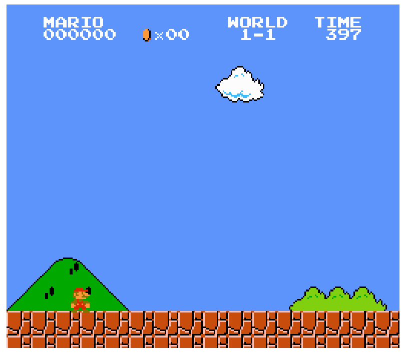
Datasets

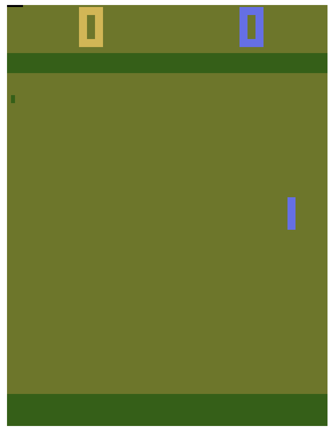
Main Features of OpenRL

Gallery







Main Features of OpenRL

➢ High performance

Training CartPole on a laptop only takes **a few seconds**.
+17% speedup for language model training.

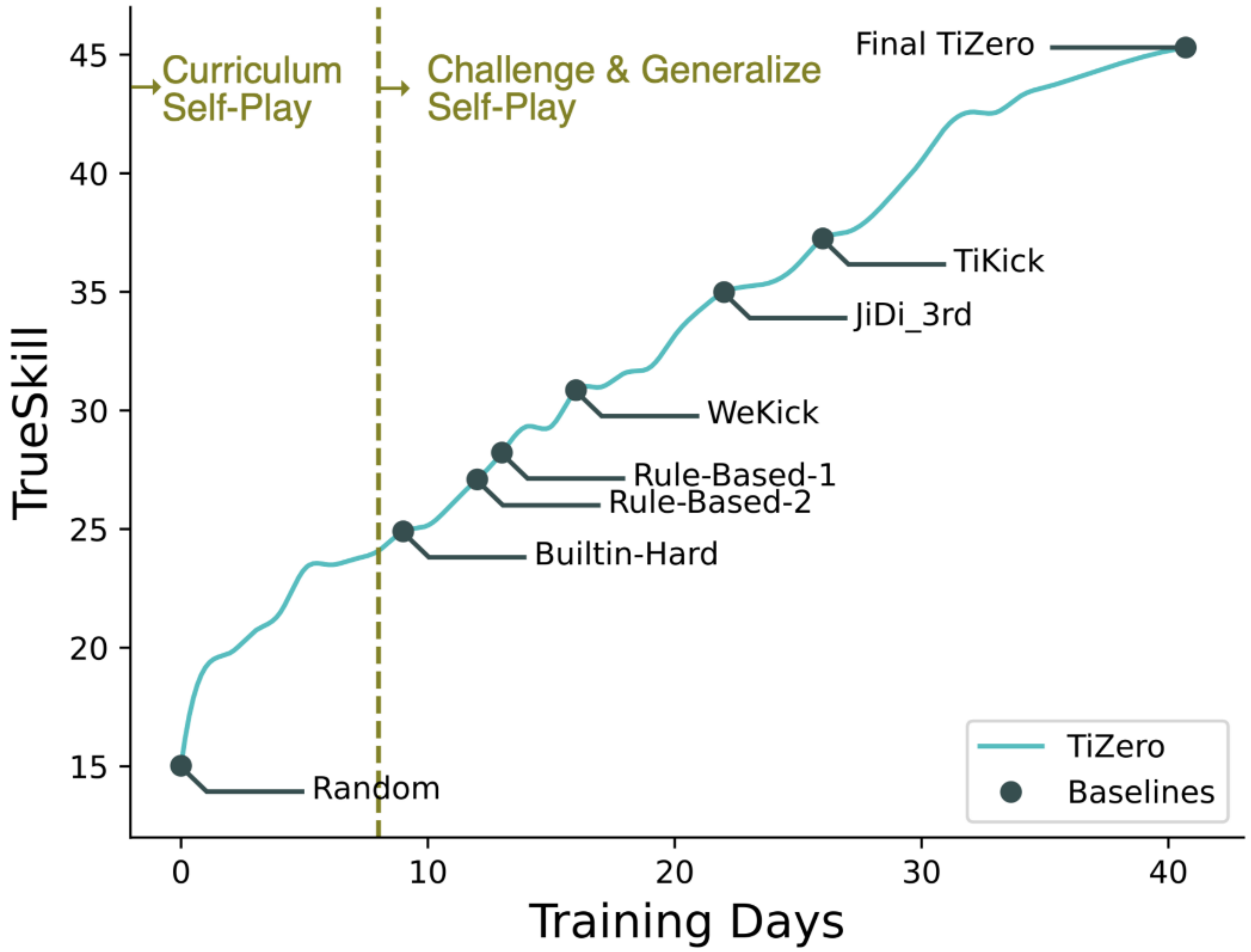
Ranking 1st on Google Research Football.
Achieving **+43%** performance improvement on LLM.

Compared with RL4LMs

	FPS(Speed)	Rouge-1	Rouge-Lsum	Meteor	SacreBLEU
Supervised Learning	None	0.164	0.137	0.234	0.063
RL4LMs	11.26	0.169	0.144	0.198	0.071
OpenRL	**13.20(+17%)**	**0.181(+10%)**	**0.153(+12%)**	**0.292(+25%)**	**0.090(+43%)**

