AI - Reinforcement Learning (Project 4)

API Documentation

What do we need to do in Project 4?

- Enter each of the 10 worlds
  - Each world is 40 x 40
  - (Start with world 0)
  - Learn about them
  - Move around and get points
- What to submit/present
  - Present in the last class informally with a couple of slides
- Your scores are automatically recorded
  - "Quorum" points - Every world, traversed at least 5 times
    - Quorum points must be met by April 30th
  - Higher "scores" mean higher "scores". 😀
    - Scores can be accumulated till May 7th.

Where / how to program?

For each of the worlds, you have:

QLearning 1600 x 4

Persistence

Because you want your Q learning array to be saved when program exits/crashes, etc.

Which algorithm to use for learning?

- The spirit of this project is to learn and expand our understanding of Reinforcement Learning
- Many RL algorithms can be used.
- Generally, model free is suggested.
- Q-learning is a popular choice.
- For some of the worlds, "features" may be needed to fully learn.

API Information

Introduction

This API is for robots (rational agents/programs/algorithms) to navigate in the gridworld.

This is a back end service.

To get an API key, you can visit www.notexponential.com and register. (If you already have an API key, you are all set.)

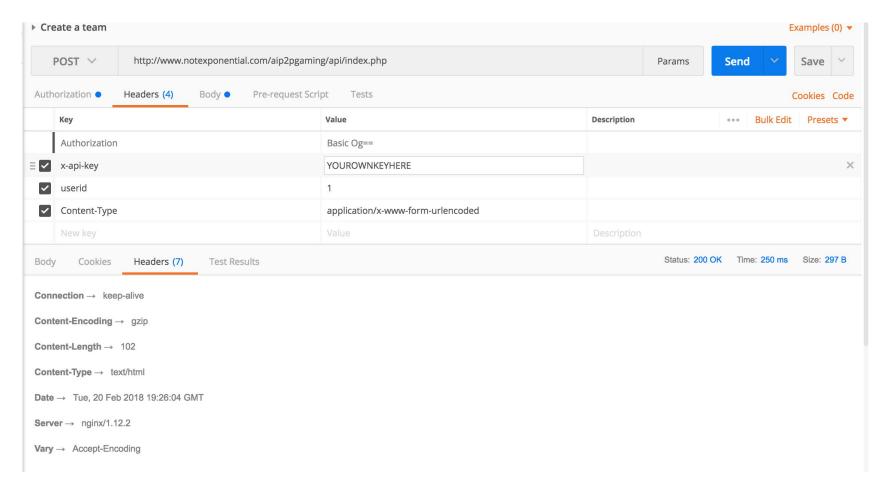# URLs and Request Types

- Two URLs
  - https://www.notexponential.com/aip2pgaming/api/rl/gw.php
    - Locate me (GET)
    - Enter a world (POST)
    - Make a move (POST)
  - https://www.notexponential.com/aip2pgaming/api/rl/score.php
    - Get my team's reinforcement learning score (GET)
    - Get my team's last x runs (GET)
- Only two request types
  - GET and POST.
  - No PUT, no DELETE, etc.

A Test World?

World 0 is available just to practice the API.

How to use the user ID and API Key

Using the authorization header of the RESTful request

What to look for in Return

Every return value is JSON.

Always look for "code".   It can be "OK" or "FAIL". This is inside the JSON response.

If "FAIL", then look for "message" also.

If "OK", then you may also get additional information.

Operations

Get runs

Get Location

Enter a World

Make a move

Get score

Operation Details

Operation: Get Runs

Parameters: type=runs, teamId=$teamId, count=$count

Return Values: Your previous $count runs with score.

Operation: Get Location

Parameters: type=location, teamId=$teamId

Return Values: your current world and state in that world. Think of this as your GPS, and **confirm** where you are. If you are in world "-1", that means you are in no world, and you can enter a world.

This call is entirely optional and is useful only for debugging purposes.

Your program does not need to make this call.

Operation: Enter a World

Body: type="enter", worldId=$worldId, teamId=$teamId

Return Values: The new $runId started

Fails if you are already in a world.

This is the starting part of your "learning" agent.

Introduce a delay and do not make more than one enter call every 10 minutes.

Operation: Make a Move

Body: type="move", teamId=$teamId, move="$move", worldId=$worldId

Return Values: Reward, New State entered $runId started

Fails if you are not already in a world (in that case, enter a world first).

This is the central part of your "learning" agent.

Your program needs to carefully process the result.

Introduce a delay and do not make more than one move call every 15 seconds..

Operation: Get Score

Parameters: type=score, teamId=$teamId

Return Values: score. Fails if you are not in the team (you can only get scores for your team).

This call is entirely optional and will be useful only after many runs have been completed.

Your program never needs to make this call.

Snapshots from Postman

Operation: Get Runs

GET   https://www.notexponential.com/aip2pgaming/api/rl/score.php?type=runs&teamId=1041&count=10 ...   **Send**

Params ●   Authorization ●   Headers (10)   Body   Pre-request Script   Tests   Settings   **Cookies**

	Key	Value	Description
☑	type	runs	
☑	teamId	1041	
☑	count	10	

Body   Cookies (1)   Headers (10)   Test Results   Status: 200 OK   Time: 439 ms   Size: 477 B   Save Response ⌄

Pretty   Raw   Preview   Visualize   HTML ⌄

```
1  {"runs":[{"runId":"14","teamId":"1041","gworldId":"0","createTs":null,"score":"50.54290584840832","moves":"51"},{"runId":"13","teamId":"1041",
      "gworldId":"0","createTs":null,"score":"-0.9995148228041414","moves":"139"},{"runId":"12","teamId":"1041","gworldId":"0","createTs":null,
      "score":"-0.6296415264798356","moves":"76"}],"code":"OK"}
```

Operation: Get Location

AI CS ML / **Get Location**

GET https://www.notexponential.com/aip2pgaming/api/rl/gw.php?type=location&teamId=1041 ...

