DRL project update

Cartesian/polar duplicated coordinates experiment

Andrea Pierré

January 21, 2025

Outline

1. Current status

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

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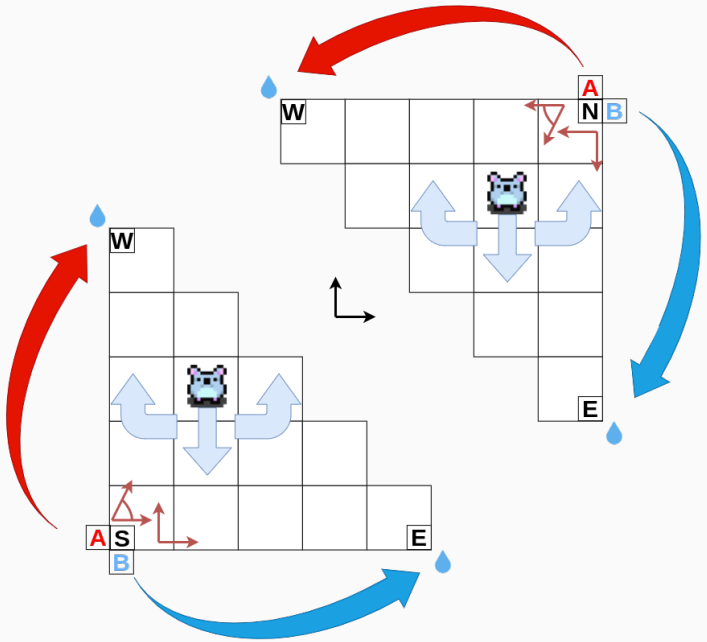
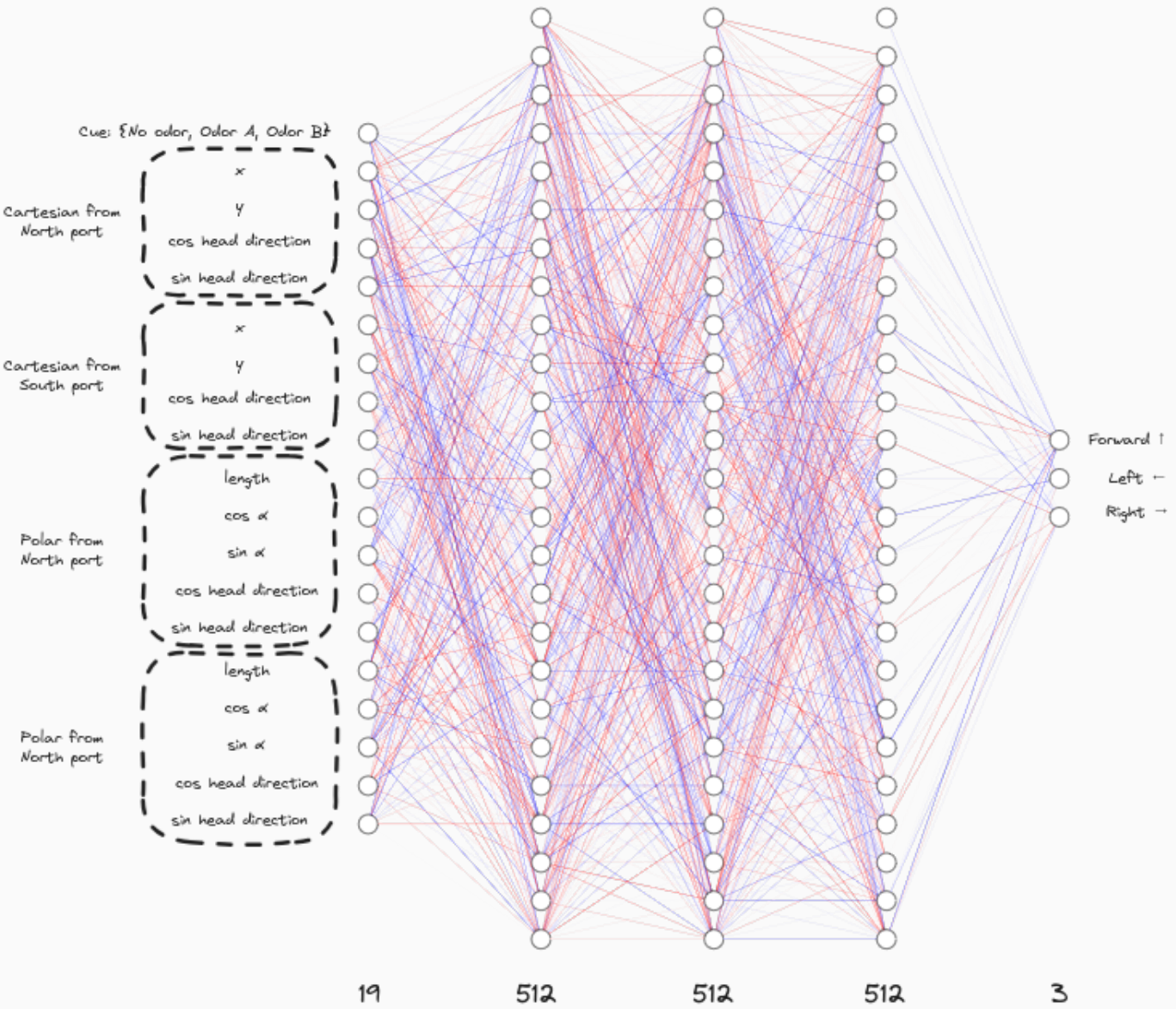
2. How to get insights at what the network learn?

