DRL project status

Cartesian/polar duplicated coordinates experiment

Andrea Pierré

January 21, 2025

Outline

1. Current status

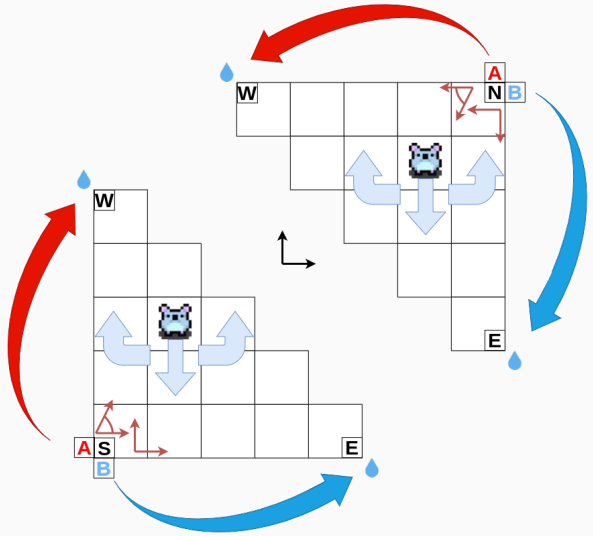
2. How to get insights at what the network learn?

Outline

1. Current status

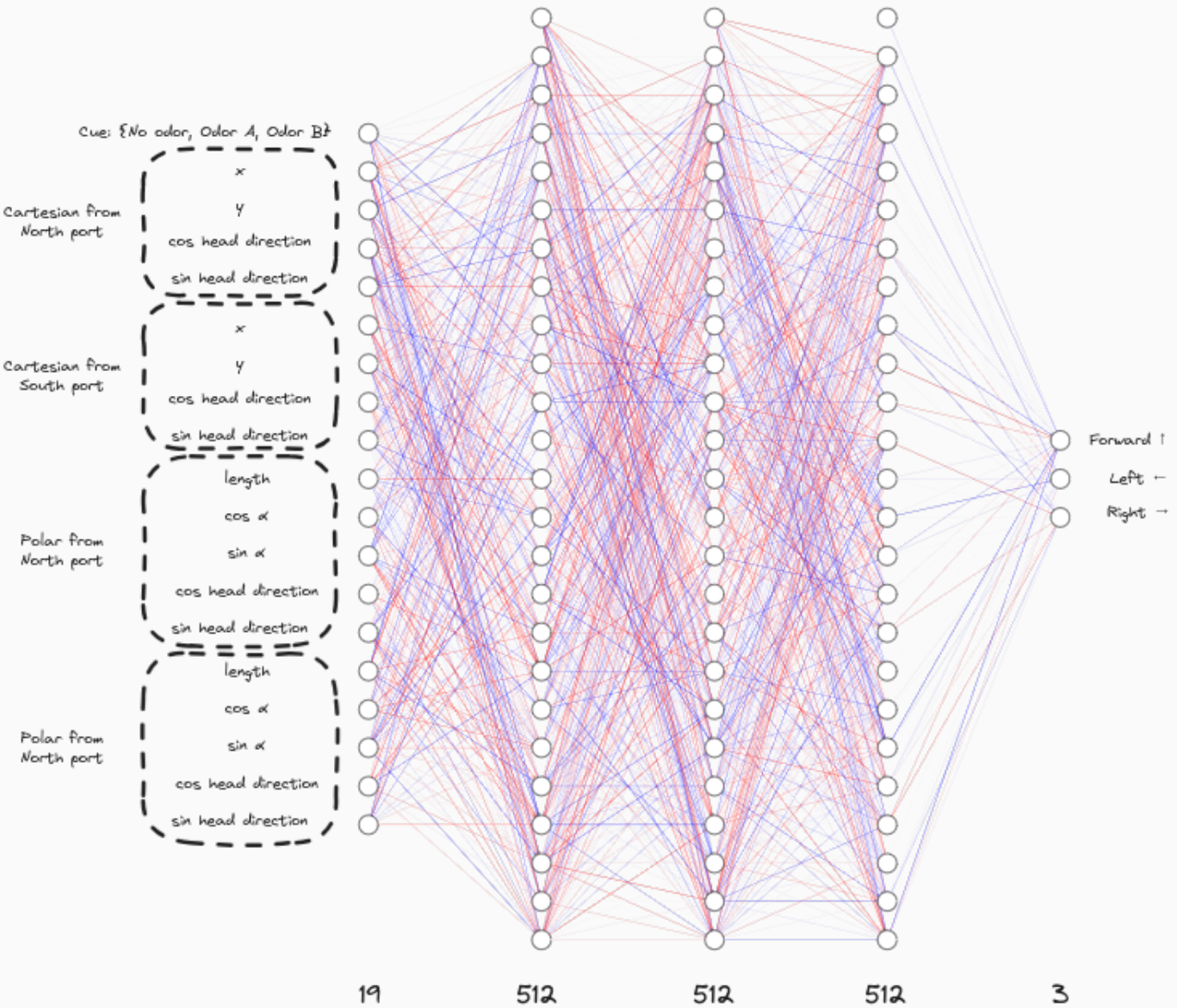
2. How to get insights at what the network learn?

