

Change of course

symposium



AI sail

From an intuitive case study
to maritime applications

Fanny Rebiffé





MARIN

BLACK GOLD

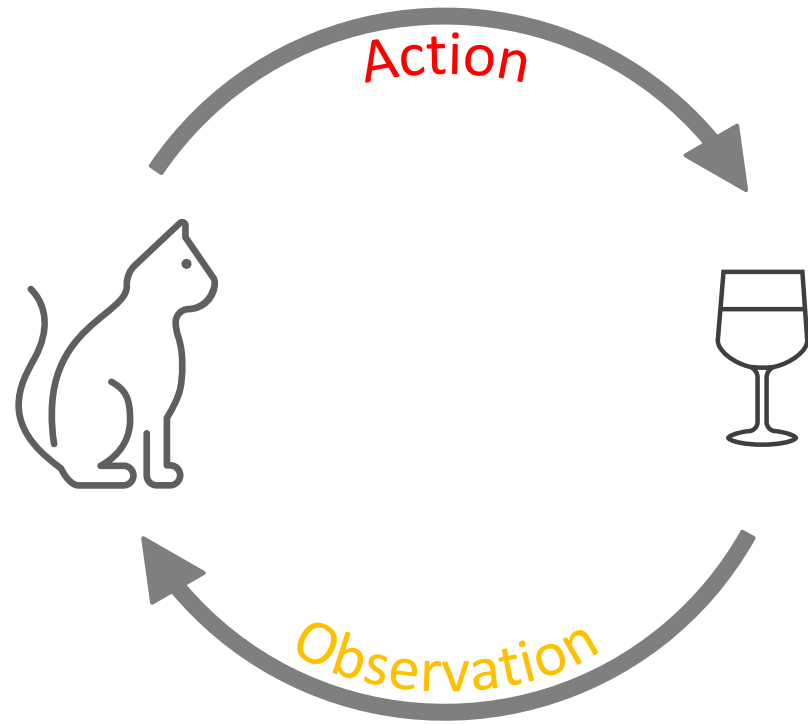
Explicit knowledge vs implicit knowledge