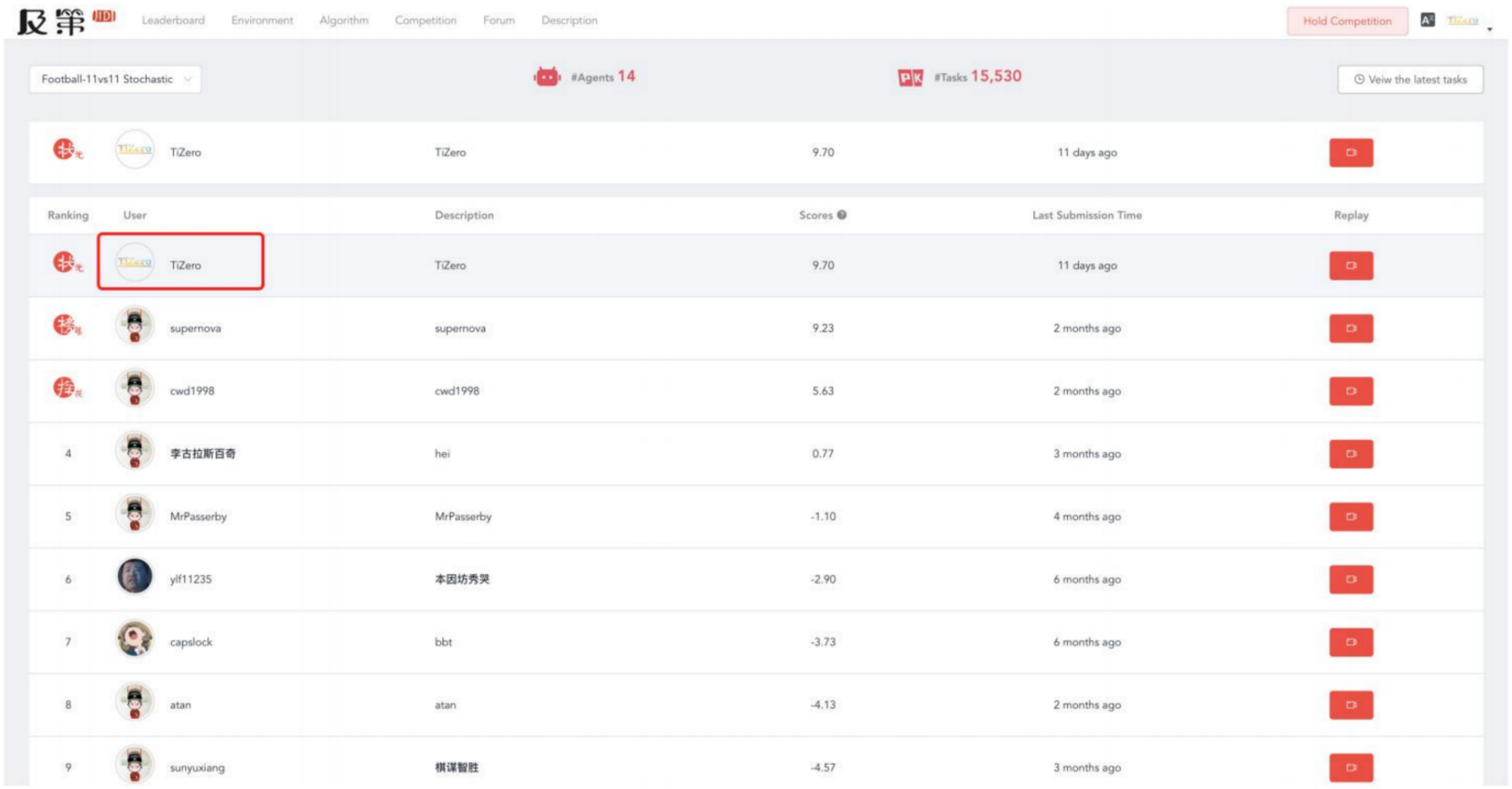
TiZero

Lin, Fanqi, et al. "TiZero: Mastering Multi-Agent Football with Curriculum Learning and Self-Play." arXiv preprint arXiv:2302.07515 (2023).



TiZero

Lin, Fanqi, et al. "TiZero: Mastering Multi-Agent Football with Curriculum Learning and Self-Play." arXiv preprint arXiv:2302.07515 (2023).



#Agents 14 #Tasks 15,530

	TiZero	TiZero	9.70	11 days ago	

Ranking	User	Description	Scores	Last Submission Time	Replay
	TiZero	TiZero	9.70	11 days ago	
	supernova	supernova	9.23	2 months ago	
	cwd1998	cwd1998	5.63	2 months ago	
4	李古拉斯百奇	hei	0.77	3 months ago	
5	MrPasserby	MrPasserby	-1.10	4 months ago	
6	ylf11235	本因坊秀哭	-2.90	6 months ago	
7	capslock	bbt	-3.73	6 months ago	
8	atan	atan	-4.13	2 months ago	
9	sunyuxiang	棋谋智胜	-4.57	3 months ago	

TiZero

Lin, Fanqi, et al. "TiZero: Mastering Multi-Agent Football with Curriculum Learning and Self-Play." arXiv preprint arXiv:2302.07515 (2023).

PART 03
Future Release

Large-Scale RL

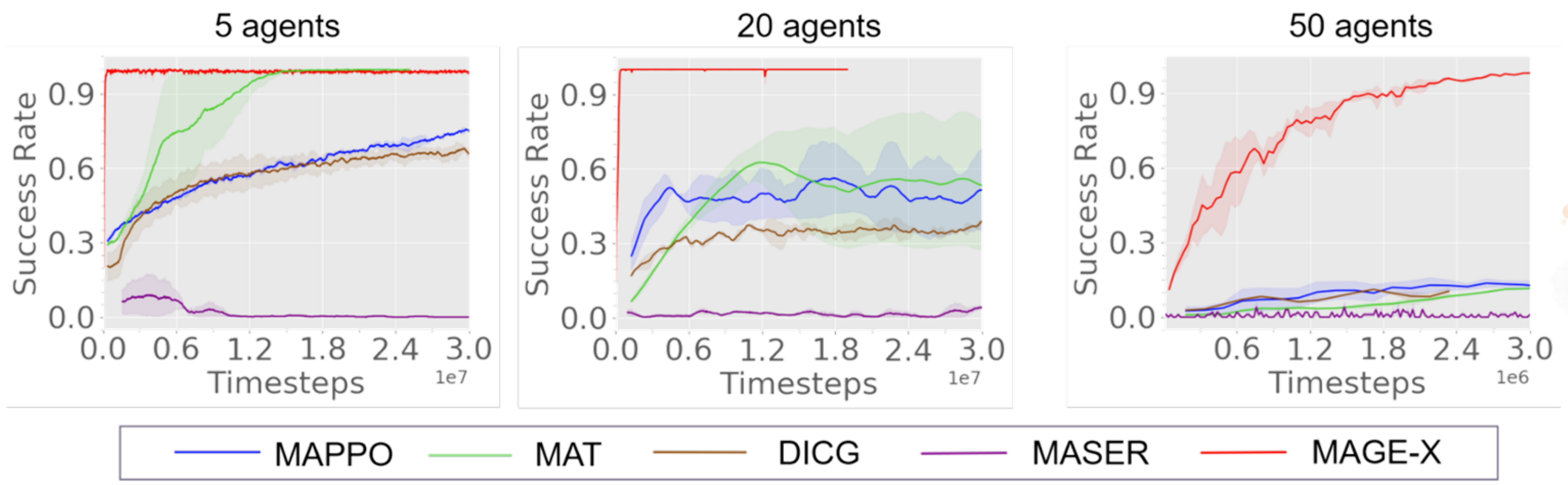
Large Model

Large Cluster

Large Population

Large-Scale RL

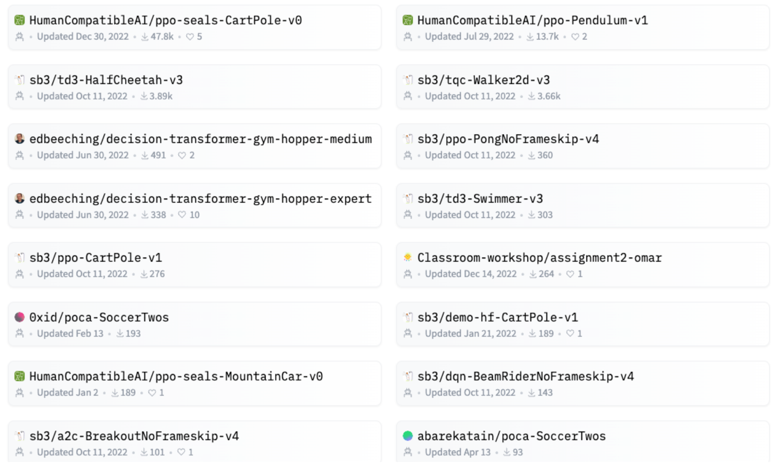
Large Population



Yang, Xinyi, et al. "Learning Graph-Enhanced Commander-Executor for Multi-Agent Navigation." arXiv preprint arXiv:2302.04094 (2023).