Current status



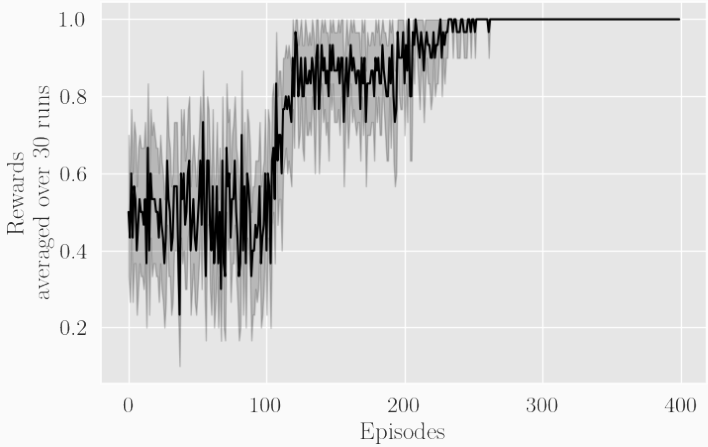
- Environment rewrite: done
- Training: ~4.5 hours to train 30 agents on both tasks on Oscar
- Analysis: WIP

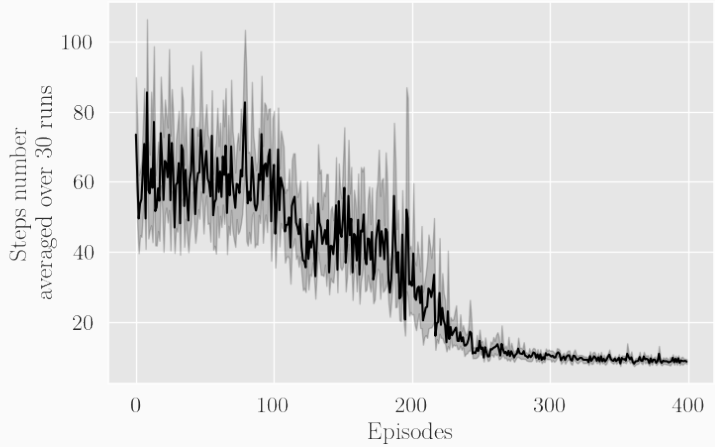
State space & network architecture



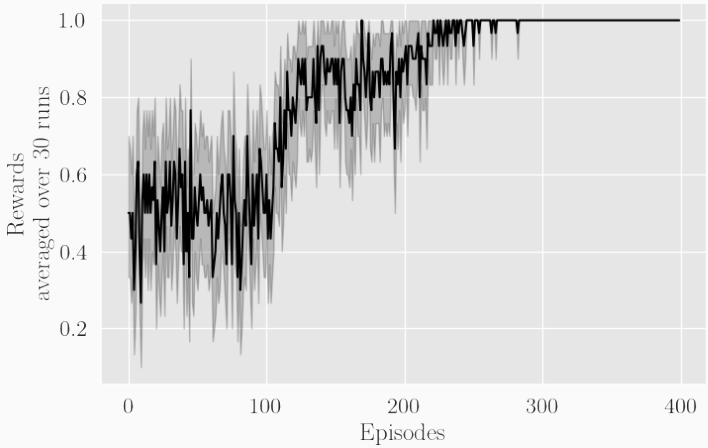