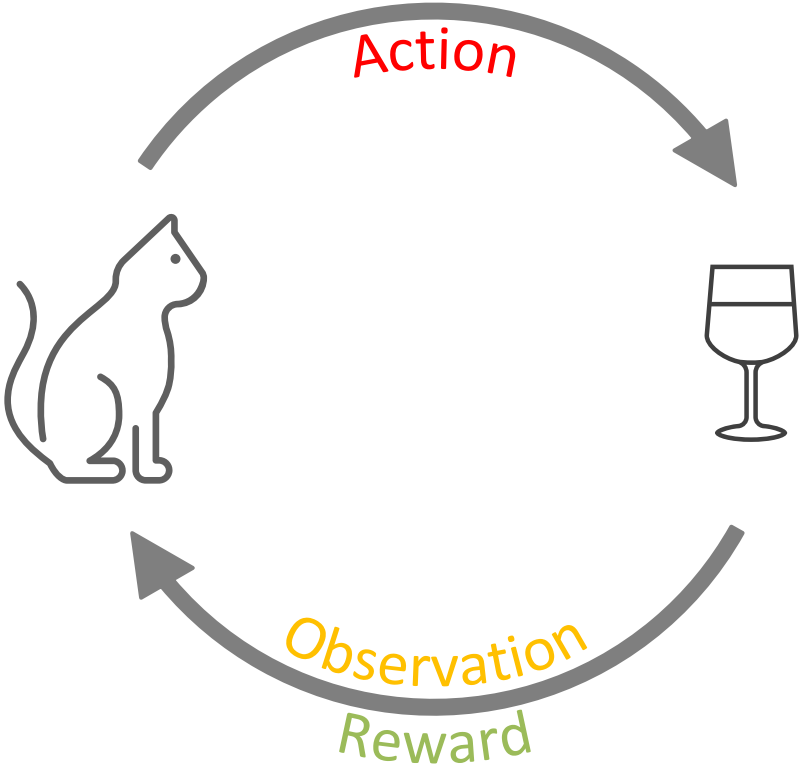
Learning by trial and error



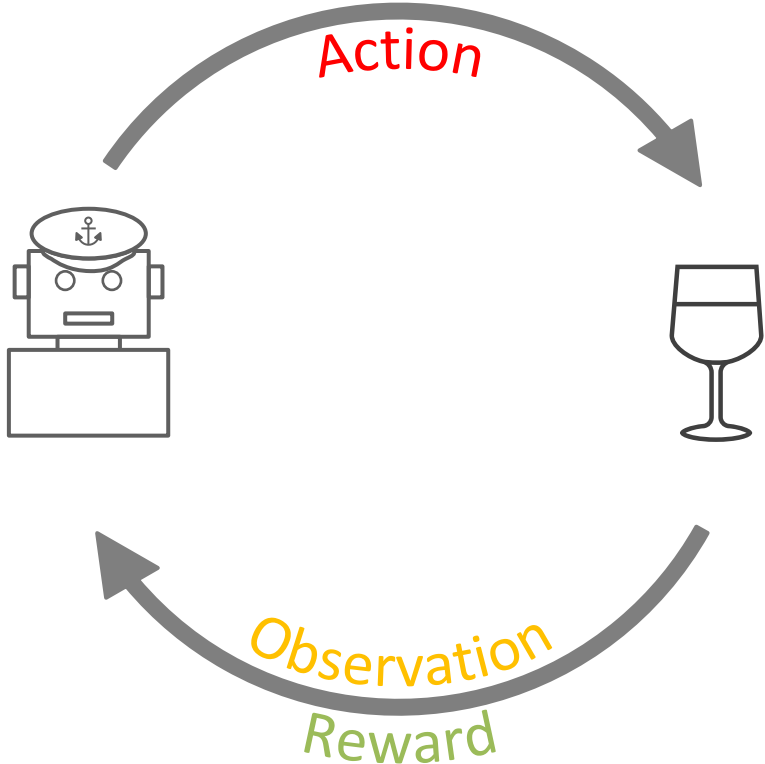
Interactions



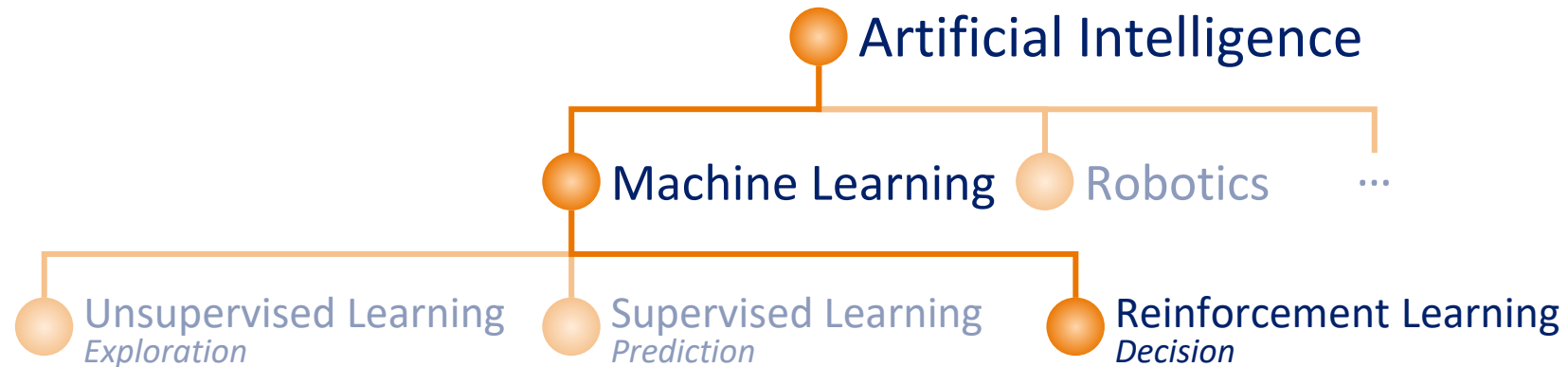
Reinforcement Learning



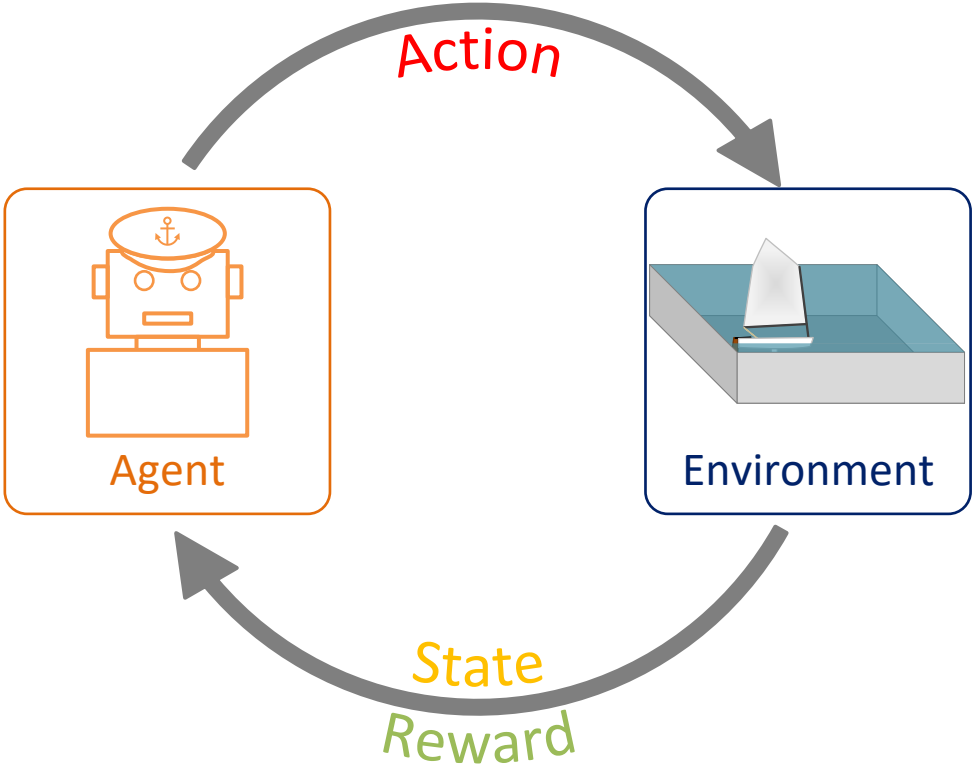
Reinforcement Learning



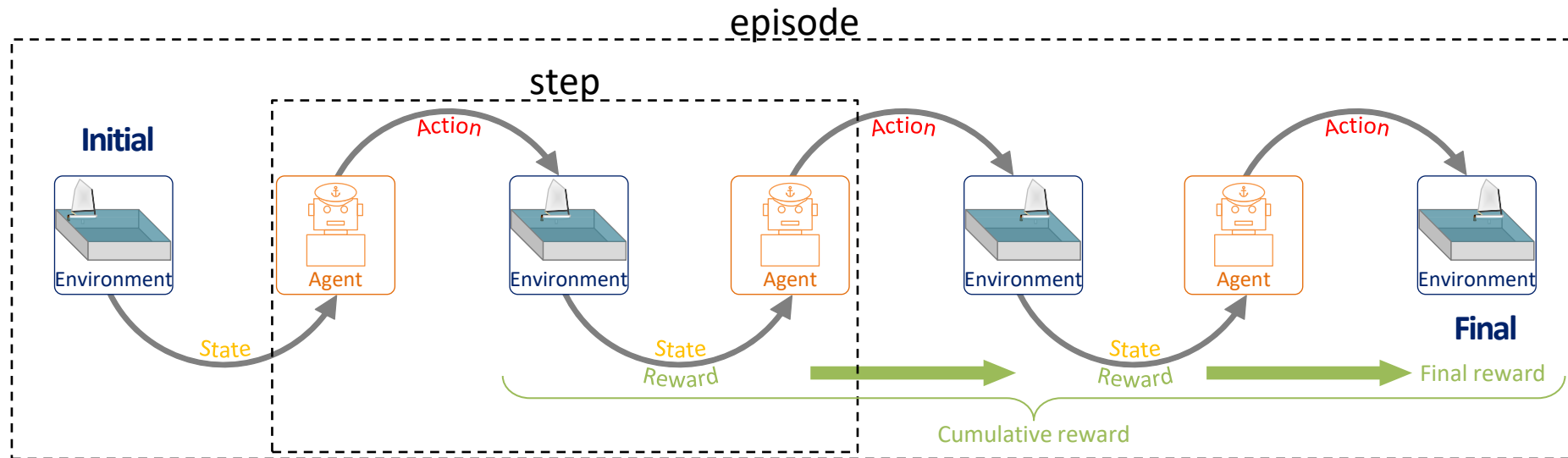
Reinforcement Learning



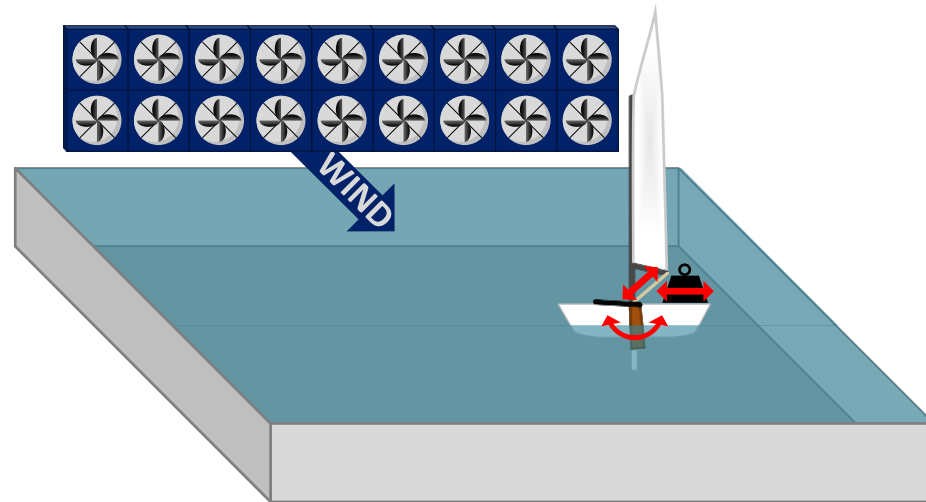
Reinforcement Learning



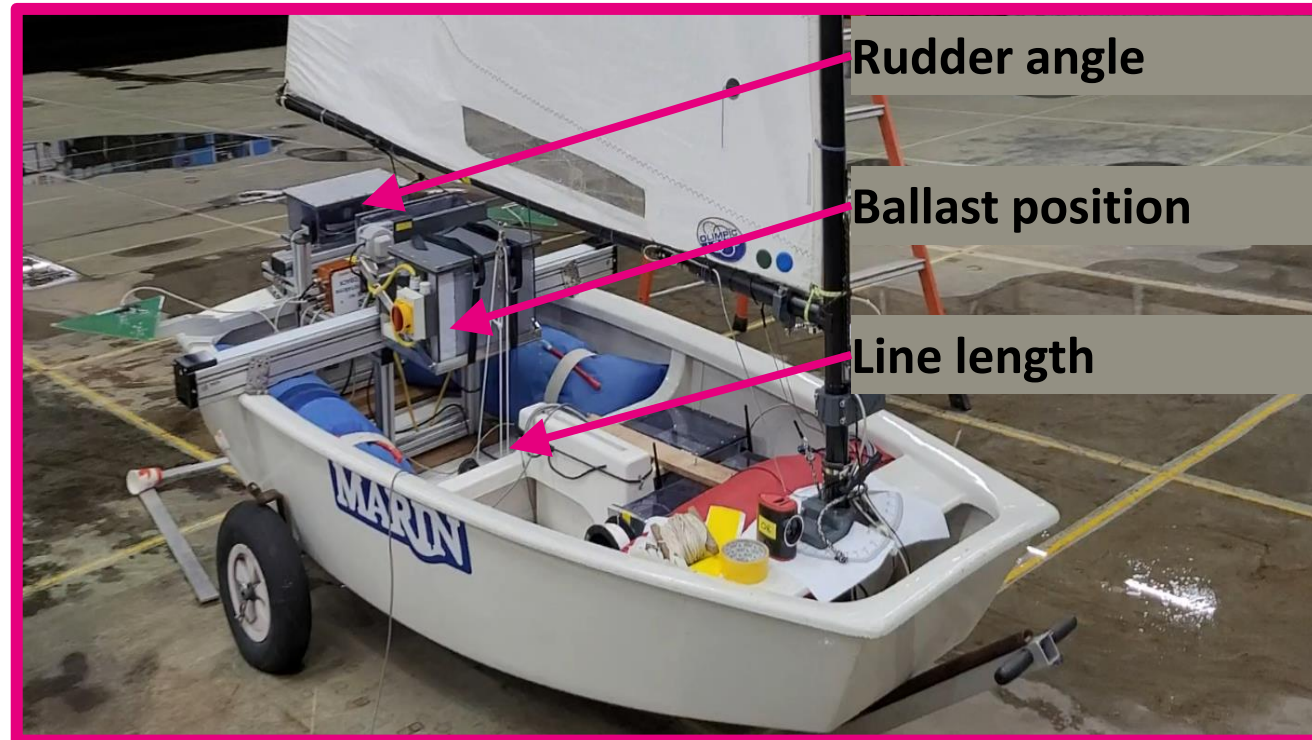
Training



Sailing upwind



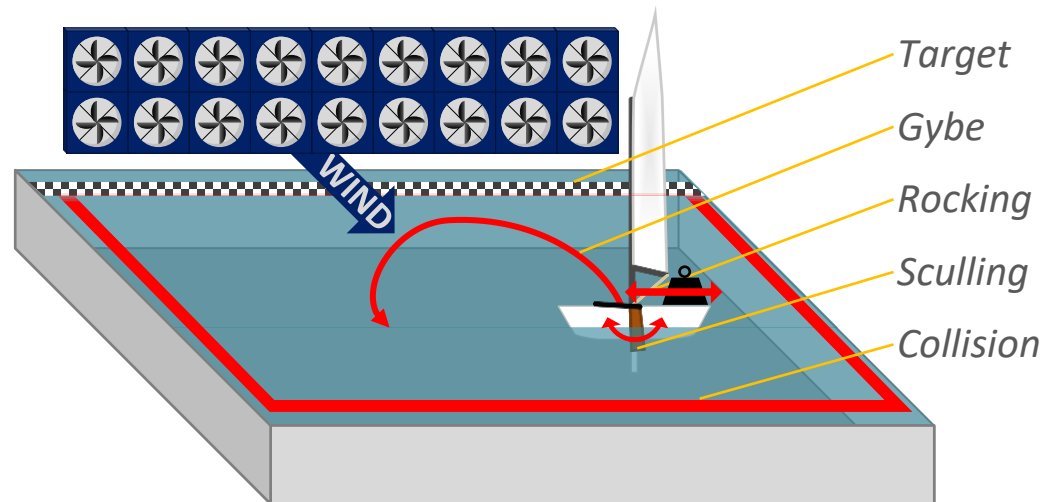
Sailing upwind



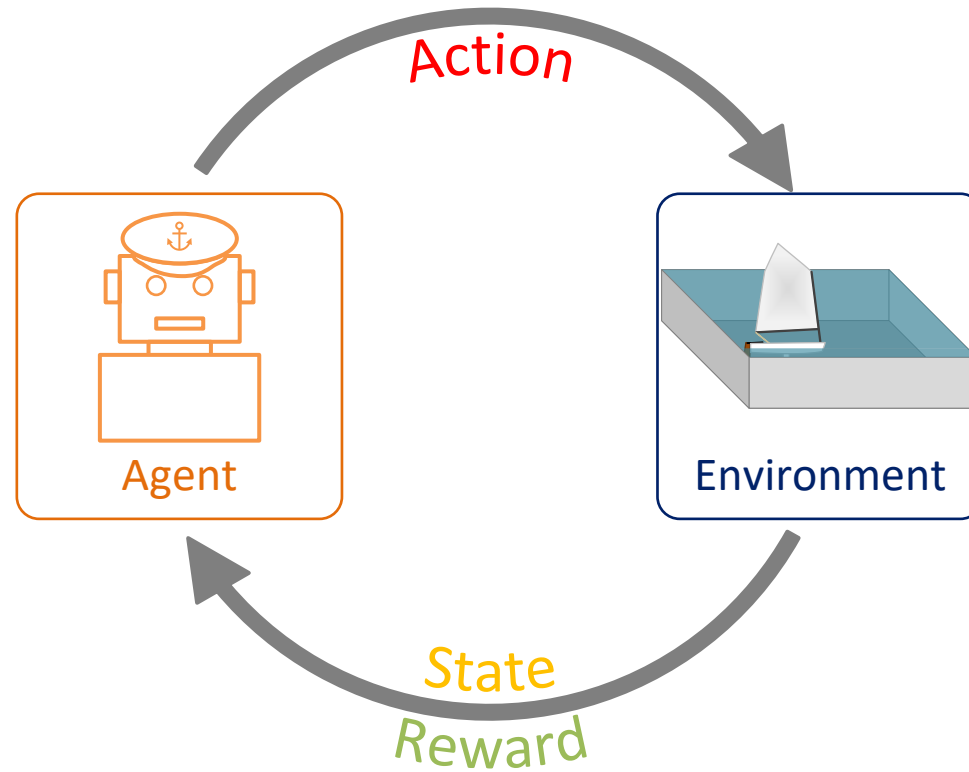
Sailing upwind



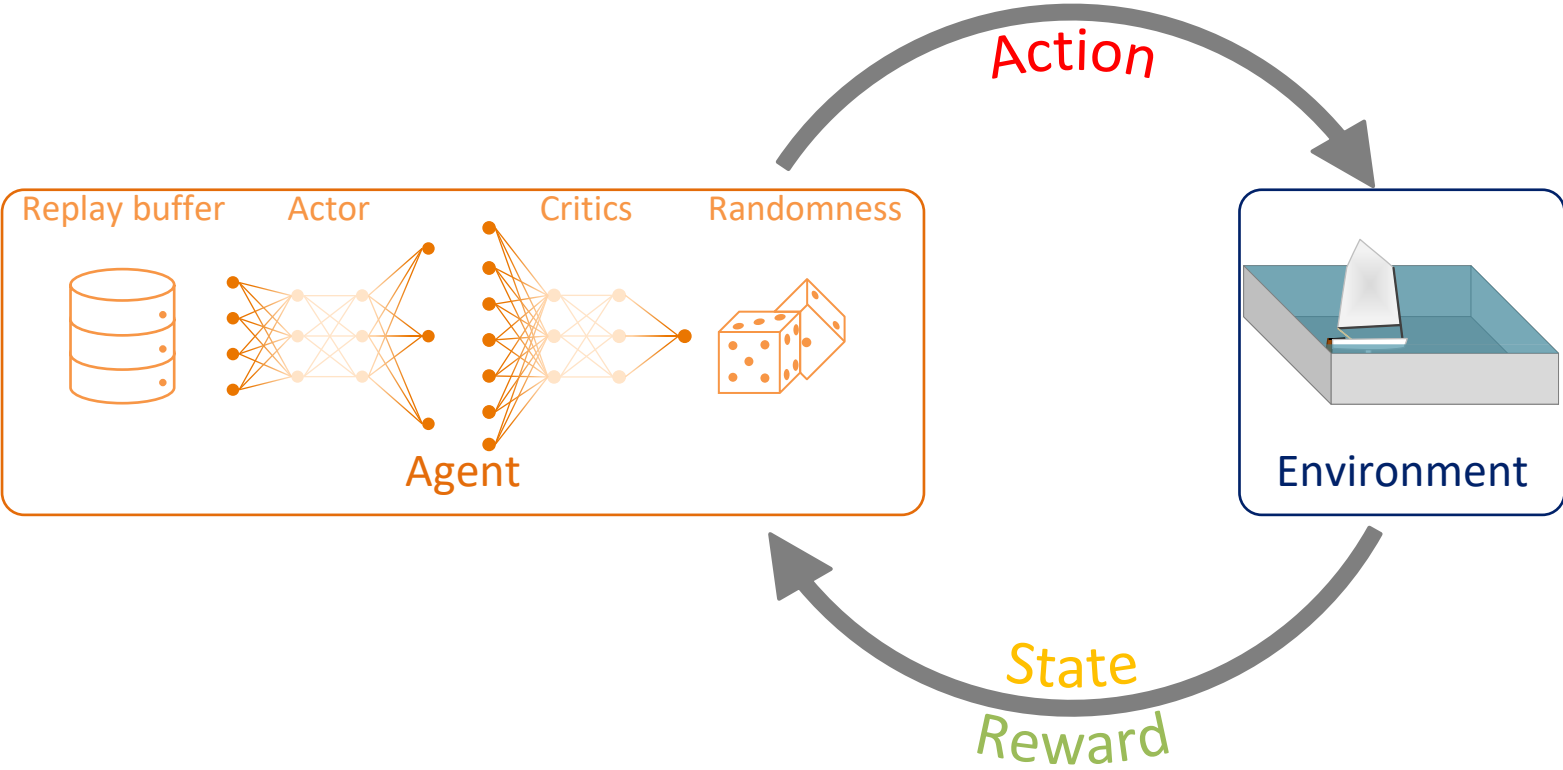
