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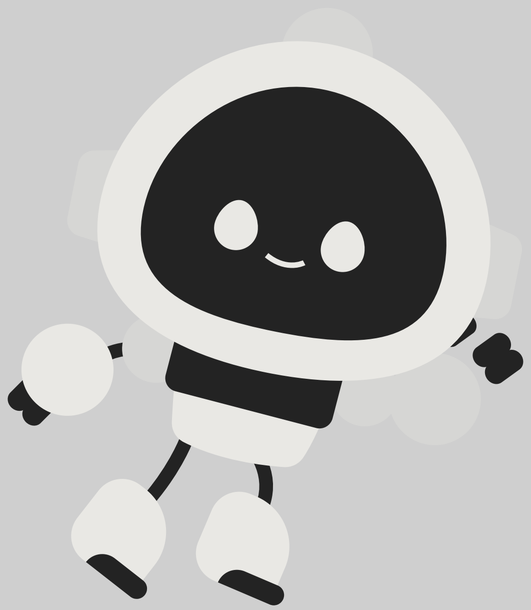
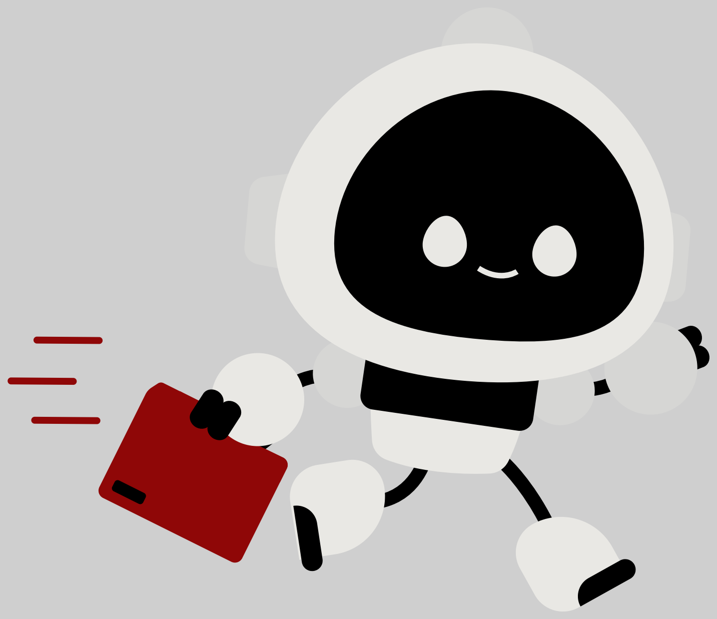
Artificial Intelligence Project