Training

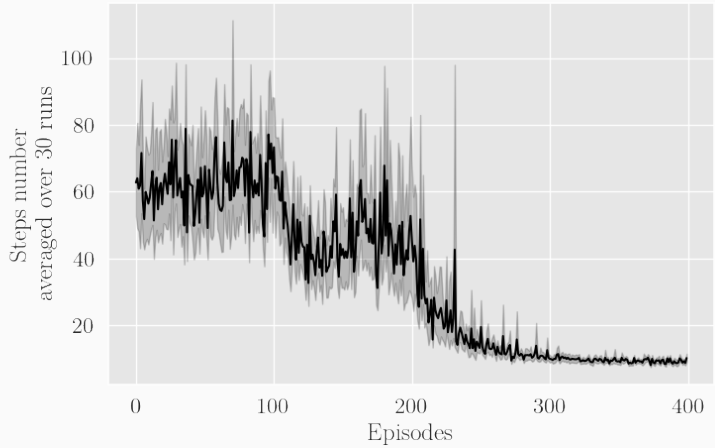
East/West



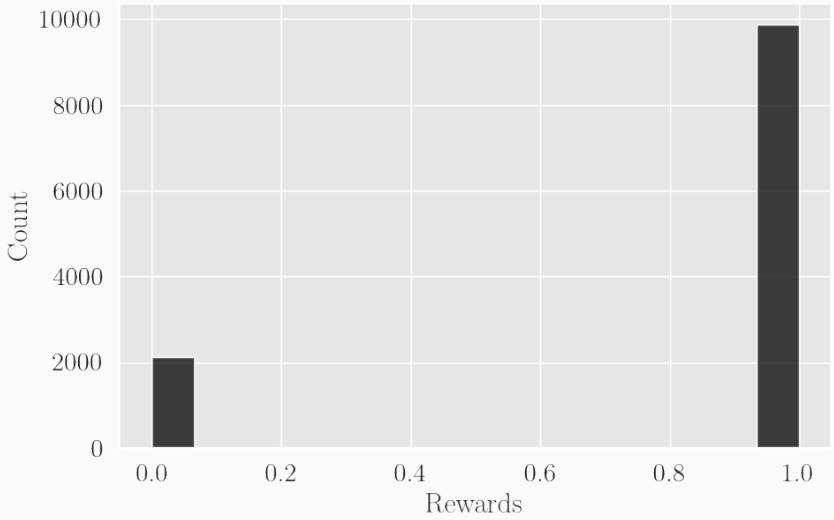


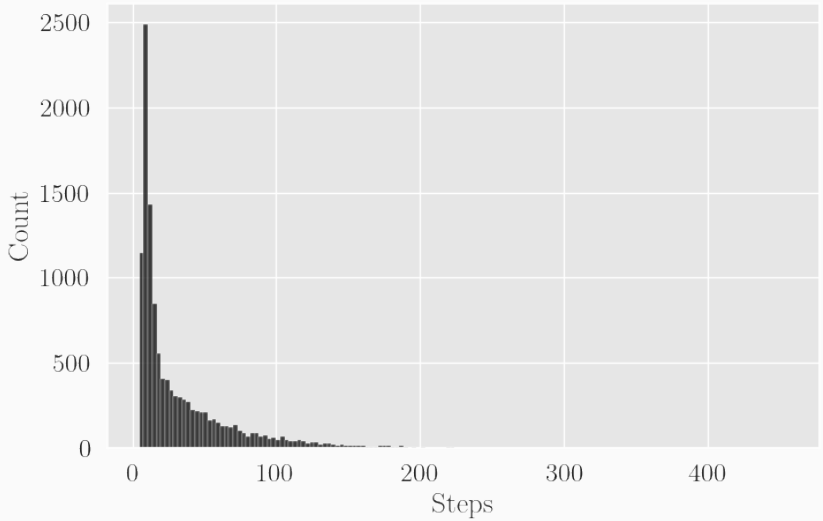
Left/Right

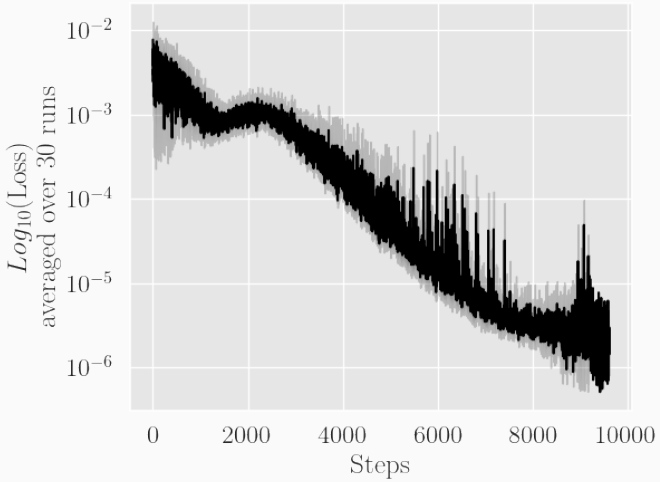


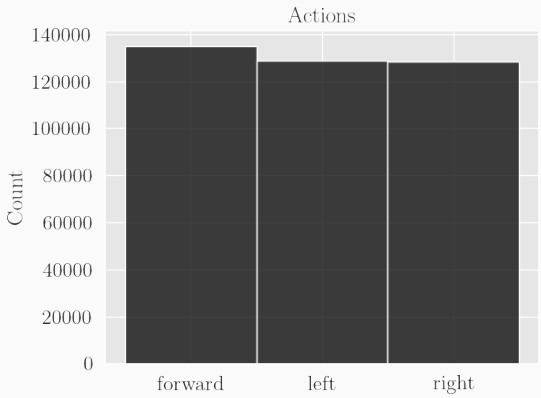


Training checks - East/West