Open RL via Sharing

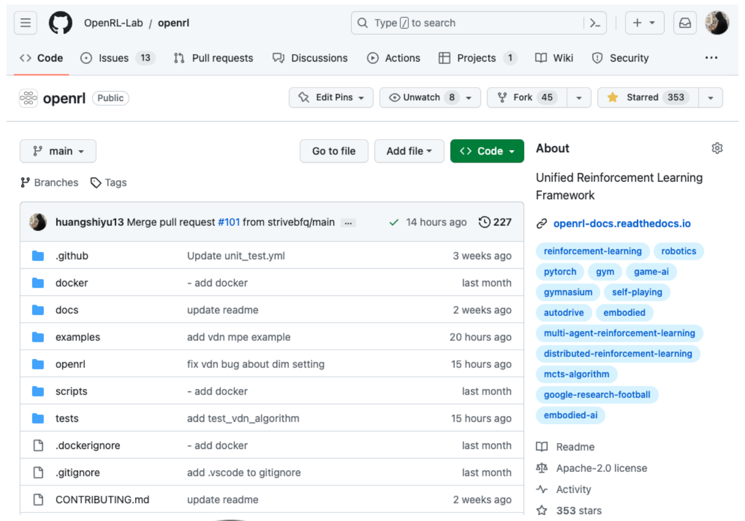
Share Models



- HumanCompatibleAI/ppo-seals-CartPole-v0 · Updated Dec 30, 2022 · 47.8k · ♡ 5
- HumanCompatibleAI/ppo-Pendulum-v1 · Updated Jul 29, 2022 · 13.7k · ♡ 2
- sb3/td3-HalfCheetah-v3 · Updated Oct 11, 2022 · 3.89k
- sb3/tqc-Walker2d-v3 · Updated Oct 11, 2022 · 3.66k
- edbeeching/decision-transformer-gym-hopper-medium · Updated Jun 30, 2022 · 491 · ♡ 2
- sb3/ppo-PongNoFrameskip-v4 · Updated Oct 11, 2022 · 360
- edbeeching/decision-transformer-gym-hopper-expert · Updated Jun 30, 2022 · 338 · ♡ 10
- sb3/td3-Swimmer-v3 · Updated Oct 11, 2022 · 303
- sb3/ppo-CartPole-v1 · Updated Oct 11, 2022 · 276
- Classroom-workshop/assignment2-omar · Updated Dec 14, 2022 · 264 · ♡ 1
- 0xid/poca-SoccerTwos · Updated Feb 13 · 193
- sb3/demo-hf-CartPole-v1 · Updated Jan 21, 2022 · 189 · ♡ 1
- HumanCompatibleAI/ppo-seals-MountainCar-v0 · Updated Jan 2 · 189 · ♡ 1
- sb3/dqn-BeamRiderNoFrameskip-v4 · Updated Oct 11, 2022 · 143
- sb3/a2c-BreakoutNoFrameskip-v4 · Updated Oct 11, 2022 · 101 · ♡ 1
- abarekatain/poca-SoccerTwos · Updated Apr 13 · 93

Hugging Face

Share Codes



huangshiyu13 Merge pull request #101 from strivebfq/main ... ✓ 14 hours ago 227

.github	Update unit_test.yml	3 weeks ago
docker	- add docker	last month
docs	update readme	2 weeks ago
examples	add vdn mpe example	20 hours ago
openrl	fix vdn bug about dim setting	15 hours ago
scripts	- add docker	last month
tests	add test_vdn_algorithm	15 hours ago
.dockerignore	- add docker	last month
.gitignore	add .vscode to gitignore	last month
CONTRIBUTING.md	update readme	2 weeks ago

About

Unified Reinforcement Learning Framework

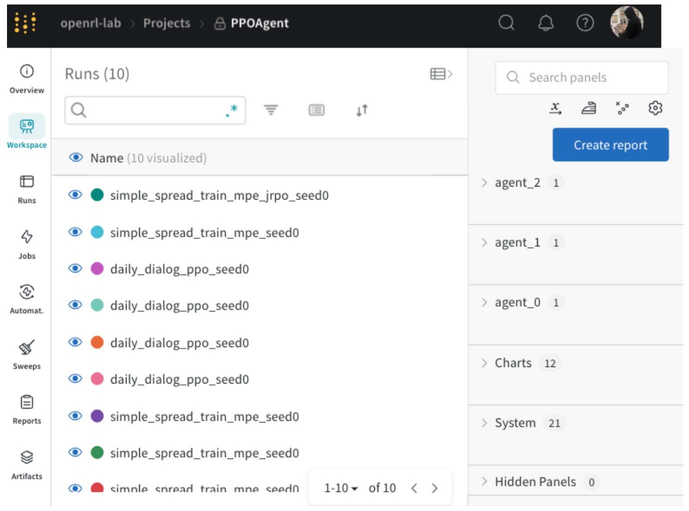
openrl-docs.readthedocs.io

reinforcement-learning robotics pytorch gym game-ai gymnasium self-playing autodrive embodied multi-agent-reinforcement-learning distributed-reinforcement-learning mcts-algorithm google-research-football embodied-ai

Readme
Apache-2.0 license
Activity
353 stars

GitHub

Share Results



Runs (10)

Name (10 visualized)

- simple_spread_train_mpe_jrpo_seed0
- simple_spread_train_mpe_seed0
- daily_dialog_ppo_seed0
- daily_dialog_ppo_seed0
- daily_dialog_ppo_seed0
- daily_dialog_ppo_seed0
- simple_spread_train_mpe_seed0
- simple_spread_train_mpe_seed0
- simple_spread_train_mpe_seed0