Send

Params ●   Authorization ●   Headers (10)   Body   Pre-request Script   Tests   Settings   **Cookies**

Query Params

	KEY		VALUE	DESCRIPTION	ooo	Bulk Edit
☑	type		location			
☑	teamId		1041			
	Key		Value	Description		

Body   Cookies (1)   Headers (8)   Test Results   Status: **200 OK**   Time: **531 ms**   Size: **281 B**   **Save Response** ⌄

Pretty   Raw   Preview   Visualize   HTML ⌄

```
1    {"world":"-1","state":""}
```

-1 signifies you are not in any world, and can enter a world!

Operation: Enter a World

Operation: Make a Move

POST ⌄ https://www.notexponential.com/aip2pgaming/api/rl/gw.php   **Send** ⌄

Params   Authorization ●   Headers (12)   **Body** ●   Pre-request Script   Tests   Settings   **Cookies**

● none   ● form-data   ● x-www-form-urlencoded   ● raw   ● binary   ● GraphQL

	KEY		VALUE	DESCRIPTION	∘∘∘	**Bulk Edit**
☑	type		move			
☑	teamId		1041			
☑	move		N			
⇕ ☑	worldId	Text ⌄	0		✕	
	Key		Value	Description		

Body   Cookies (1)   Headers (9)   Test Results   🌐 Status: 200 OK   Time: 365 ms   Size: 408 B   **Save Response** ⌄

Pretty   Raw   Preview   Visualize   HTML ⌄   ⇄

```
1  {"code":"OK","worldId":0,"runId":"14","reward":10000,"scoreIncrement":51.53999999999999914734871708787977695465087890625,"newState":null}
```

Operation: Get Score

GET | https://www.notexponential.com/aip2pgaming/api/rl/score.php?type=score&teamId=1041 | **Send**

Params ●   Authorization ●   Headers (10)   Body   Pre-request Script   Tests   Settings   **Cookies**

Query Params

	KEY	VALUE	DESCRIPTION	ooo	Bulk Edit
☑	type	score			
☑	teamId	1041			
	Key	Value	Description		

Body   Cookies (1)   Headers (8)   Test Results   Status: 200 OK   Time: 452 ms   Size: 279 B   **Save Response** ⌄

Pretty   Raw   Preview   Visualize   HTML ⌄

```
1   {"score":0,"code":"OK"}
```

Frequent Errors/FAQ

Upper Case/Lower Case

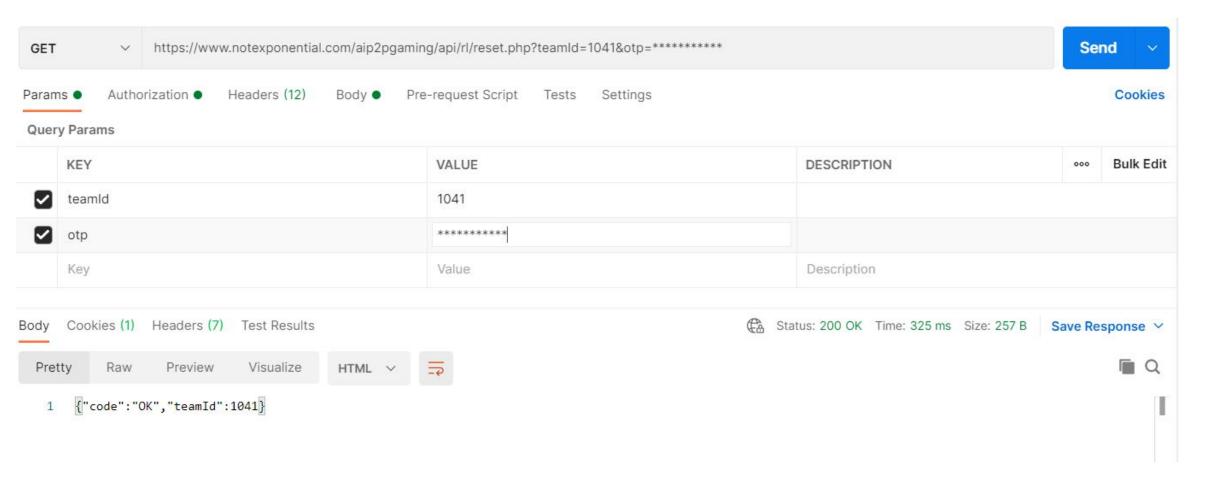API is case sensitive. For example, teamid != teamId

Inconsistent State

If you get an "inconsistent state" message, that simply implies that perhaps you entered a world, but the run never got created. Or perhaps you entered an exit state, but the run did not terminate.

How to resolve?

There is a Reset API call (see slide 26). You will need a onetime code to invoke it though. Contact a team member on Slack with the teamId.

Operation: Reset My Team

You can invoke this (obviously) for your team only. You will need a one time password to hit this API. It is a GET call.
https://www.notexponential.com/aip2pgaming/api/rl/reset.php?teamId=1041&otp=***********

Still Questions?

Discuss via Slack!