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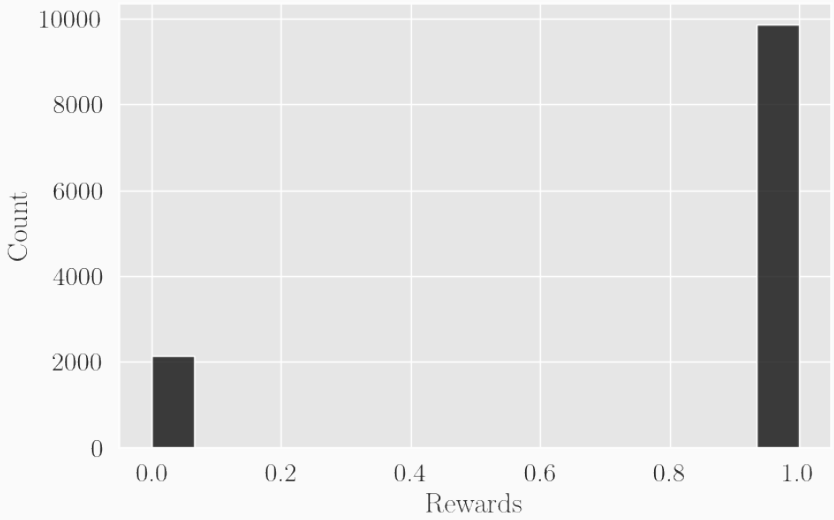
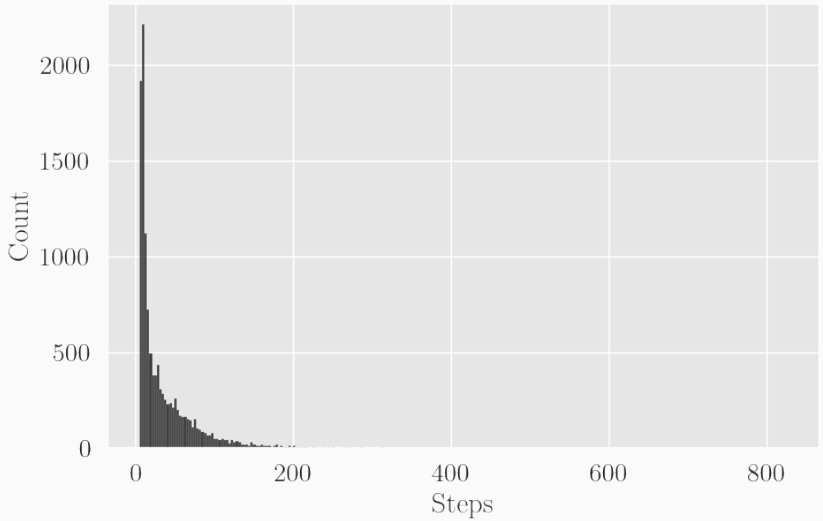
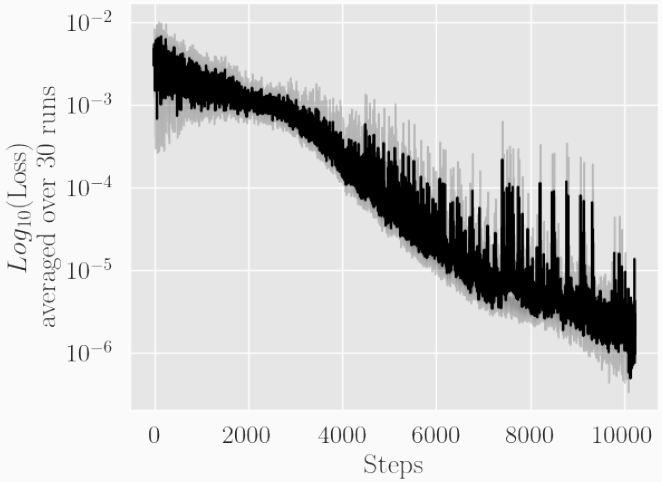
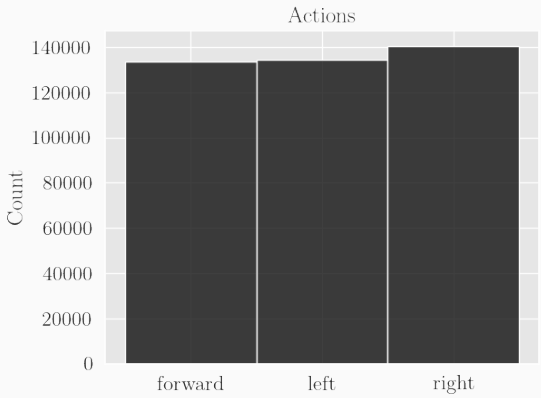
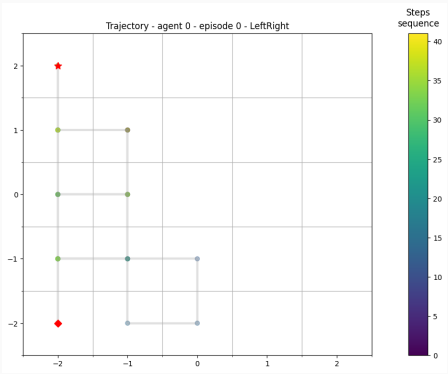