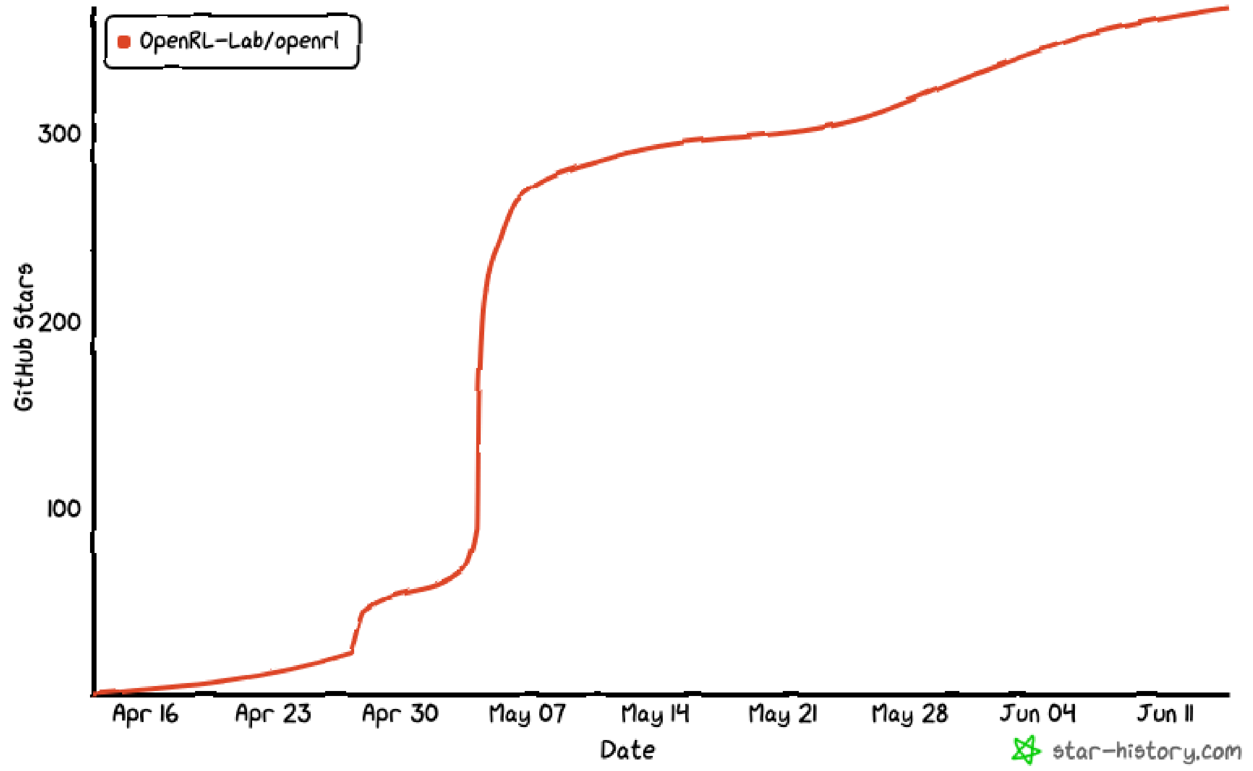
1-10 of 10

agent_2	1
agent_1	1
agent_0	1
Charts	12
System	21
Hidden Panels	0

Weights & Biases

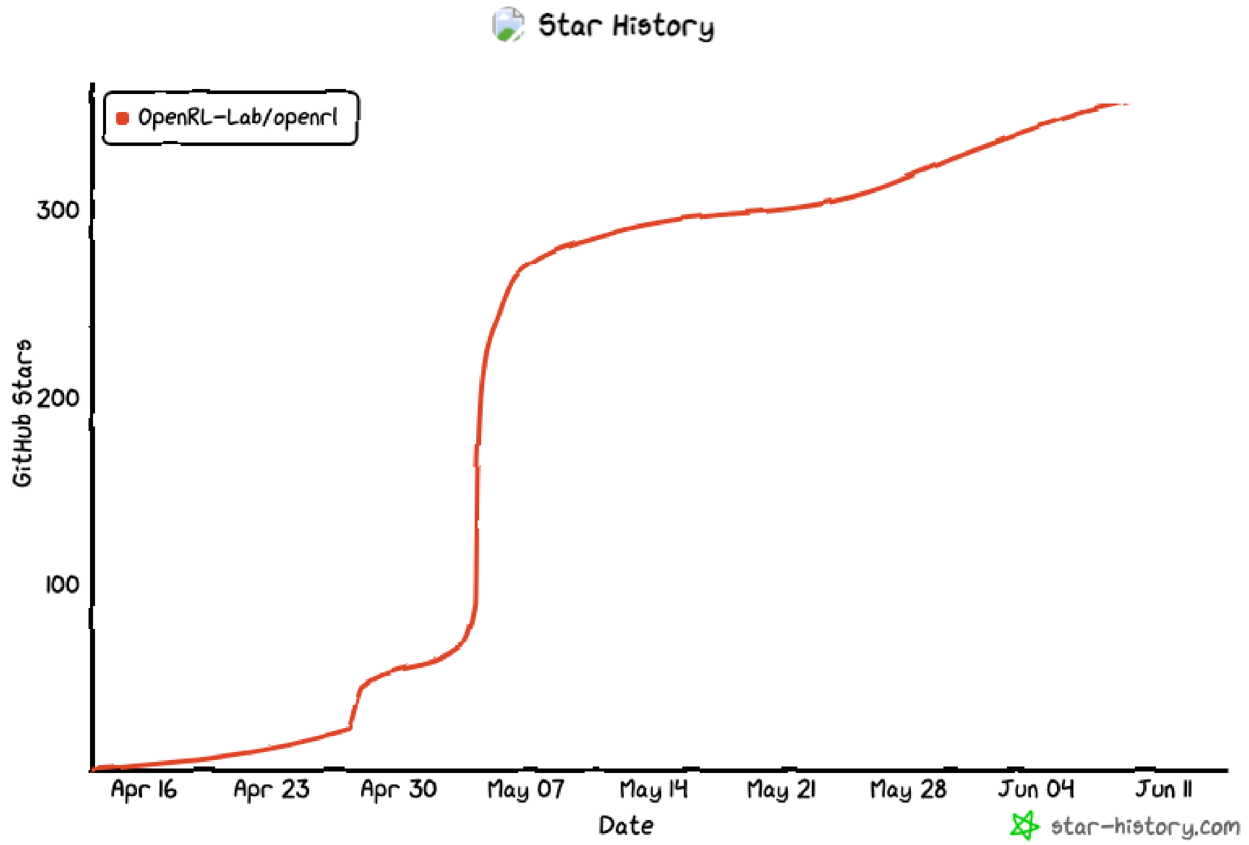
Scan the QR code to try OpenRL!

OpenRL



Visit: github.com/OpenRL-Lab/openrl

Scan the QR code to try OpenRL!



Visit: github.com/OpenRL-Lab/openrl

PART 03

OpenPlugin: Plugins for LLM

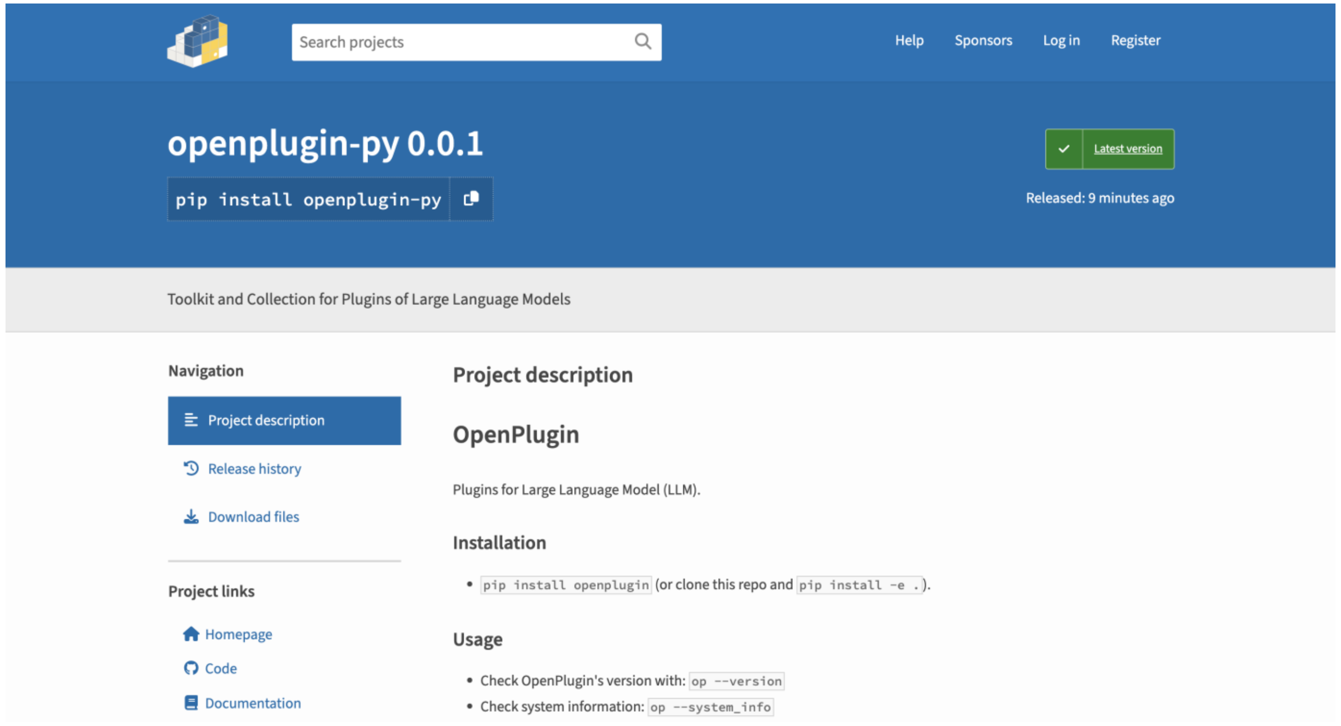
Why?