Sailing upwind



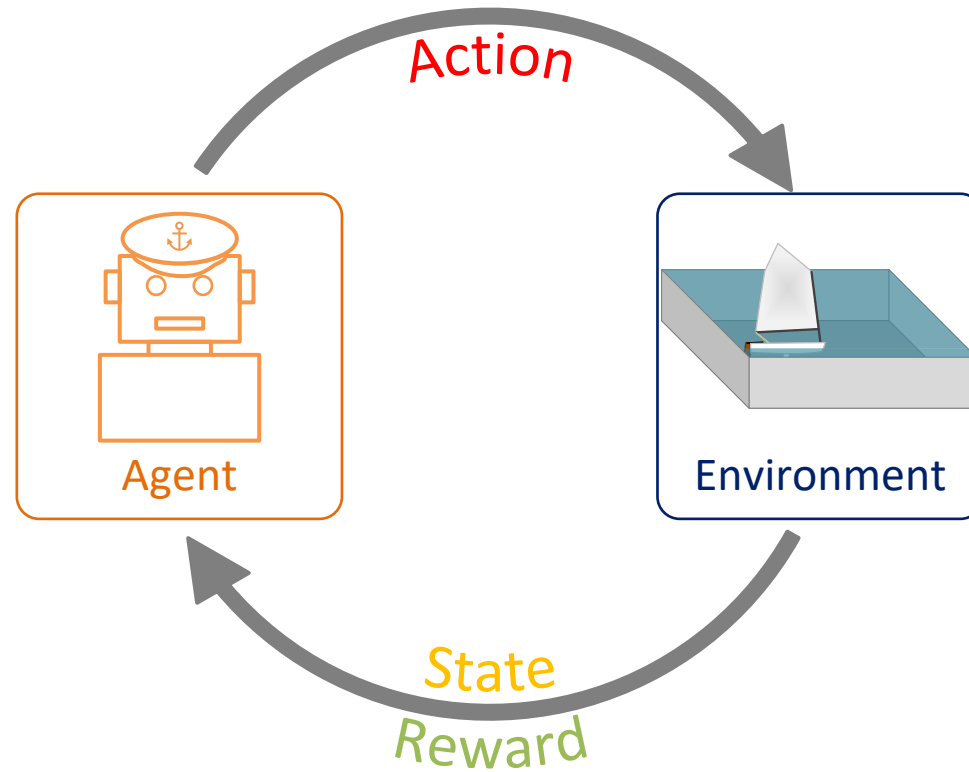
Reinforcement Learning



RL agent



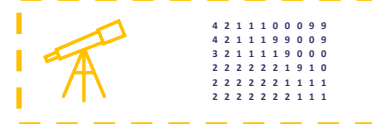
State encoding



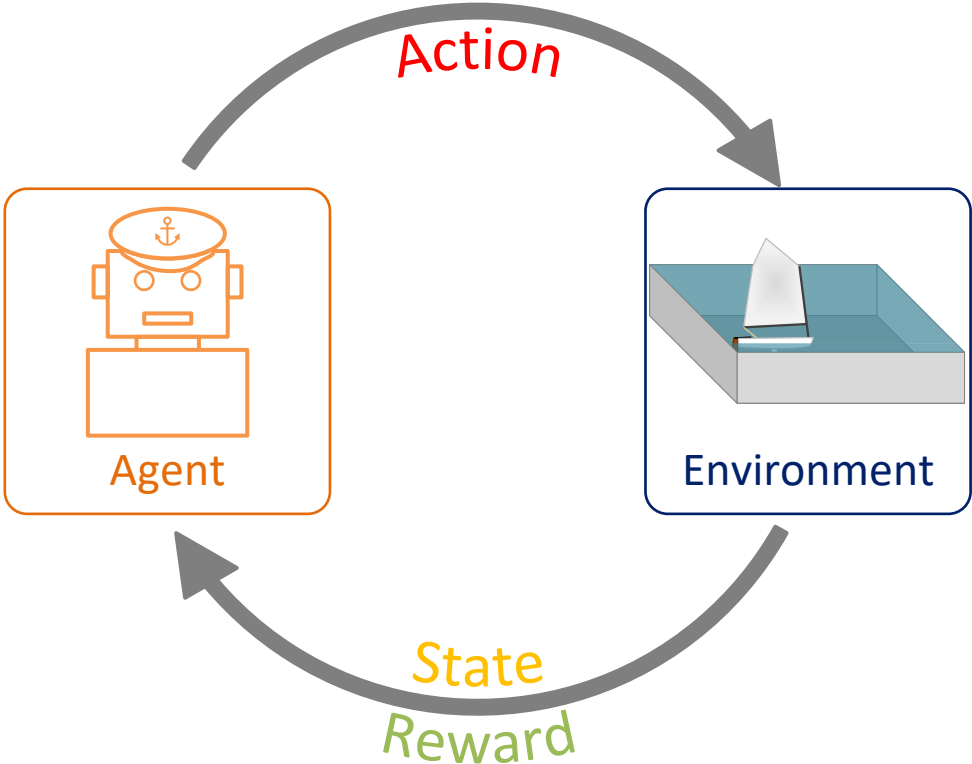
Agent & hyperparameters



State encoding



Reward design



Agent & hyperparameters

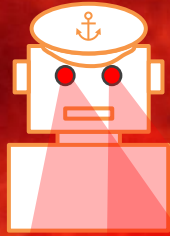


State encoding

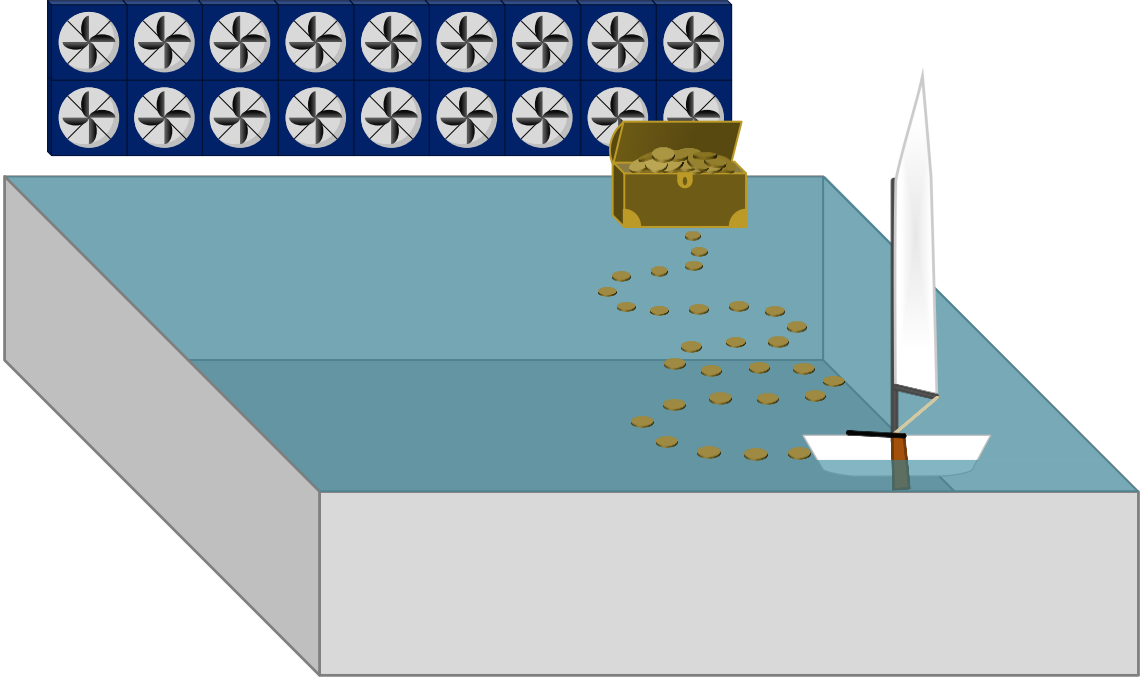


End conditions & reward





Reward design



Agent & hyperparameters



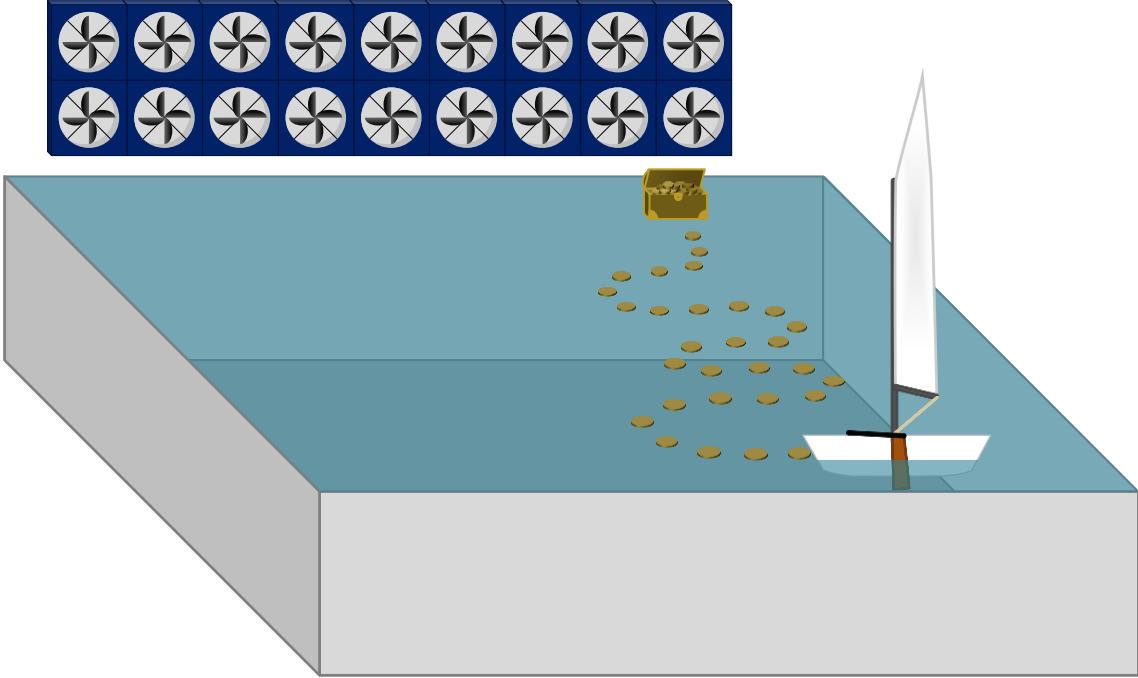
State encoding



End conditions & reward



Reward design



Agent & hyperparameters



