Reinforcement Learning approach for decision-making in driver control shifting for semi-autonomous driving

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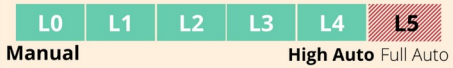
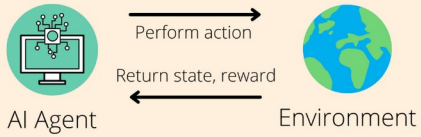
Background

MEDIATOR - bridging gap between manual & autonomous driving



Use case: Driver requests shift to manual/auto

Reinforcement Learning (RL): AI technique learning optimized policy in stochastic environments



Method

Hypothesis: RL approach is applicable & efficient to solve use case

1. Formulate environment as **MDP**

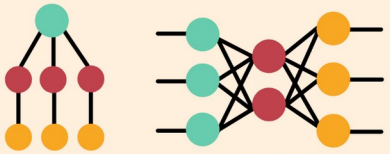
Driver wants to shift: L4

Suggest Shift Optimal (L3)

75%: Accept	20%: Reject	5%: No response
+0.1 reward	+0.1 reward	0 reward

2. Formulate route **simulation**

3. Apply **policies** on MDP



Output: MDP **actions**

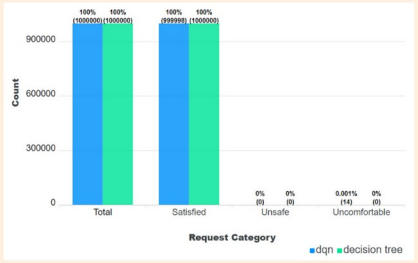
4. Evaluate results using **metrics** →

Results

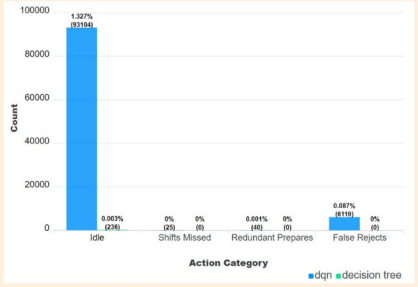
Request satisfaction times

	DQN	Tree
μ	4.52s	5s
σ	± 5.88s	± 6.19s

Request safety & comfort



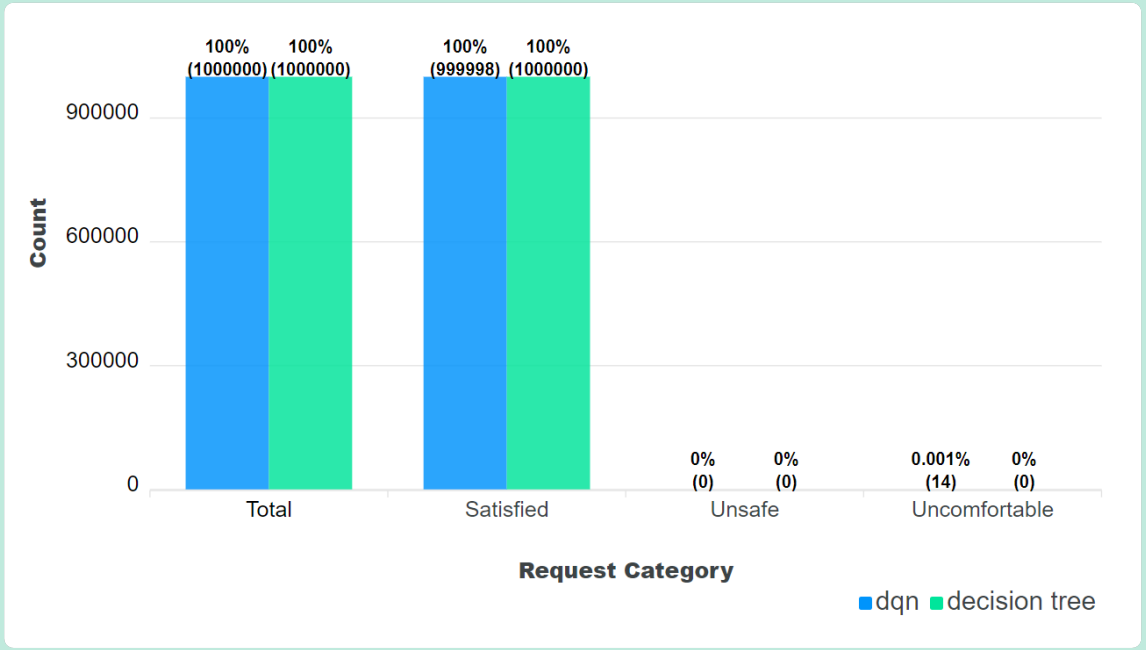
Outlier actions



Conclusion

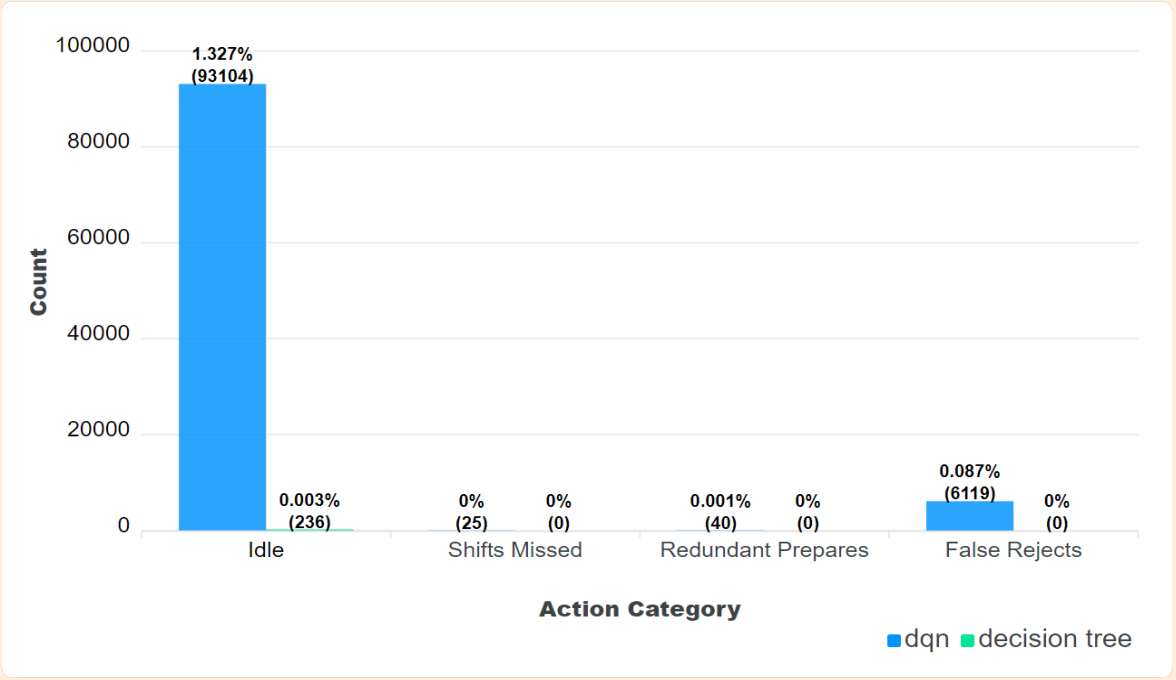
RL learns an applicable & efficient policy

- ✓ Safe & comfortable policy
- ✓ Efficient & fast operation
- ✗ Outlier issues in 0.09% cases
- ✗ Model not yet realistic



Request safety & comfort

Outlier actions



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