- Think about **pip** for Python package (apt/yum/brew/dnf/npm/)!
- Think about App Store.
- Standardize plugin.
- **Provide a simple way to use, share LLM plugins.**

Main Features of OpenPlugin

Installation

pip install openplugin-py



Search projects

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openplugin-py 0.0.1

```
pip install openplugin-py
```

Latest version

Released: 9 minutes ago

Toolkit and Collection for Plugins of Large Language Models

Navigation

- Project description
- Release history
- Download files

Project links

- Homepage
- Code
- Documentation

Project description

OpenPlugin

Plugins for Large Language Model (LLM).

Installation

- `pip install openplugin` (or clone this repo and `pip install -e .`).

Usage

- Check OpenPlugin's version with: `op --version`
- Check system information: `op --system_info`

Main Features of OpenPlugin

Find out more

Usage

- install plugin: **op install** <plugin_name>
  - install locally **op install ./**
  - reinstall **op reinstall** <plugin_name>
- uninstall plugin: **op uninstall** <plugin_name>
- start to run plugin: **op run** <plugin_name>
- list installed plugins: **op list**

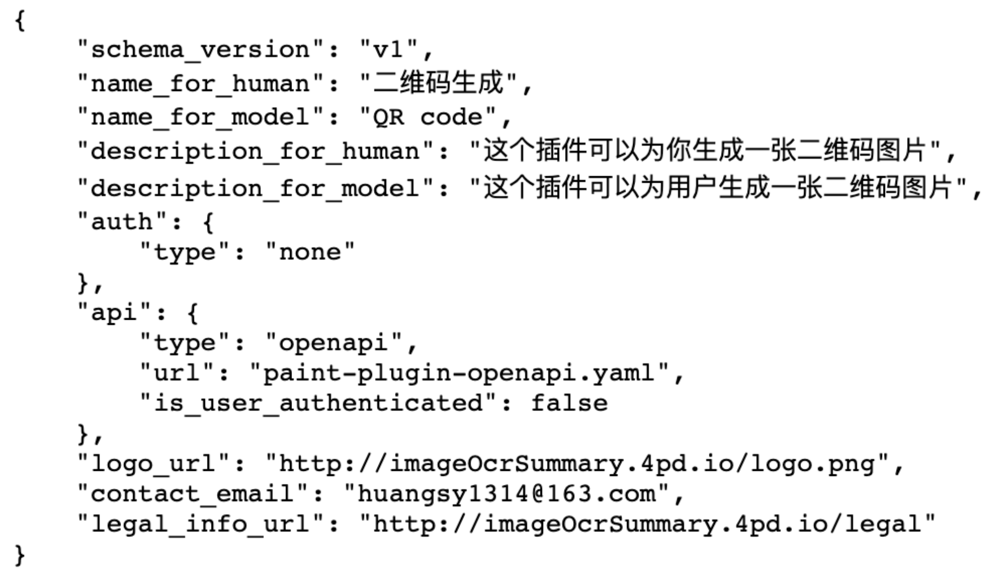
op is all you need!

Main Features of OpenPlugin

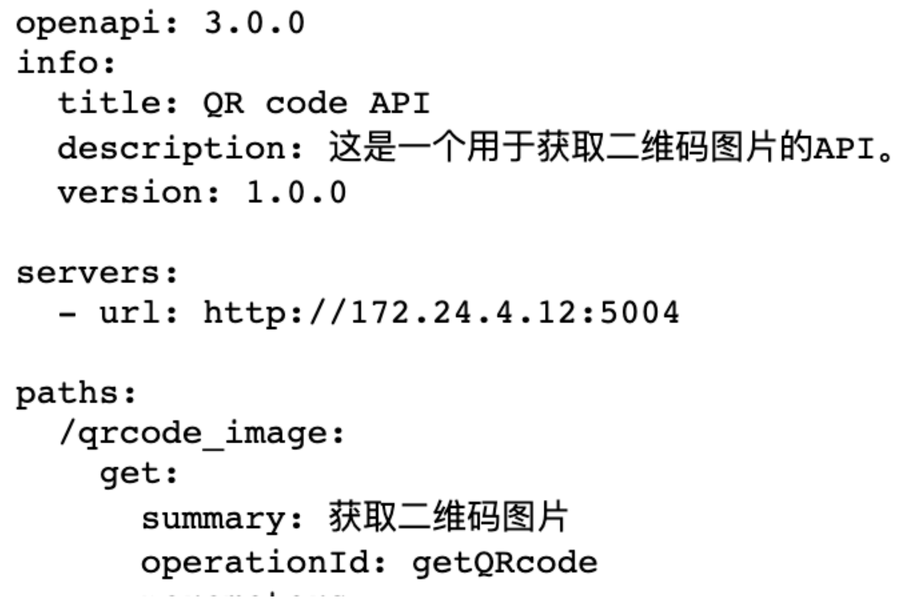
Find out more

Usage

- Provide config API for SageGPT/ChatGPT platform
  - can get json file via: **server_host/ai-plugin.json**
  - can get YAML file via: **server_host/openapi.yaml**



```
{
    "schema_version": "v1",
    "name_for_human": "二维码生成",
    "name_for_model": "QR code",
    "description_for_human": "这个插件可以为你生成一张二维码图片",
    "description_for_model": "这个插件可以为用户生成一张二维码图片",
    "auth": {
        "type": "none"
    },
    "api": {
        "type": "openapi",
        "url": "paint-plugin-openapi.yaml",
        "is_user_authenticated": false
    },
    "logo_url": "http://imageOcrSummary.4pd.io/logo.png",
    "contact_email": "huangsy1314@163.com",
    "legal_info_url": "http://imageOcrSummary.4pd.io/legal"
}
```