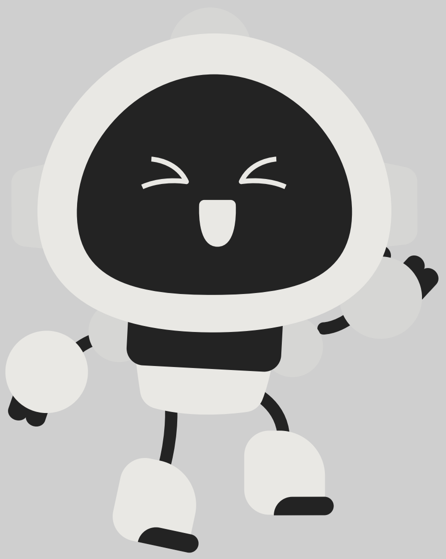
DYNAMIC MAZE



Sophie



Mher



Veronika

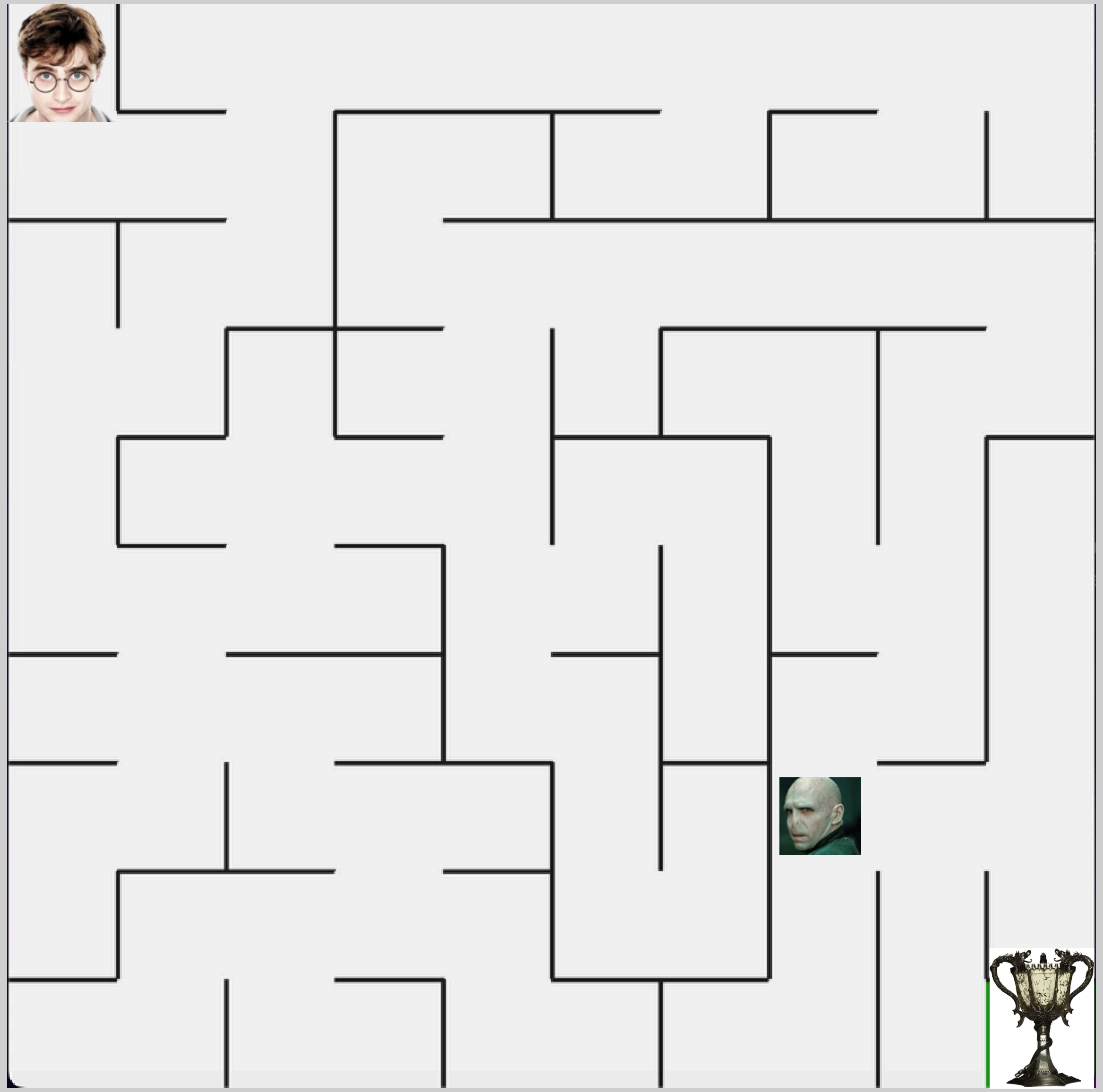
AGENDA

1. **Maze Game Presentation**
2. **Possible Approaches**
3. **Algorthms' Properties**
4. **Statistical Performance Analysis**
5. **Q&A Session**

Channeling Our inner Gryffindor to conquer this labyrinth

MAZE GAME PRESENTATION

Agent



Goal

1. Collection of cells, stored in a 10x10 grid
2. Fixed starting position of the agent and goal cell : (0,0) and (9,9) respectively
3. Inital positions of walls are random and visible to our agent
4. Unique path from one cell to another
5. At most 10 walls are randomly changed
6. Invisible Indicator changing the walls