Current status

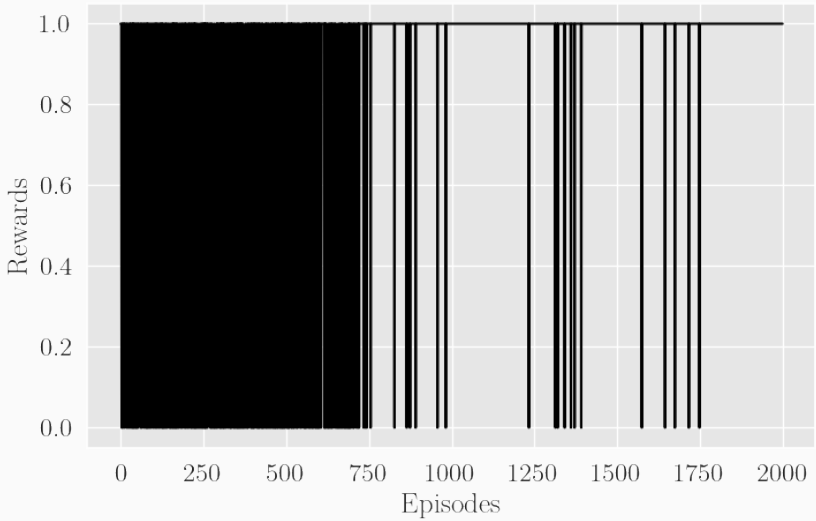


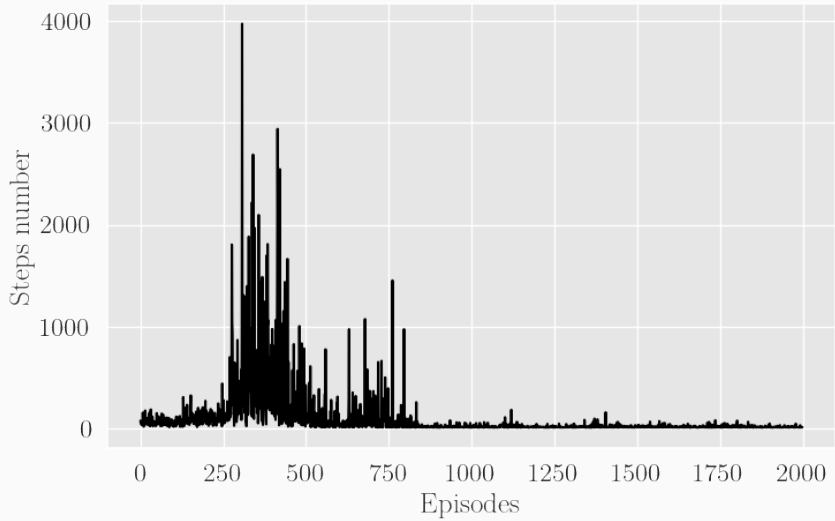
- Environment: done
- Training: WIP
- Visualization: to be improved/discussed
- Progress are slow as my bandwidth has become very limited