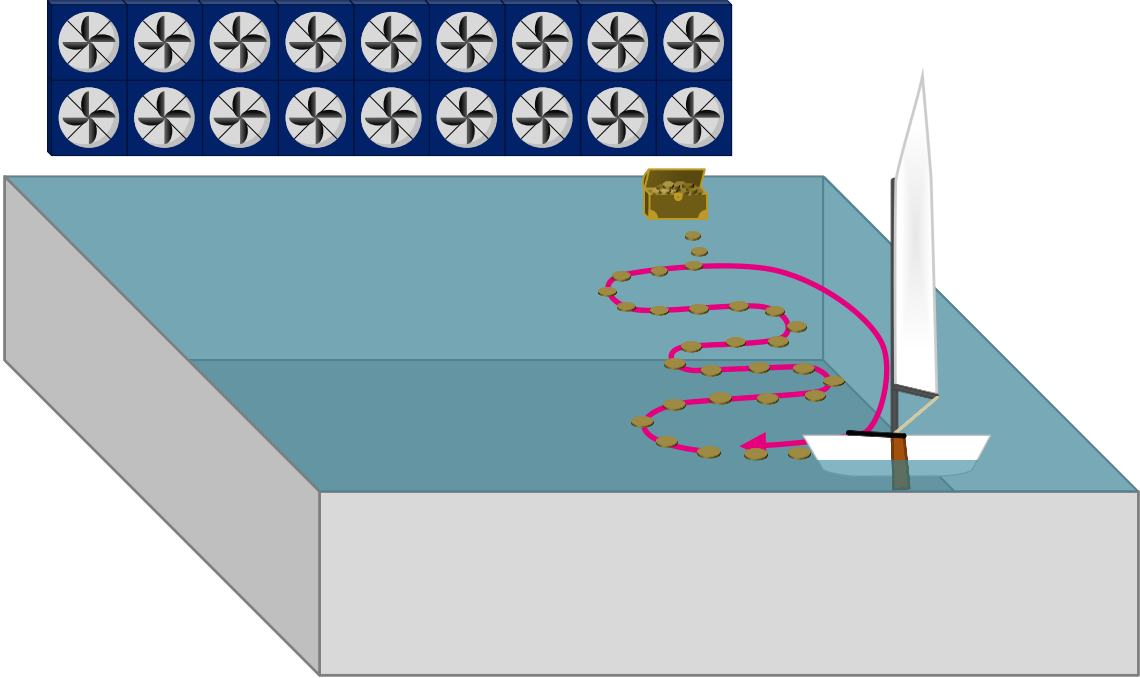
State encoding



End conditions & reward



Reward design



Agent & hyperparameters



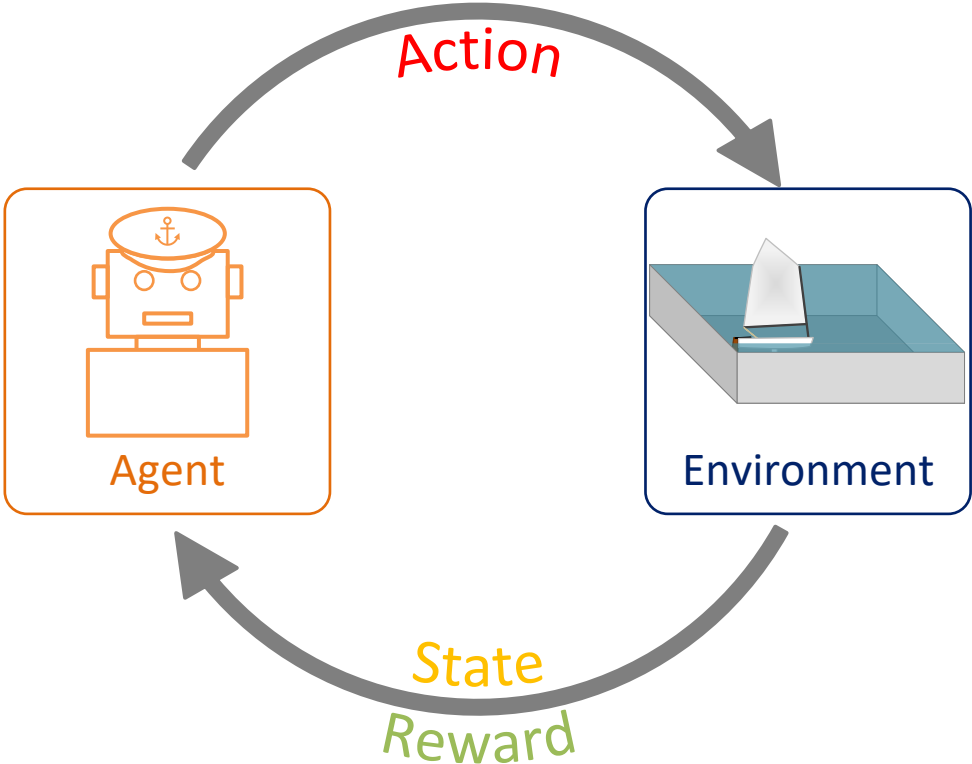
State encoding



End conditions & reward



Environment



Agent & hyperparameters

This block contains an icon of a robot and a line graph with data points, representing the agent and its hyperparameters.

State encoding

4	2	1	1	1	0	0	0	9	9
4	2	1	1	1	9	9	0	0	9
3	2	1	1	1	9	0	0	0	0
2	2	2	2	2	1	9	1	0	
2	2	2	2	2	1	1	1	1	
2	2	2	2	2	2	1	1	1	

This block features a telescope icon and a grid of binary digits, representing state encoding.

