



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

TU Delft

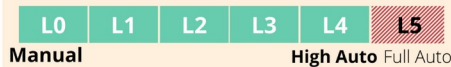
CSE3000 Research Project

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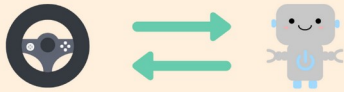
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Background

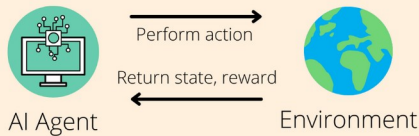
MEDIATOR - bridging gap between manual & autonomous driving



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

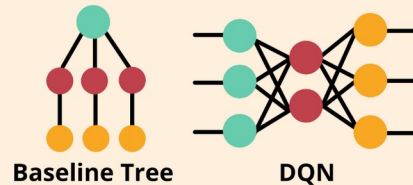


75%: Accept +0.1 reward 20%: Reject +0.1 reward 5%: No response 0 reward

2. Formulate route **simulation**



3. Apply **policies** on MDP



Output: MDP **actions**



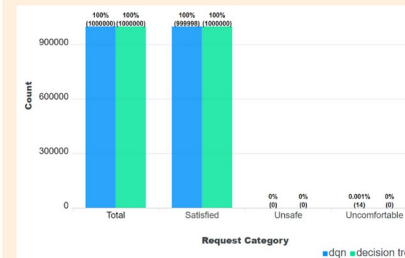
4. Evaluate results using **metrics** →

Results

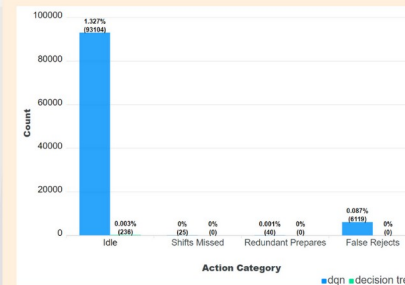
Request satisfaction times

	DQN	Tree
μ	4.52s	5s
σ	$\pm 5.88s$	$\pm 6.19s$

Request safety & comfort



Outlier actions

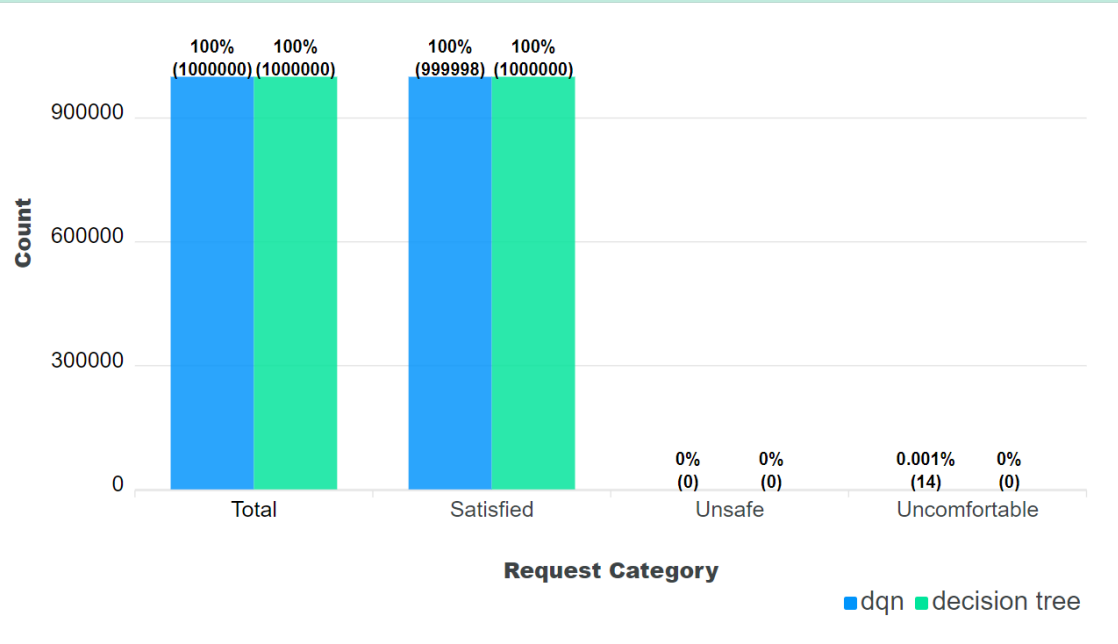


Conclusion



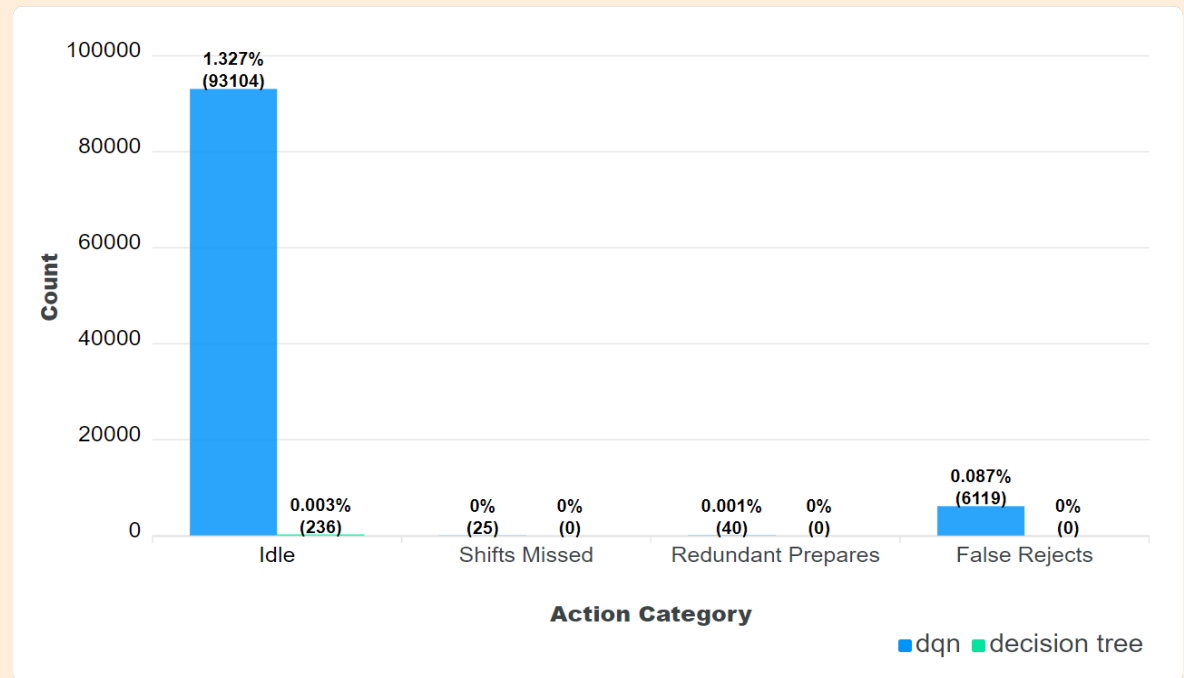
RL learns an applicable & efficient policy

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



Request safety & comfort

Outlier actions



References

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