State space & network architecture



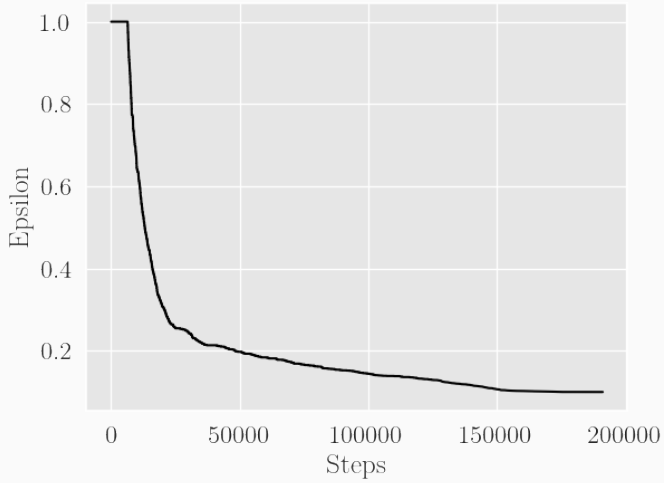
Training

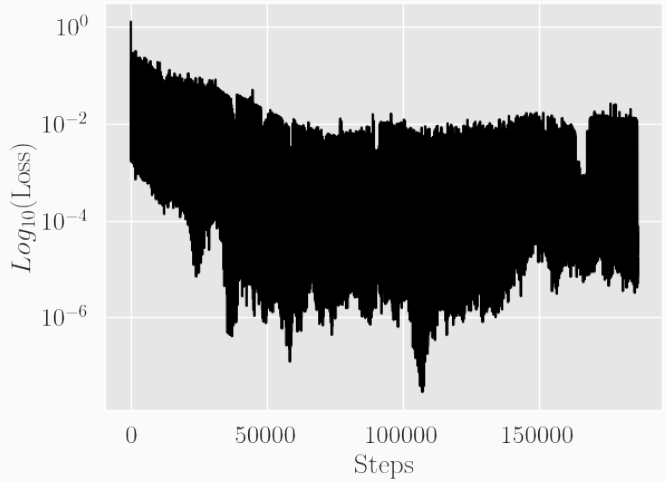


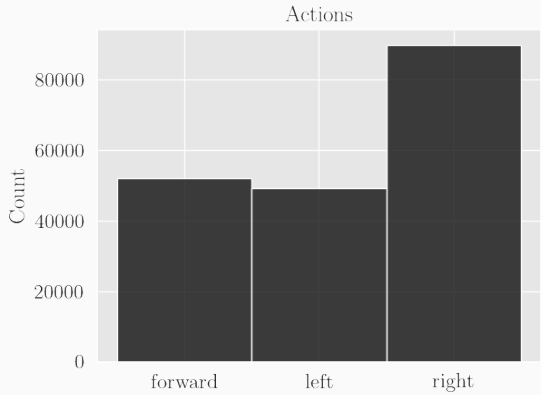


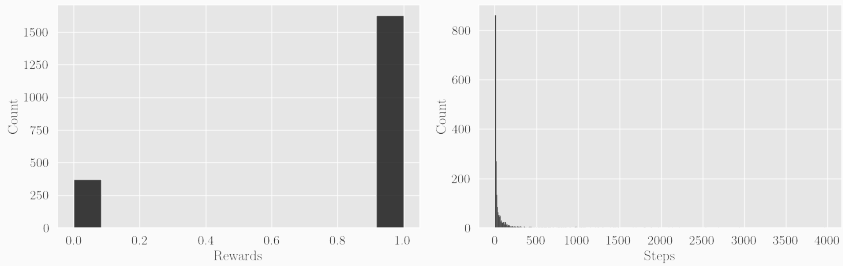
- 8 hours of training for a single agent on the East/West task

Training checks









Policy learned

Weights learned

Activations learned

Outline

1. Current status

2. How to get insights at what the network learn?

Use the behavior as proxy

- Silence the Cartesian/polar part of the input on a trained agent and look at how the agent behaves (x4 experiments)
- Expectation:
  - Left/right task:
  - East/west task:
- Any other approach we could use?

Use the behavior as proxy

- Silence the Cartesian/polar part of the input on a trained agent and look at how the agent behaves (x4 experiments)
- Expectation:
  - Left/right task:
    - With the Cartesian inputs silenced → the agent can solve the task
    - With the polar inputs silenced → the agent struggle to solve the task
  - East/west task:
    - With the Cartesian inputs silenced → the agent can solve the task
    - With the polar inputs silenced → the agent struggle to solve the task
- Any other approach we could use?

Use the behavior as proxy

- Silence the Cartesian/polar part of the input on a trained agent and look at how the agent behaves (x4 experiments)
- Expectation:
  - Left/right task:
    - With the Cartesian inputs silenced → the agent can solve the task
    - With the polar inputs silenced → the agent struggle to solve the task
  - East/west task:
    - With the Cartesian inputs silenced → the agent can solve the task
    - With the polar inputs silenced → the agent struggle to solve the task
- Any other approach we could use?

Use the behavior as proxy

- Silence the Cartesian/polar part of the input on a trained agent and look at how the agent behaves (x4 experiments)
- Expectation:
  - Left/right task:
    - With the Cartesian inputs silenced $\rightarrow$ the agent can solve the task
    - With the polar inputs silenced $\rightarrow$ the agent struggle to solve the task
  - East/west task:
    - With the Cartesian inputs silenced $\rightarrow$ the agent can solve the task
    - With the polar inputs silenced $\rightarrow$ the agent struggle to solve the task
- Any other approach we could use?