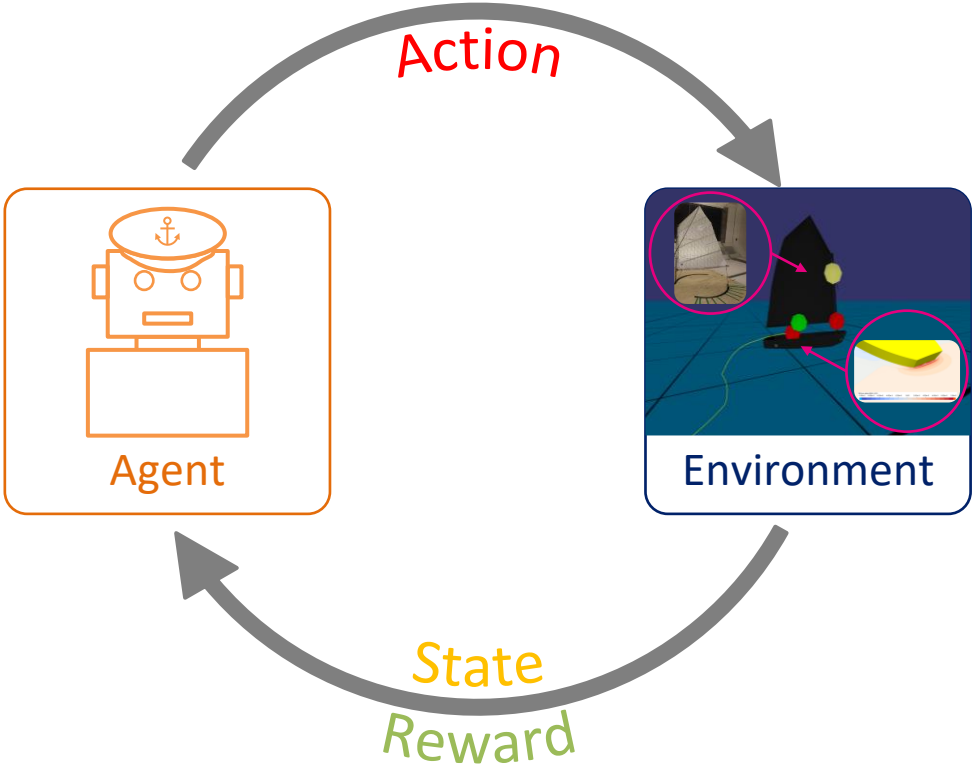
End conditions & reward

This block includes icons of a treasure chest, a string of beads, and an hourglass, representing end conditions and rewards.

Environment settings

This block shows icons of waves, a wind symbol, and a die, representing environment settings.

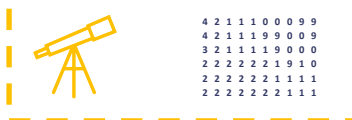
Environment



Agent & hyperparameters



State encoding



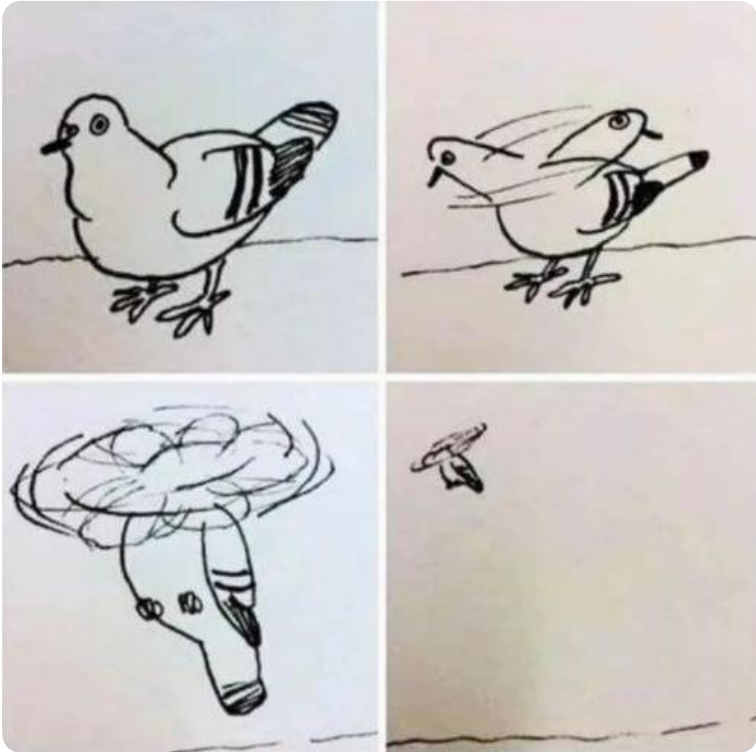
End conditions & reward



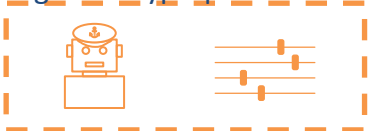
Environment settings



Environment



Agent & hyperparameters



State encoding



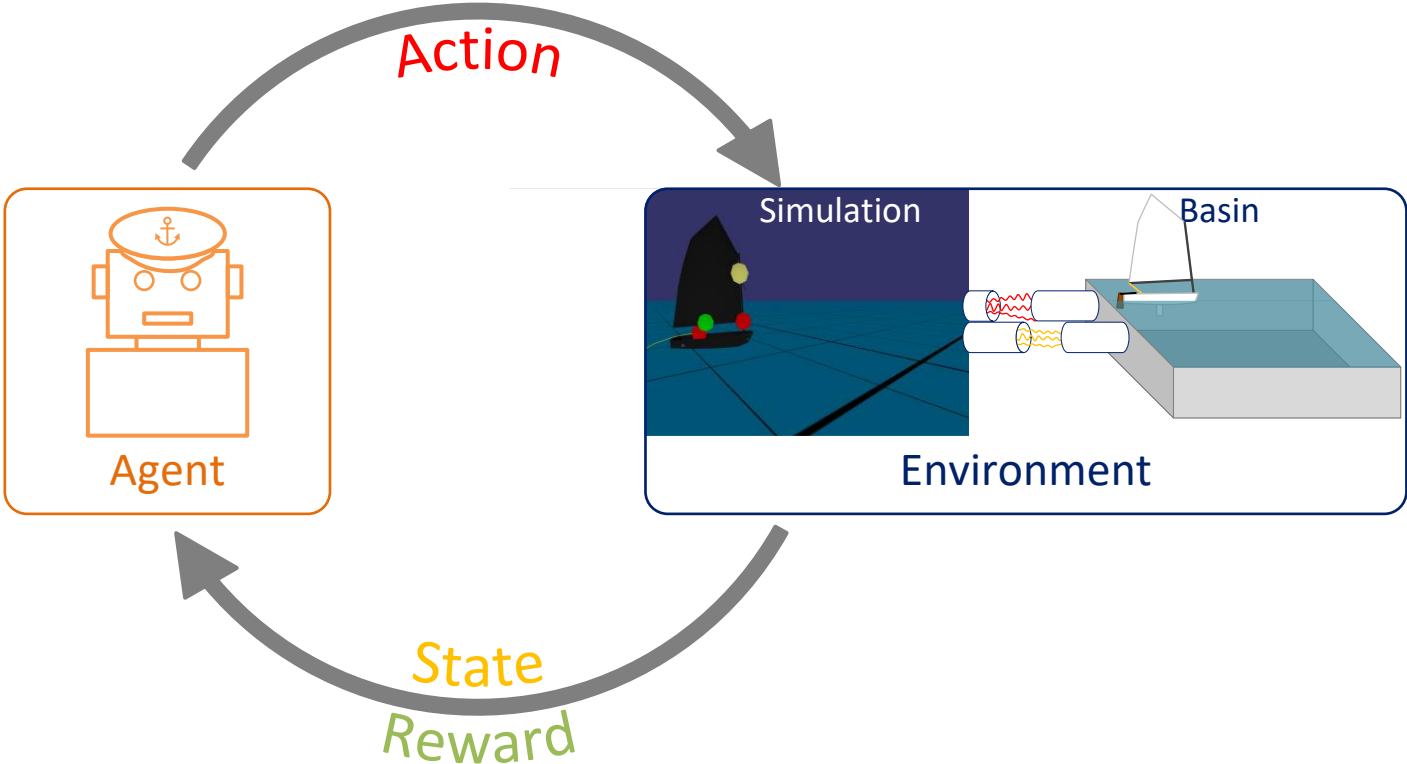
End conditions & reward



Environment settings



Environment



Agent & hyperparameters

This block contains a dashed orange border enclosing an icon of a robot head and a line graph with several data points.

State encoding

This block contains a dashed yellow border enclosing a telescope icon and a grid of binary digits: 4 2 1 1 1 0 0 0 9 9, 4 2 1 1 1 9 9 0 0 9, 3 2 1 1 1 1 9 0 0 0, 2 2 2 2 2 1 9 1 0, 2 2 2 2 2 1 1 1 1, 2 2 2 2 2 1 1 1.

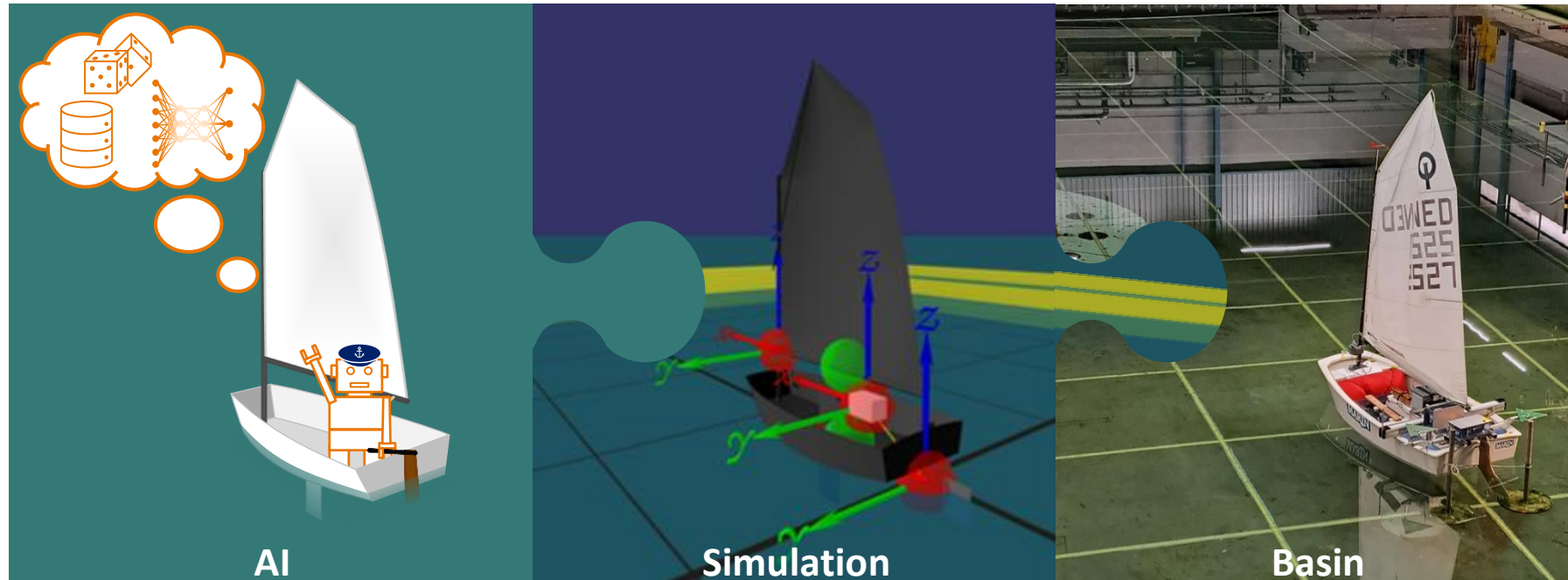
End conditions & reward

This block contains a dashed green border enclosing icons of a treasure chest, a chain with a lock, and an hourglass.