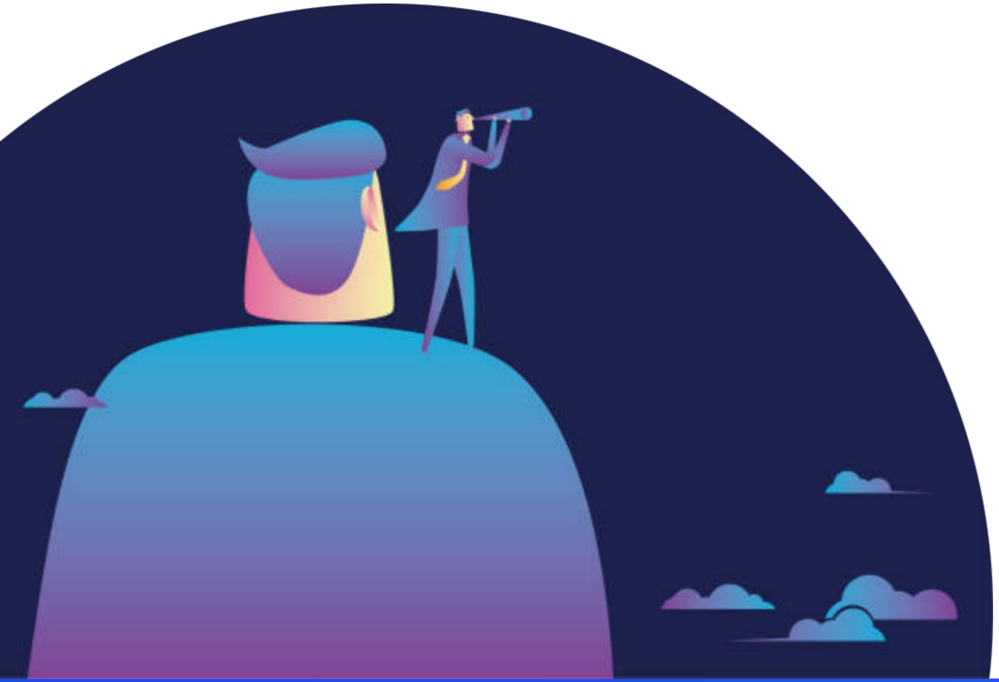


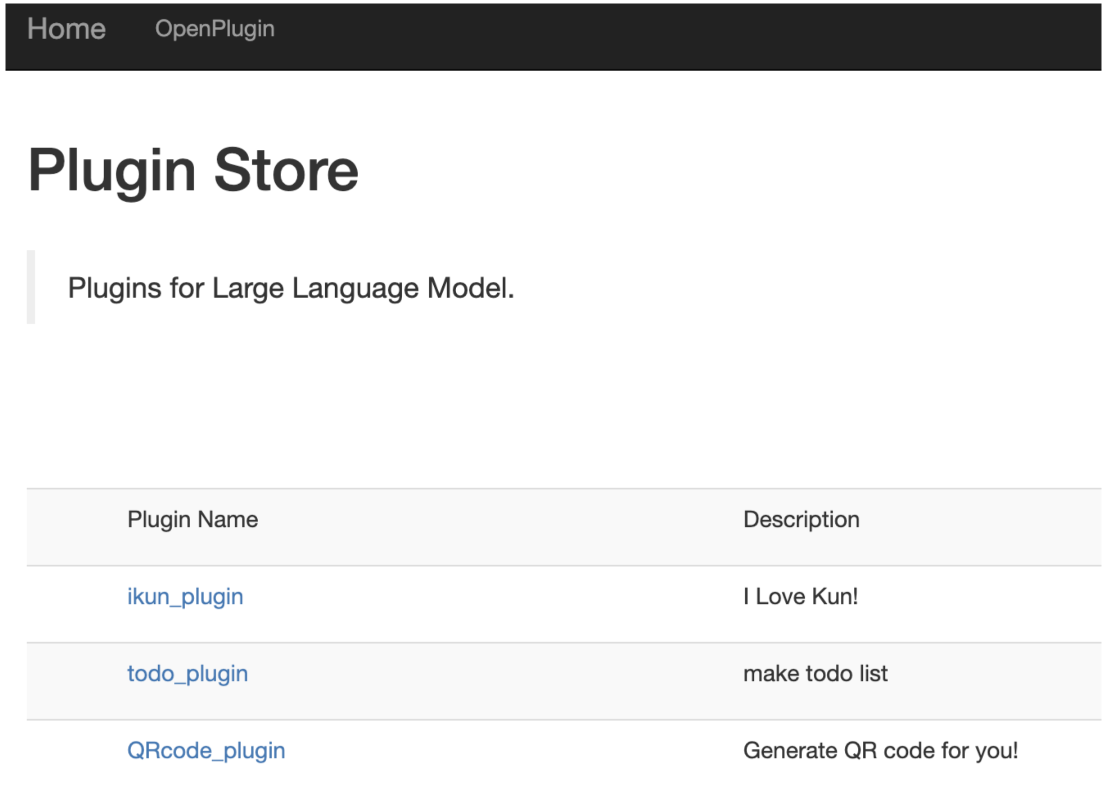
```
openapi: 3.0.0
info:
  title: QR code API
  description: 这是一个用于获取二维码图片的API。
  version: 1.0.0

servers:
  - url: http://172.24.4.12:5004

paths:
  /qrcode_image:
    get:
      summary: 获取二维码图片
      operationId: getQRcode
```

Main Features of OpenPlugin

➢ Build on top of others

https://openrl.net/plugin-store/





Plugin Store

Plugins for Large Language Model.

Plugin Name	Description
ikun_plugin	I Love Kun!
todo_plugin	make todo list
QRcode_plugin	Generate QR code for you!

You can share your plugin to others!

Main Features of OpenPlugin

➢ Plugin Store

QRcode_plugin

todo_plugin

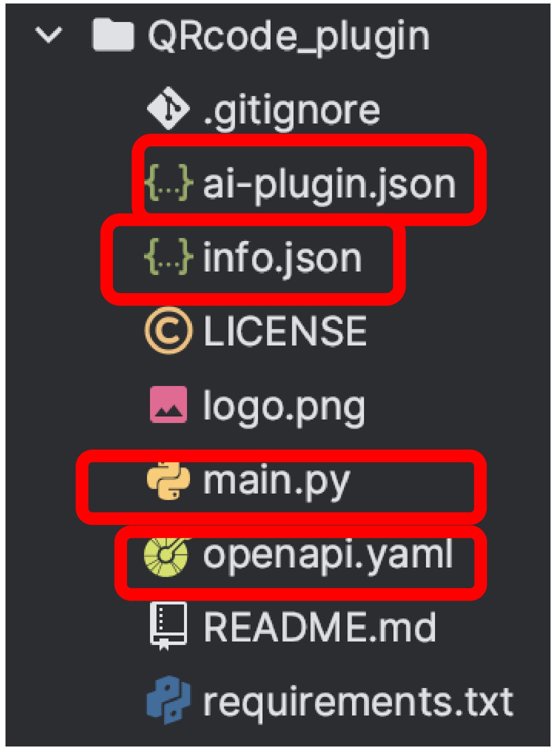
ikun_plugin

. . . .

Main Features of OpenPlugin

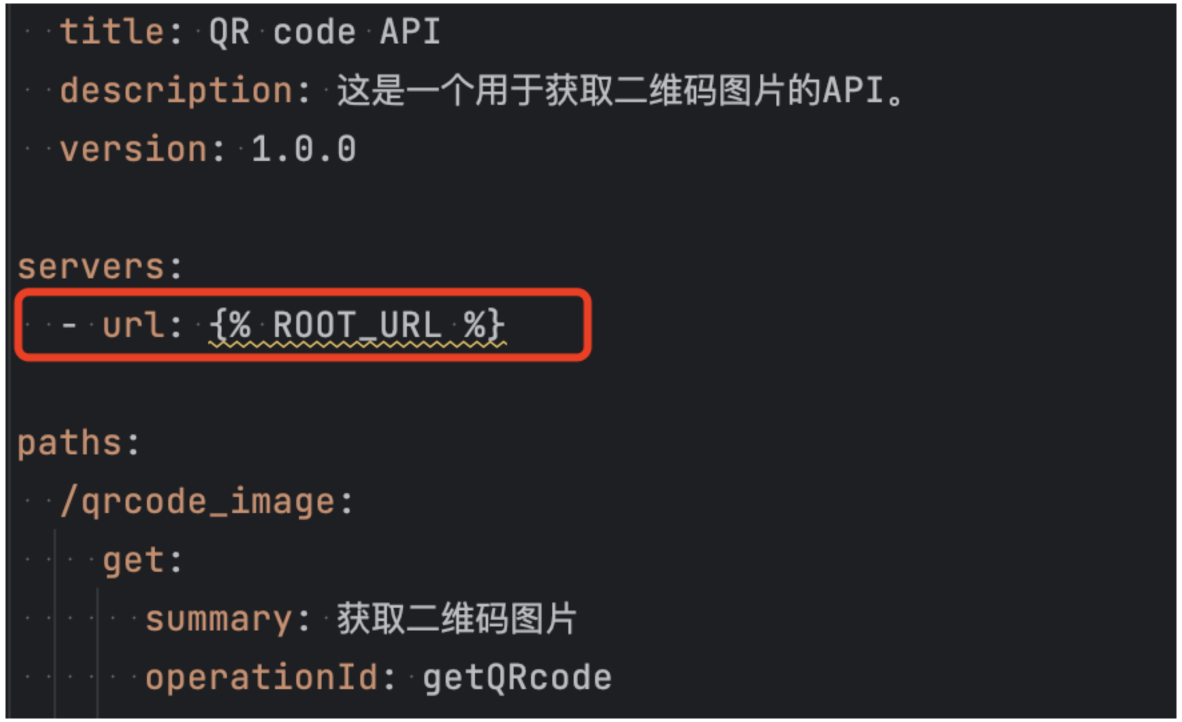
QRcode_plugin

Plugin Structure



```
QRcode_plugin
    .gitignore
    ai-plugin.json
    info.json
    LICENSE
    logo.png
    main.py
    openapi.yaml
    README.md
    requirements.txt
```