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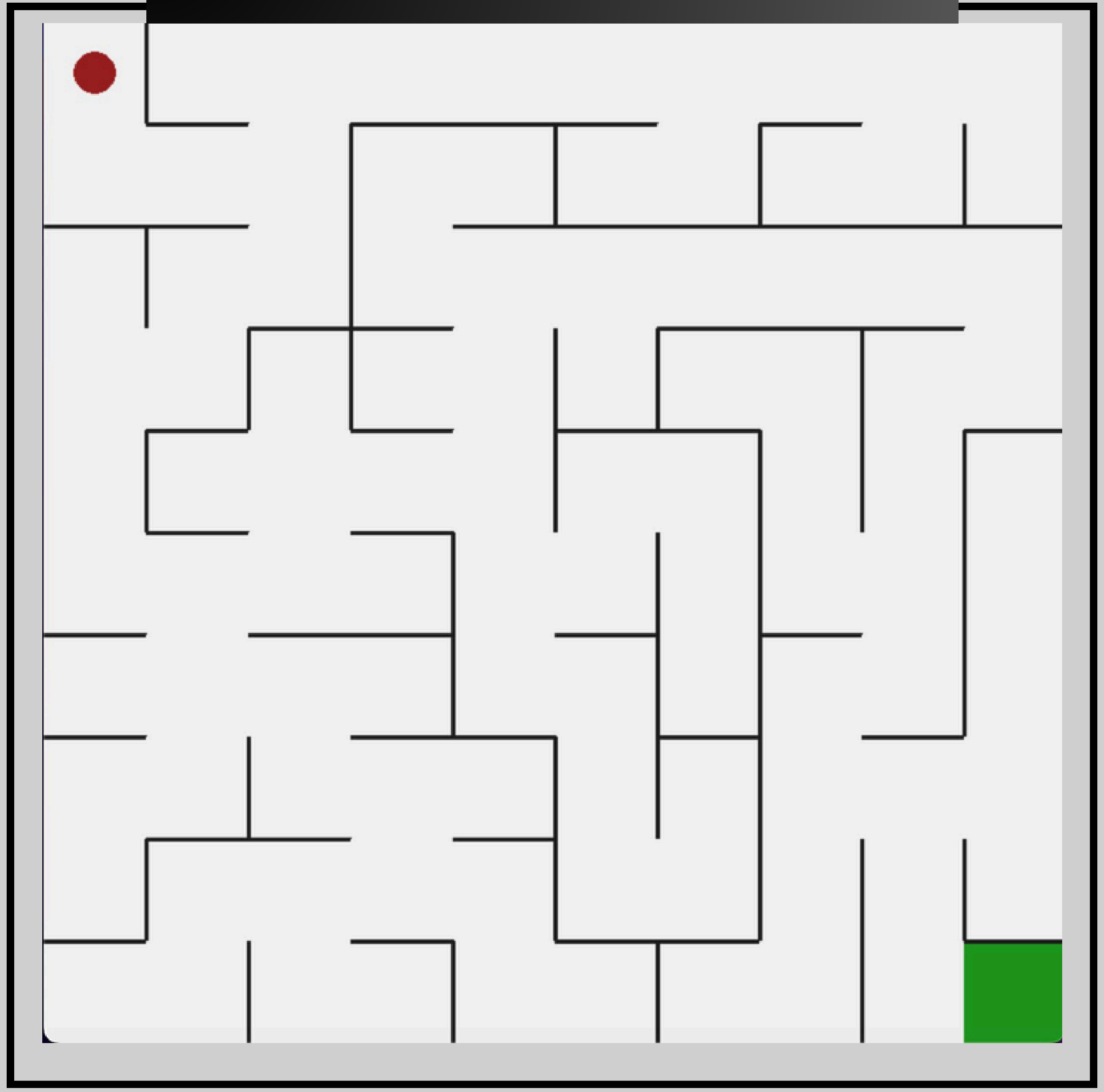
