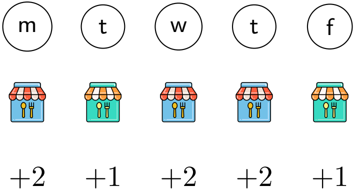
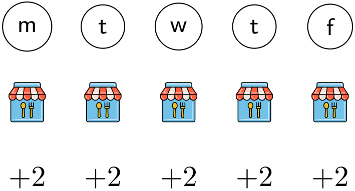
Exploration vs. exploitation

Real life example of greedy policy improvement issues



m	t	w	t	f
$+2$	$+1$	$+2$	$+2$	$+1$

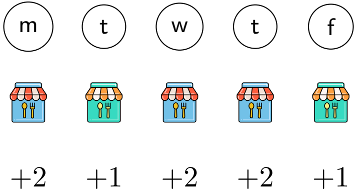
Figure: Week 1



m	t	w	t	f
$+2$	$+2$	$+2$	$+2$	$+2$

Figure: Week 2

Real life example of greedy policy improvement issues



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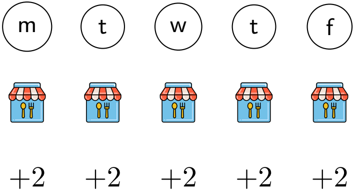
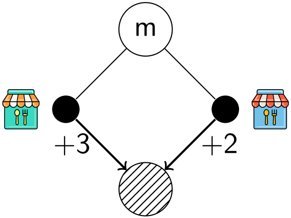


Figure: Week 2



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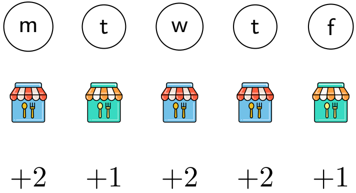

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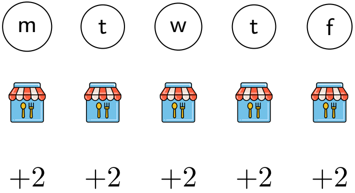


Figure: Week 2

- If random policy is too short, we don't see some state action pairs. We have no Q-value estimates for them.
  - $Q($ m , 🏪 $) = 3$

Real life example of greedy policy improvement issues

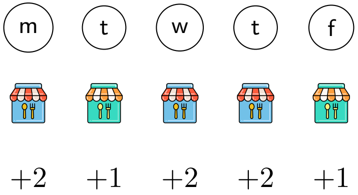
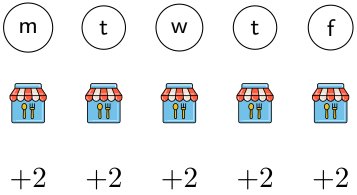


Figure: Week 1



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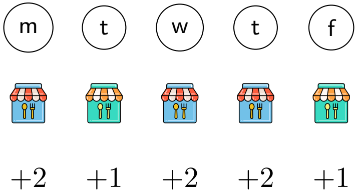

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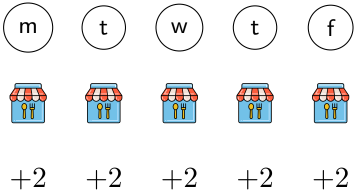

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- Greedy policy will never encounter this state-action pair
- Even worse at Q-value discovery!

Summary: Exploration vs. exploitation

Issues

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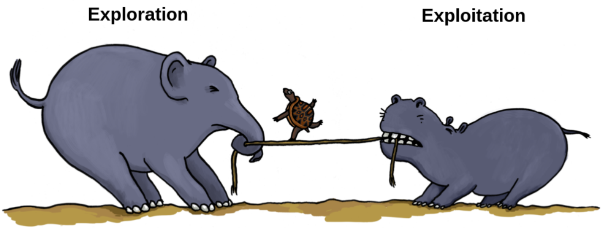

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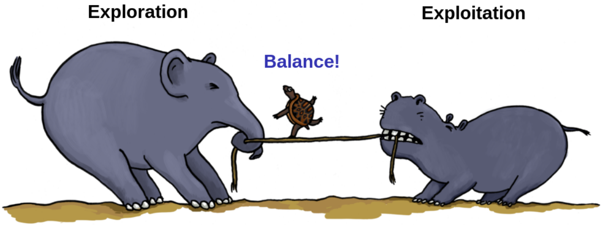

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Solution

- Need to balance exploration and exploitation in any RL problem
  - Greedy policy improvement is all exploitation and no exploration.
  - Next lesson: add an exploration component to greedy policy improvement.