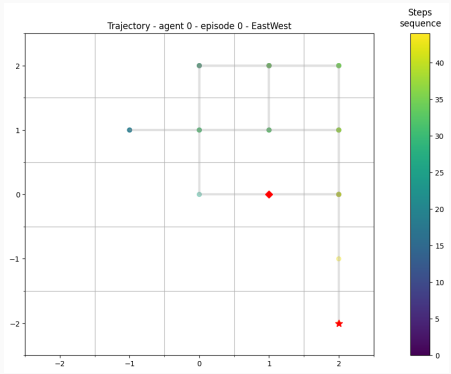


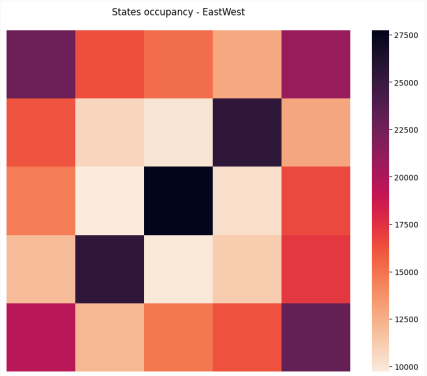


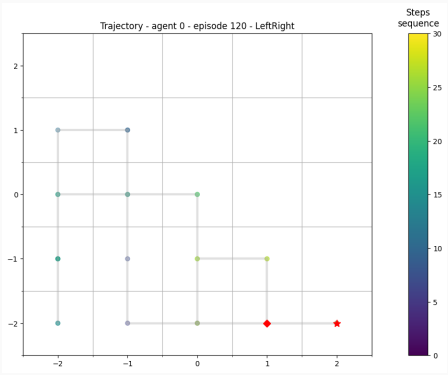


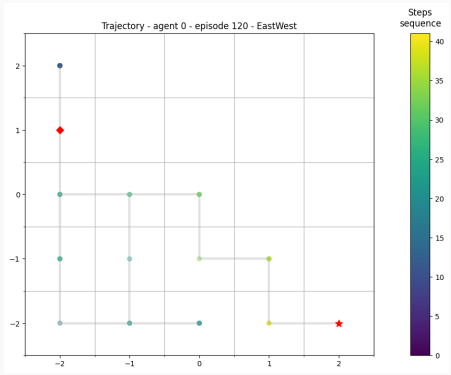
Agent behavior

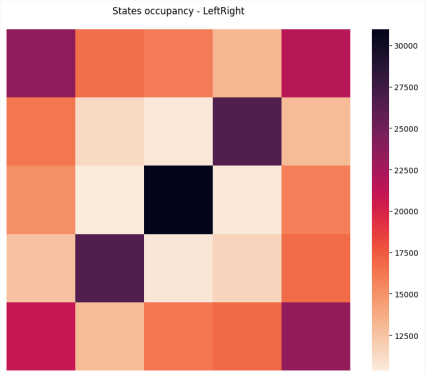