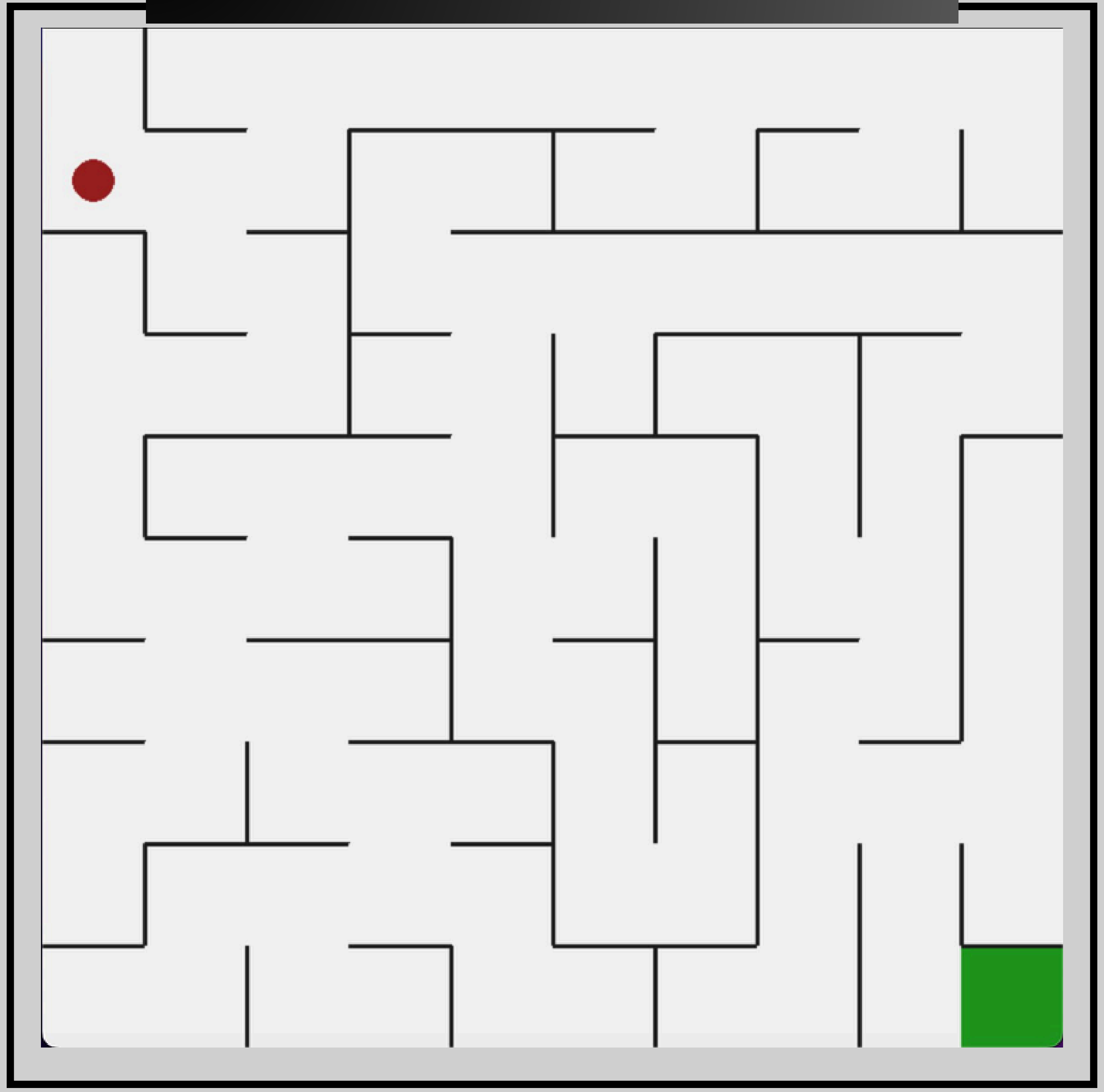
ENVIRONMENT