Environment settings

This block contains a dashed blue border enclosing icons of waves, wind, and a die.

Facilities

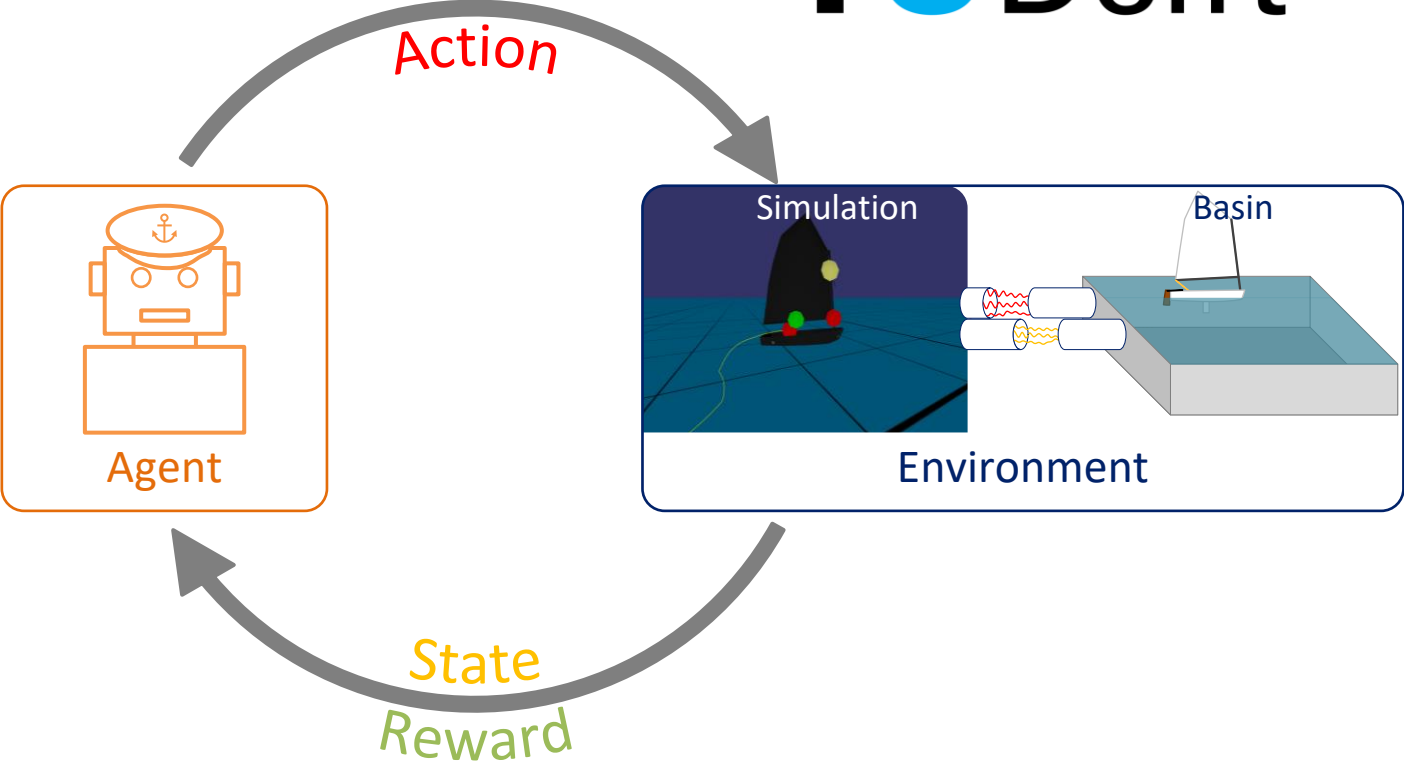


Expertise

The image displays a grid of 12 puzzle pieces, each representing a different area of expertise. The pieces are arranged in a 2x6 grid. The top row contains three pieces: 'Project' (yellow border), 'Sailing advise' (red border), and 'Media' (purple border). The bottom row contains three pieces: 'AI' (green border), 'Simulation' (blue border), and 'Basin' (green border). Each piece contains portraits of experts. The 'Project' piece has three portraits. The 'Sailing advise' piece has one portrait. The 'Media' piece has one portrait. The 'AI' piece has three portraits. The 'Simulation' piece has three portraits. The 'Basin' piece has four portraits. The puzzle pieces are interlocking, with some missing pieces in the top row.

Project	Sailing advise	Media

Environment



Agent & hyperparameters



State encoding



End conditions & reward

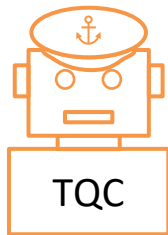


Environment settings



Example

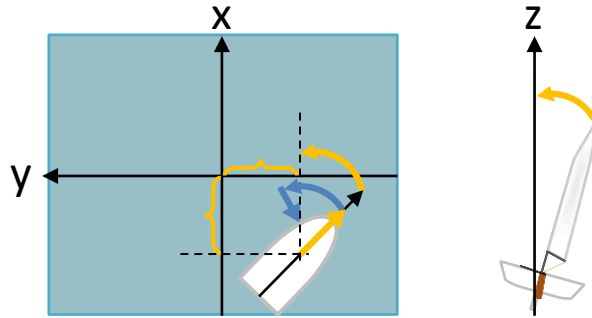
Agent



Discount factor

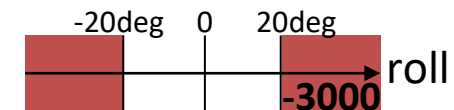
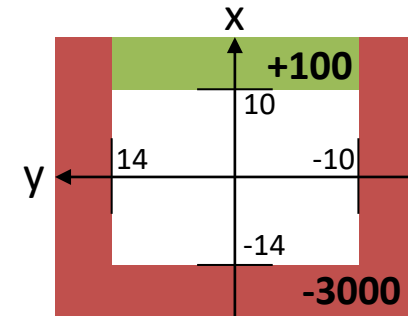
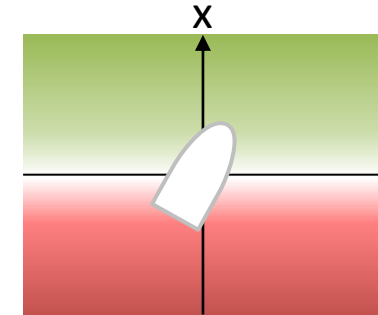


State



- x
- y
- yaw
- roll
- forward speed
- acceleration
- relative wind speed
- relative wind heading