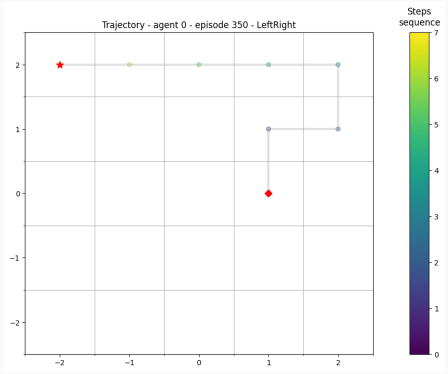


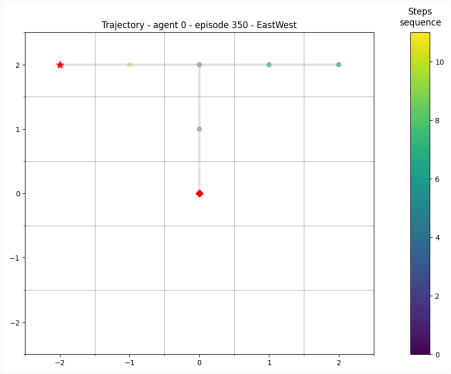












Outline

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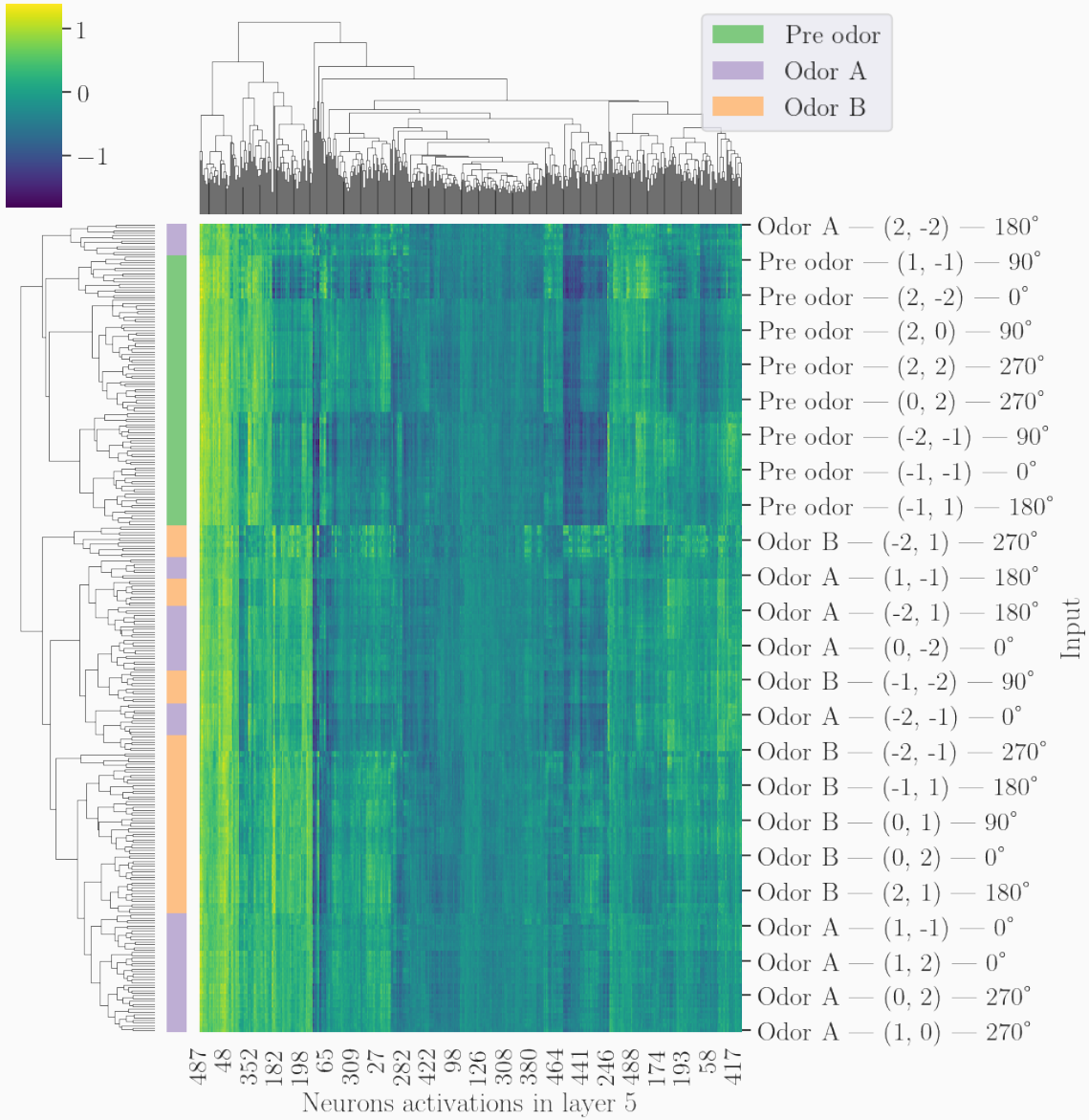
Activations learned - East/West