POSSIBLE INITIAL STATE



AFTER FIRST MOVE



Single-agent

Non-deterministic

Fully observable

Sequential

Agent-centric dynamic

Known

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POSSIBLE APPROACHES

01

Greedy Algorithm

- Uses Manhattan distance as heuristic
- Guaranteed solution
- Without time and space limit, eventually every wall will be changed

02

A*

- Uses Manhattan distance as heuristic
- Guaranteed solution
- Harry, after moving from one cell to another, each time calculates the optimal solution path

03

D* Lite

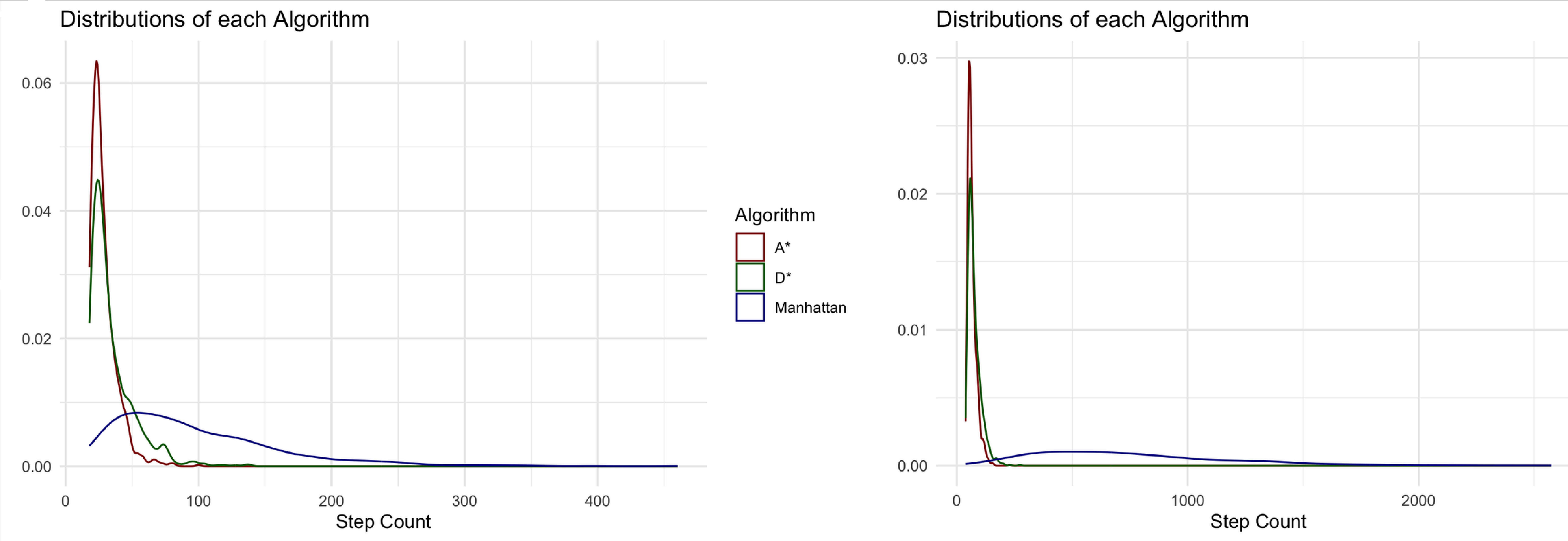
- Finds solution much faster from computational point of view
- Harry repeatedly determines the shortest paths between his current location and the goal node **ONLY** if the obstacle is on the found path

Optimal Solution

ALGORTHMS’ PROPERTIES

Algorithm	Handles Changes	Cost	Memory Usage	Optimality	Applicability
Greedy-Best-first	**No**	Low	Low	**No**	Success depends on the factor of randomness (how the maze is changed)
A* with Real-Time Updates	Yes	**High**	Moderate	Yes	Suitable for finding optimal paths in frequently changing large environments
D* Lite	Yes	Low	Low	Yes	A more efficient version of A*, suitable for dynamic maze environments where changes are frequent and regional