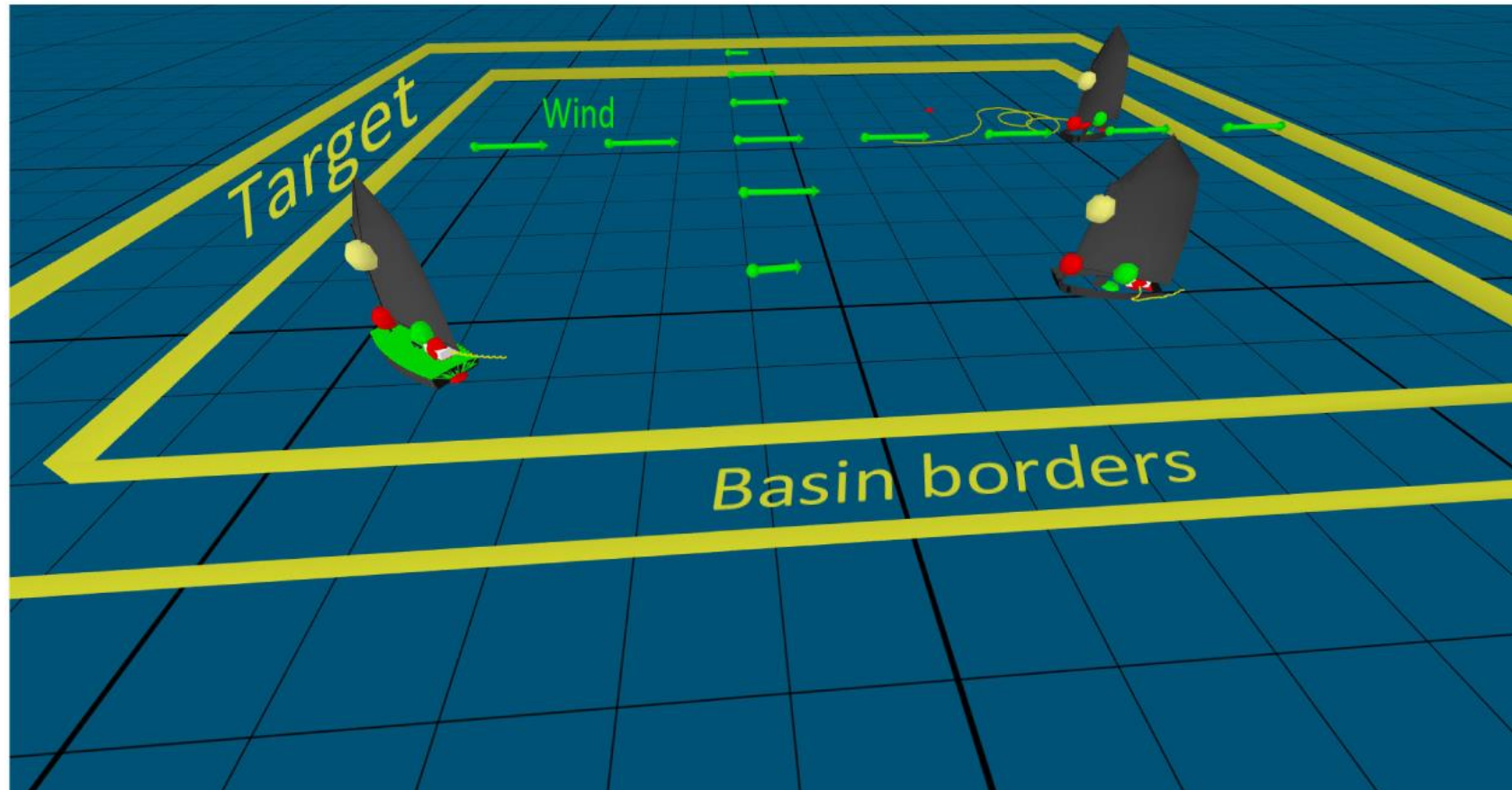
Reward



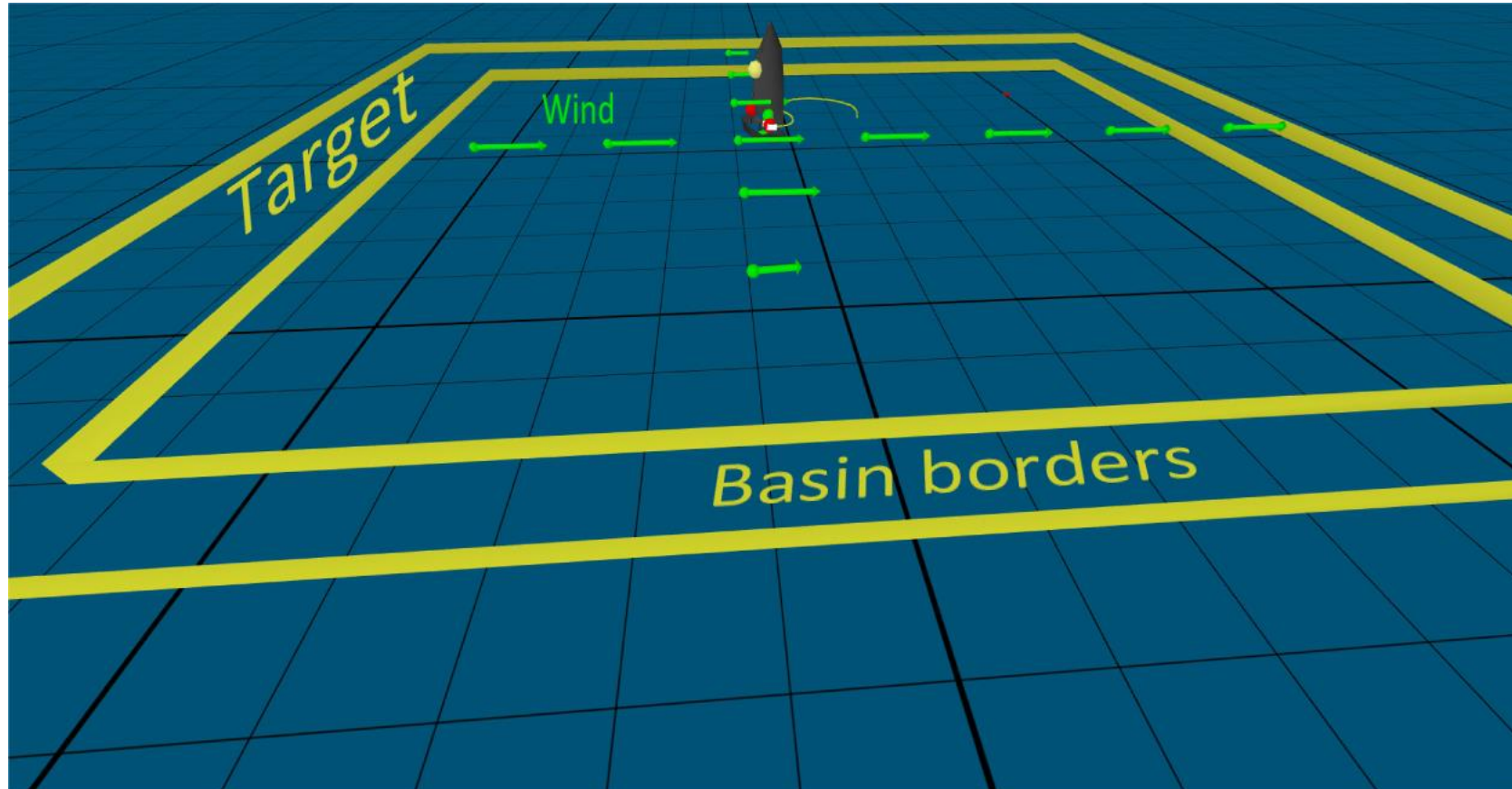
Intermediate

Final

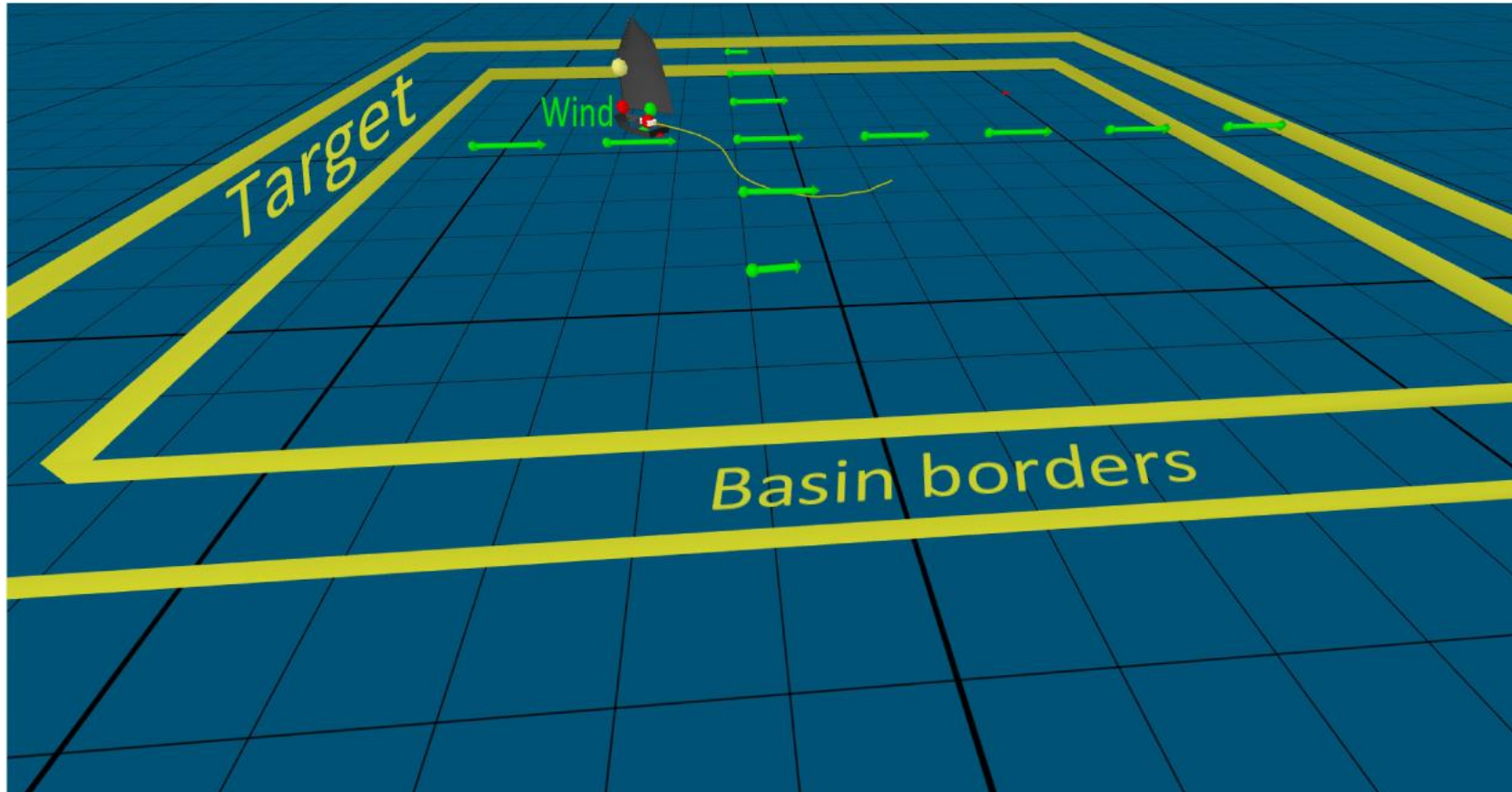
Exploration



After 70 episodes



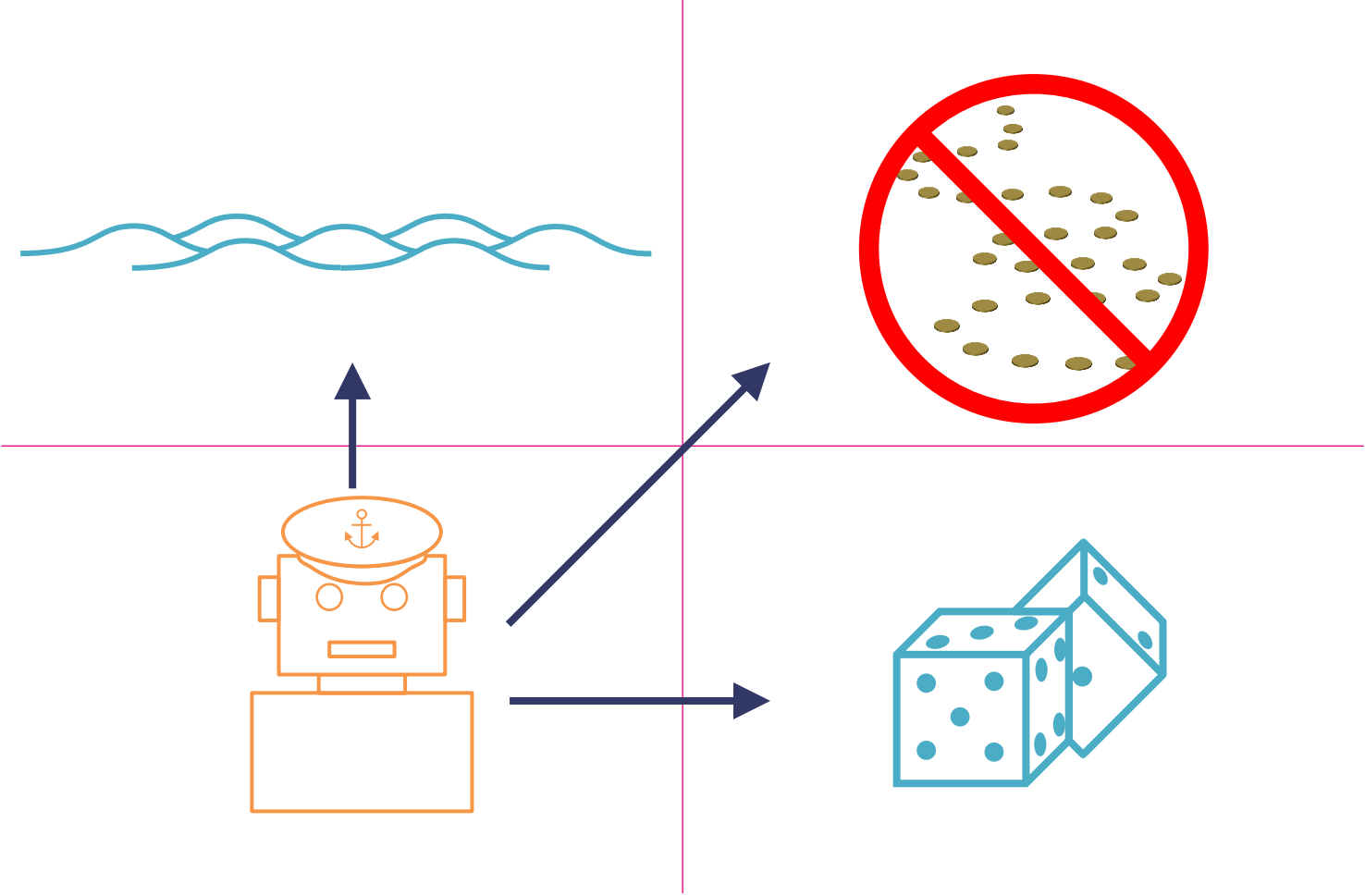
After 450 episodes

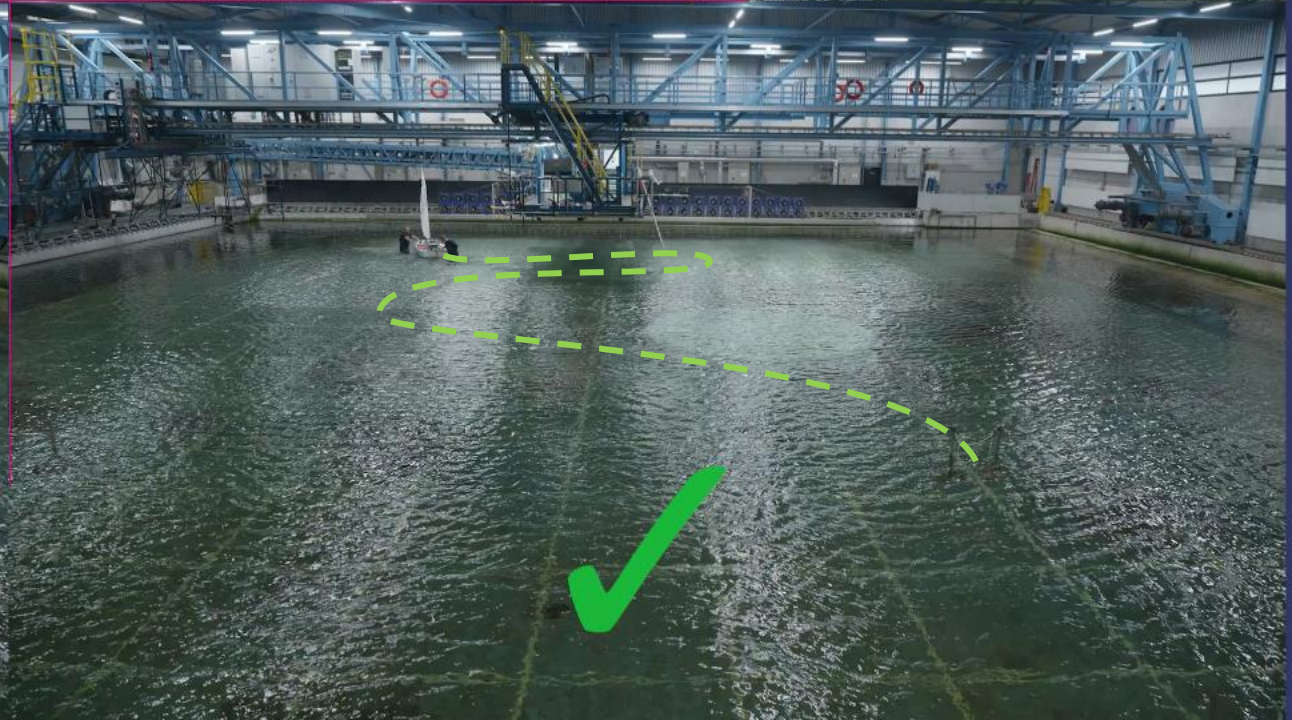