Use the behavior as proxy

- Silence the Cartesian/polar part of the input on a trained agent and look at how the agent behaves (x4 experiments)
- Expectation:
  - Left/right task:
    - With the Cartesian inputs silenced $\rightarrow$ the agent can solve the task
    - With the polar inputs silenced $\rightarrow$ the agent struggle to solve the task
  - East/west task:
    - With the Cartesian inputs silenced $\rightarrow$ the agent can solve the task
    - With the polar inputs silenced $\rightarrow$ the agent struggle to solve the task
- Any other approach we could use?

Use the behavior as proxy

- Silence the Cartesian/polar part of the input on a trained agent and look at how the agent behaves (x4 experiments)
- Expectation:
  - Left/right task:
    - With the Cartesian inputs silenced → the agent can solve the task
    - With the polar inputs silenced → the agent struggle to solve the task
  - East/west task:
    - With the Cartesian inputs silenced → the agent can solve the task
    - With the polar inputs silenced → the agent struggle to solve the task
- Any other approach we could use?

Use the behavior as proxy

- Silence the Cartesian/polar part of the input on a trained agent and look at how the agent behaves (x4 experiments)
- Expectation:
  - Left/right task:
    - With the Cartesian inputs silenced $\rightarrow$ the agent can solve the task
    - With the polar inputs silenced $\rightarrow$ the agent struggle to solve the task
  - East/west task:
    - With the Cartesian inputs silenced $\rightarrow$ the agent can solve the task
    - With the polar inputs silenced $\rightarrow$ the agent struggle to solve the task
- Any other approach we could use?

Use the behavior as proxy

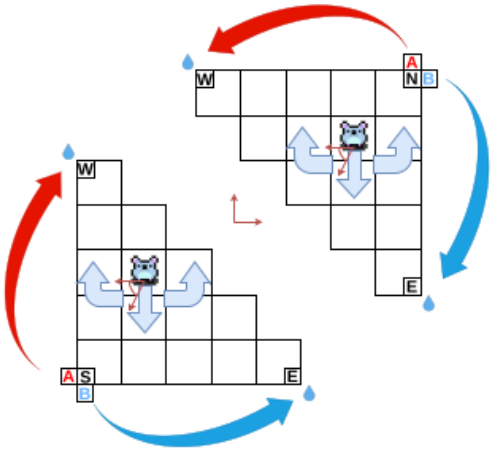
- Silence the Cartesian/polar part of the input on a trained agent and look at how the agent behaves (x4 experiments)
- Expectation:
  - Left/right task:
    - With the Cartesian inputs silenced $\rightarrow$ the agent can solve the task
    - With the polar inputs silenced $\rightarrow$ the agent struggle to solve the task
  - East/west task:
    - With the Cartesian inputs silenced $\rightarrow$ the agent can solve the task
    - With the polar inputs silenced $\rightarrow$ the agent struggle to solve the task
- Any other approach we could use?

Use the behavior as proxy

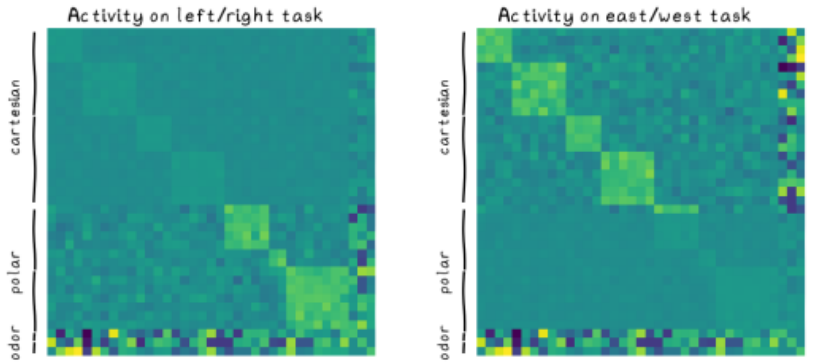
- Silence the Cartesian/polar part of the input on a trained agent and look at how the agent behaves (x4 experiments)
- Expectation:
  - Left/right task:
    - With the Cartesian inputs silenced $\rightarrow$ the agent can solve the task
    - With the polar inputs silenced $\rightarrow$ the agent struggle to solve the task
  - East/west task:
    - With the Cartesian inputs silenced $\rightarrow$ the agent can solve the task
    - With the polar inputs silenced $\rightarrow$ the agent struggle to solve the task
- Any other approach we could use?

Neural representations?

2. How the constraints of the task impact the representations learned?



(a) Experiment with duplicated spatial information input.



(b) Expected neuronal activity on the left/right task (left) and on the east/west task (right).

Figure 8. What does the network learn if it gets both Cartesian and polar information as input?
On the left/right task → we expect the activity to be close to zero on the Cartesian representation.
On the east/west task → we expect the activity to be close to zero on the polar representation.