Support for placeholder:



```
  title: QR code API
  description: 这是一个用于获取二维码图片的API。
  version: 1.0.0

servers:
  - url: {% ROOT_URL %}

paths:
  /qrcode_image:
    get:
      summary: 获取二维码图片
      operationId: getQRcode
```

Main Features of OpenPlugin

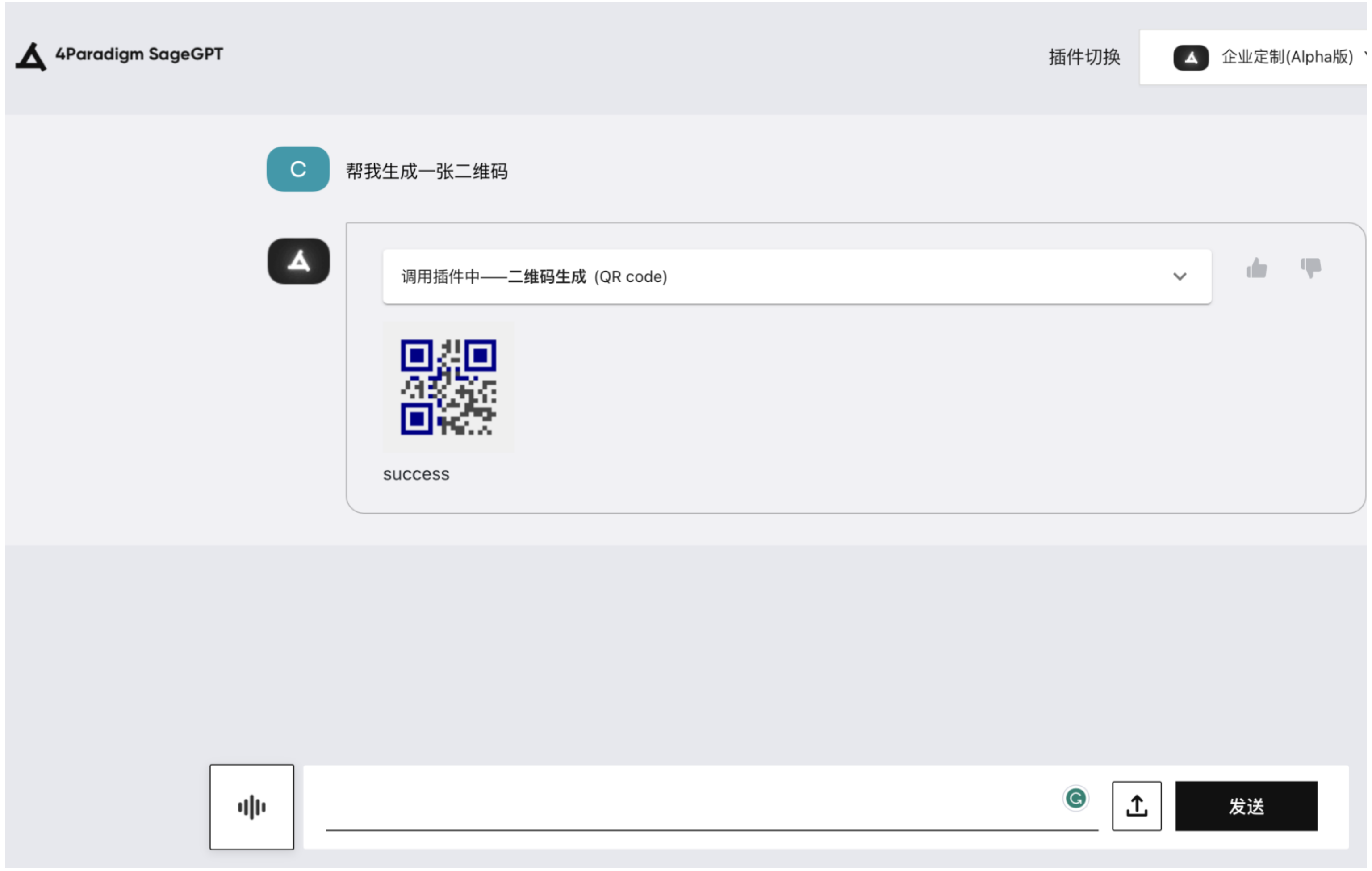
How to use QRcode_plugin

- Step 0: Find a server
- Step 1: **pip install openplugin-py**
- Step 2: **op install QRcode_plugin**
- Step 3: **op run QRcode**
- Step 4: Get the **json** and **YAML** file
- Step 5: Register plugin to SageGPT or ChatGPT website
- Step6: Finished! Have fun!