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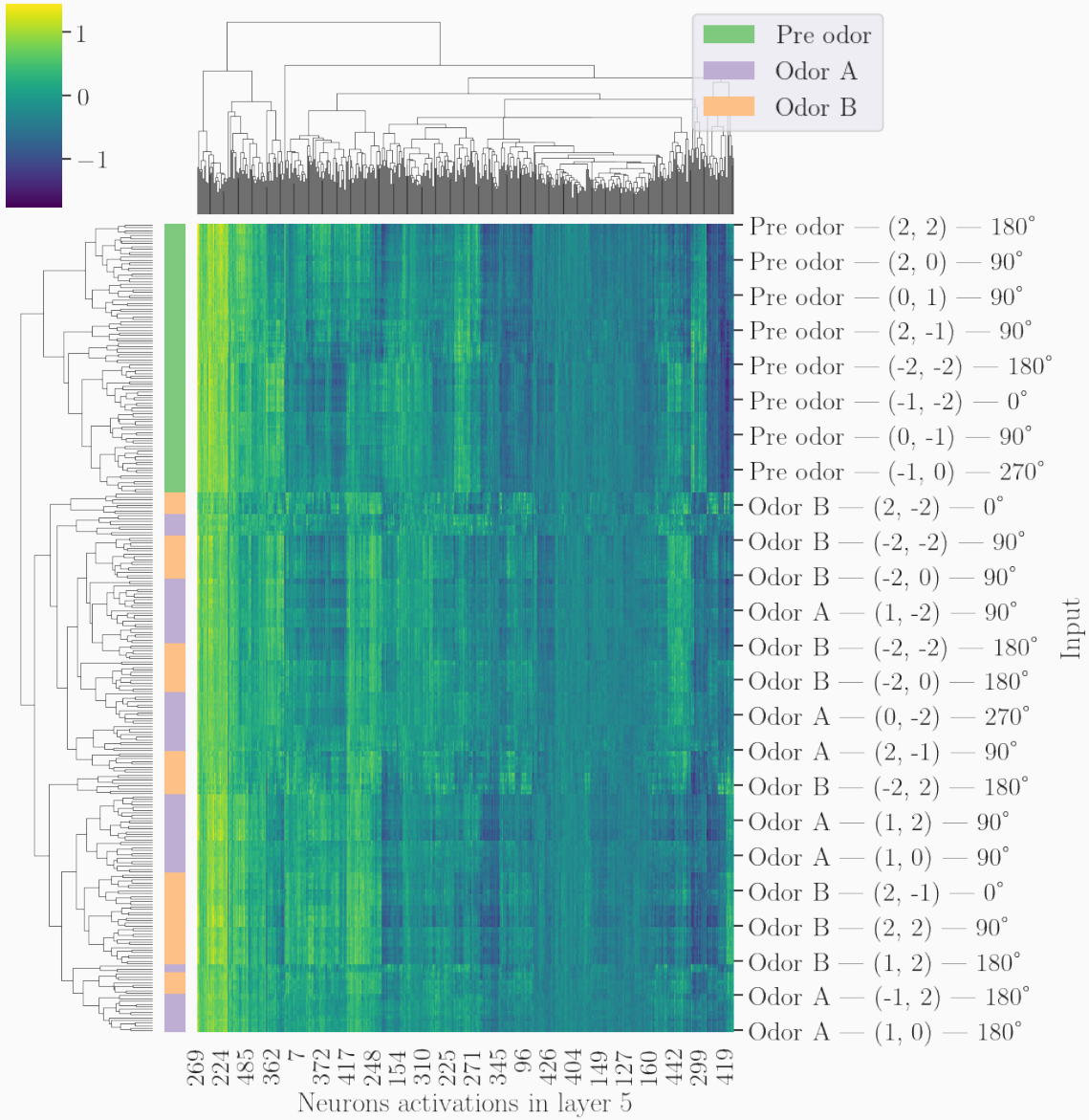

Use the behavior as proxy

- 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?

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  - 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