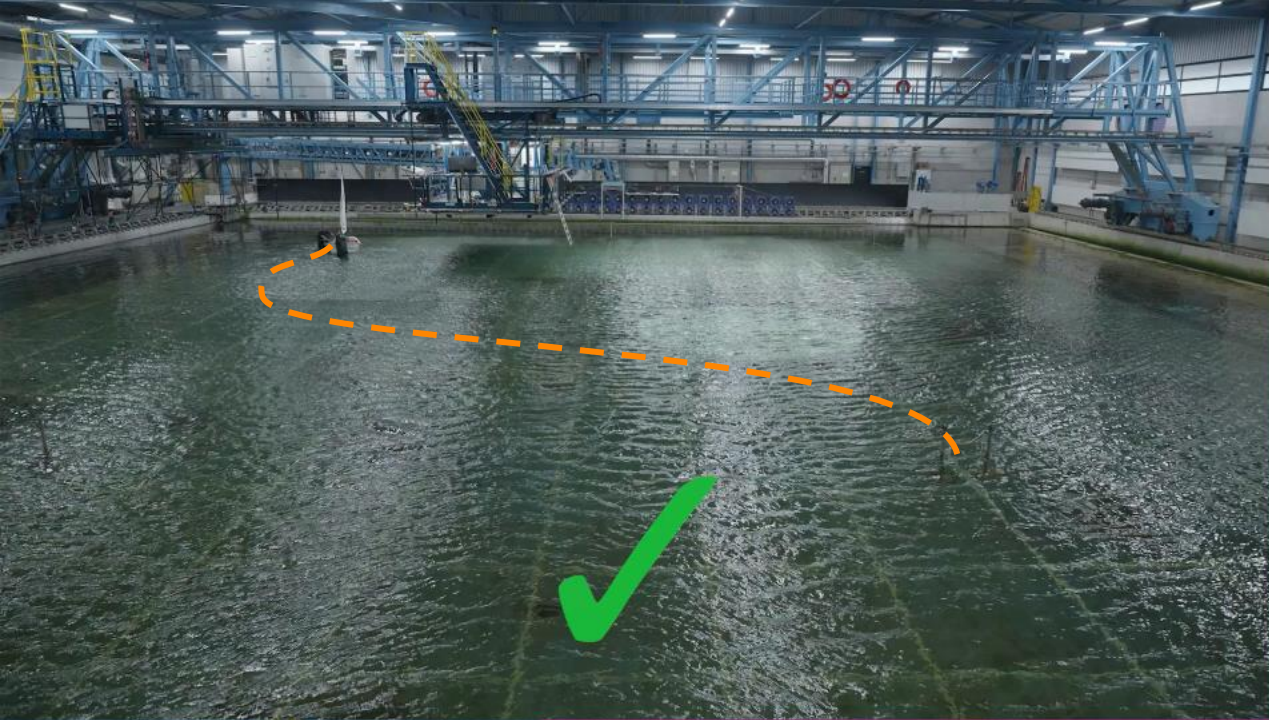


Stepping to real world



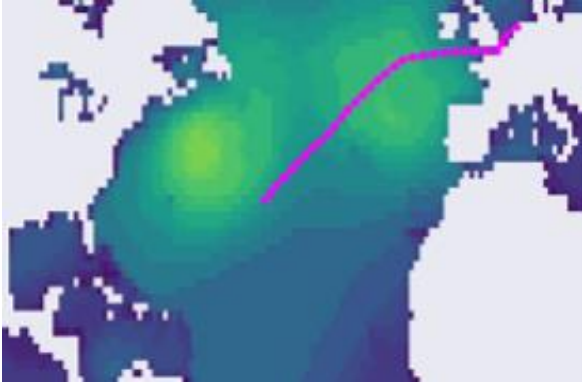
Improvement





Real applications

- Advice



- Assist

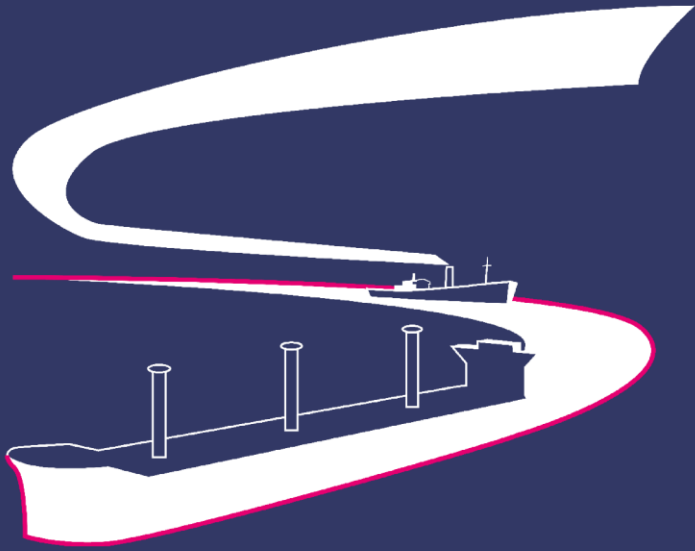


- Mimic



Thank you





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symposium