Main Features of OpenPlugin

QRcode_plugin

Demo

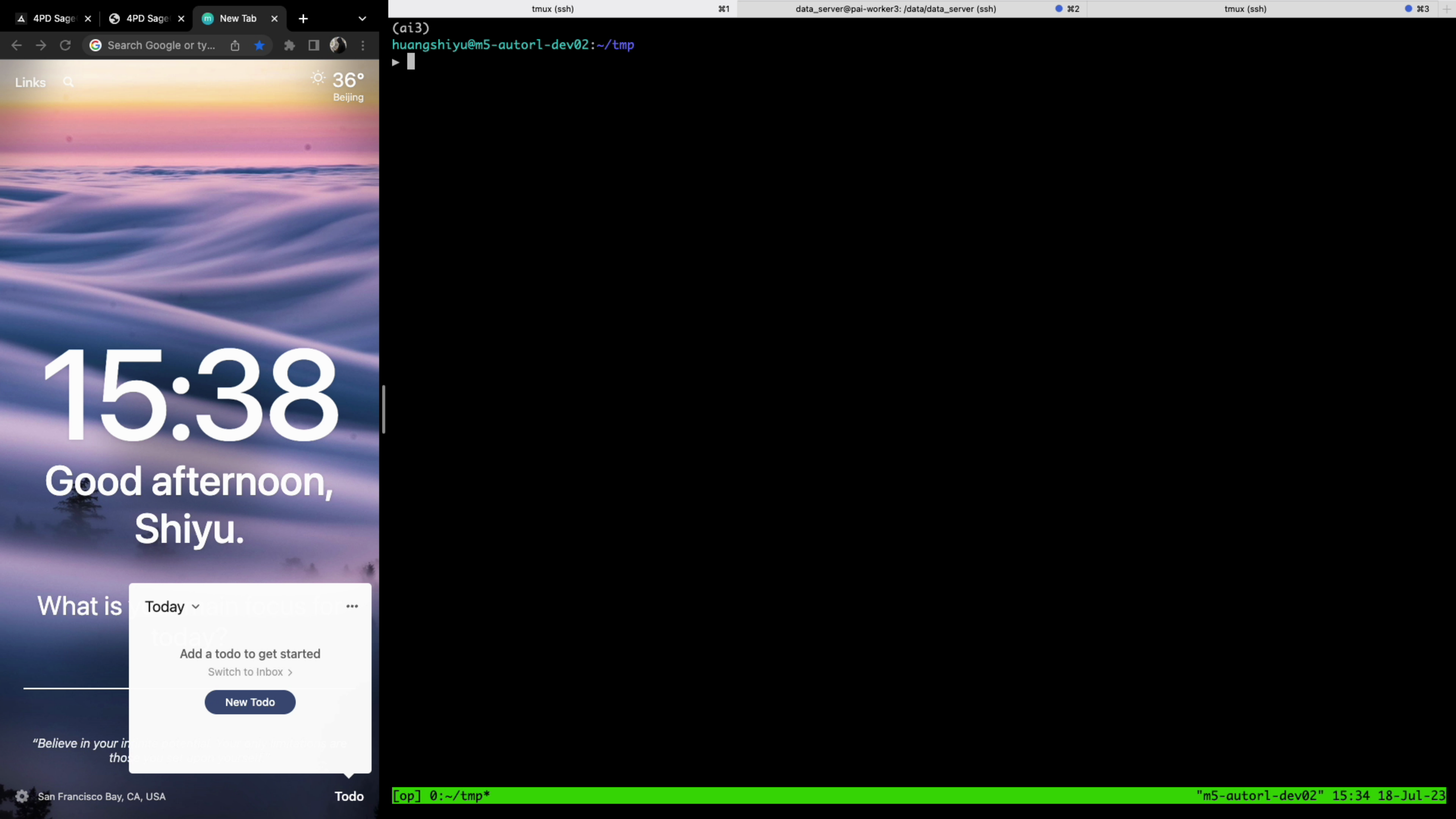

4Paradigm SageGPT

插件切换 企业定制(Alpha版)

C 帮我生成一张二维码

调用插件中——**二维码生成** (QR code)

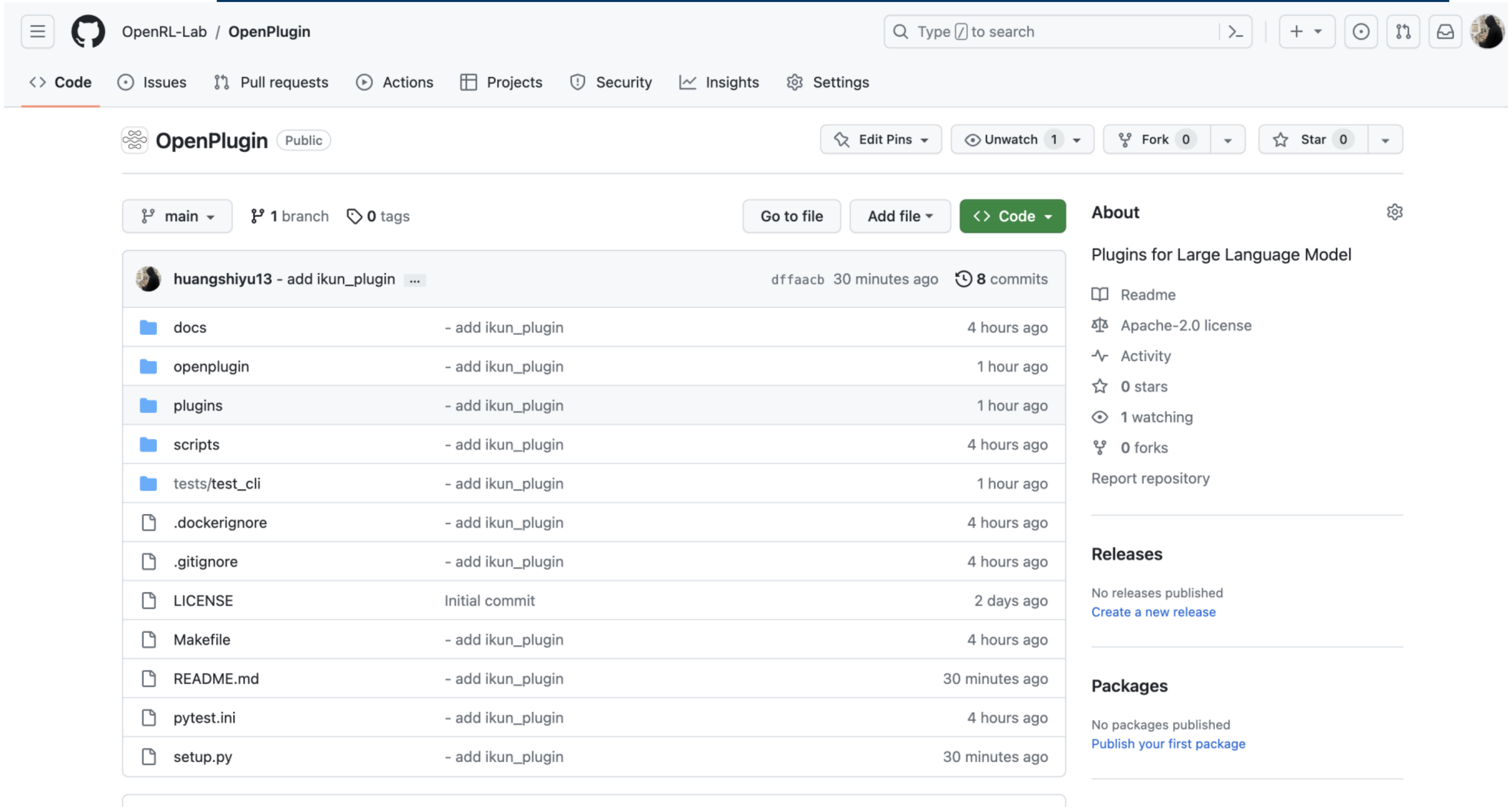
success



```
(ai3)
huangshiyu@m5-autorl-dev02:~/tmp
▶ 





[op] 0:~/tmp*                                                                    "m5-autorl-dev02" 15:34 18-Jul-23
```

Try OpenPlugin, Click Star!

Visit: https://github.com/OpenRL-Lab/openplugin



OpenRL-Lab / OpenPlugin

Type / to search

Code | Issues | Pull requests | Actions | Projects | Security | Insights | Settings

OpenPlugin Public

Edit Pins | Unwatch 1 | Fork 0 | Star 0

main | 1 branch | 0 tags | Go to file | Add file | Code

huangshiyu13 - add ikun_plugin ... dffaacb 30 minutes ago 8 commits

docs	- add ikun_plugin	4 hours ago
openplugin	- add ikun_plugin	1 hour ago
plugins	- add ikun_plugin	1 hour ago
scripts	- add ikun_plugin	4 hours ago
tests/test_cli	- add ikun_plugin	1 hour ago
.dockerignore	- add ikun_plugin	4 hours ago
.gitignore	- add ikun_plugin	4 hours ago
LICENSE	Initial commit	2 days ago
Makefile	- add ikun_plugin	4 hours ago
README.md	- add ikun_plugin	30 minutes ago
pytest.ini	- add ikun_plugin	4 hours ago
setup.py	- add ikun_plugin	30 minutes ago

About

Plugins for Large Language Model

Readme
Apache-2.0 license
Activity
0 stars
1 watching
0 forks
Report repository

Releases

No releases published
Create a new release

Packages

No packages published
Publish your first package

AI⁺ 软件研发数字峰会
AI⁺ software Development Digital summit

感 谢 聆 听