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- 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:
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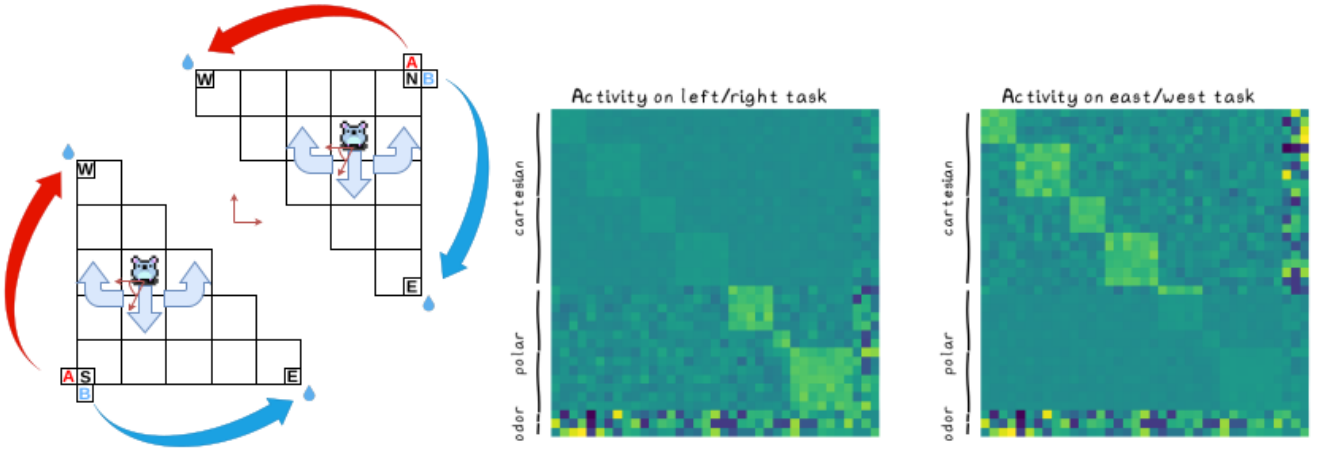
Neural representations?

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.

- Need for some causal framework?