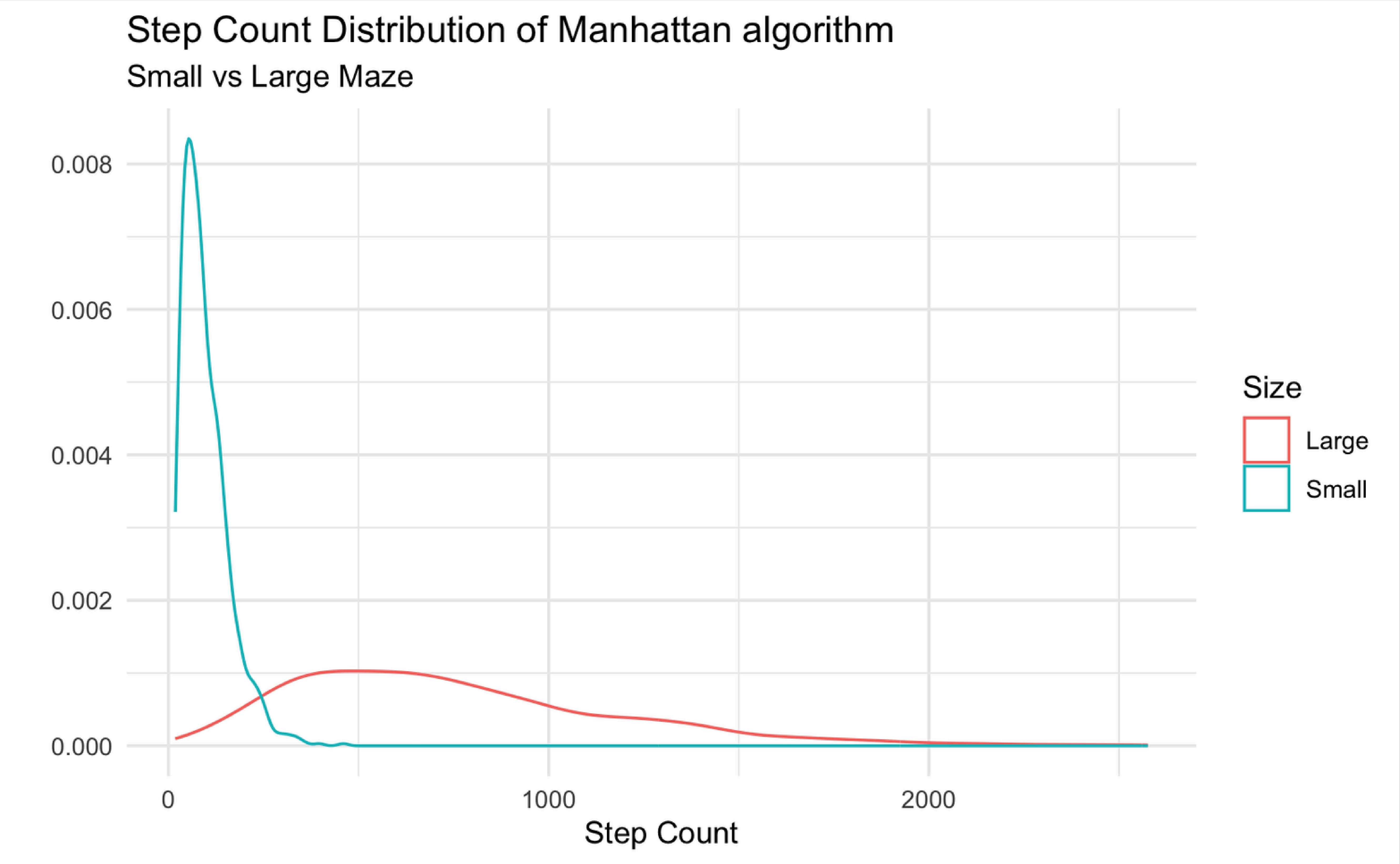
STATISTICAL PERFORMANCE ANALYSIS



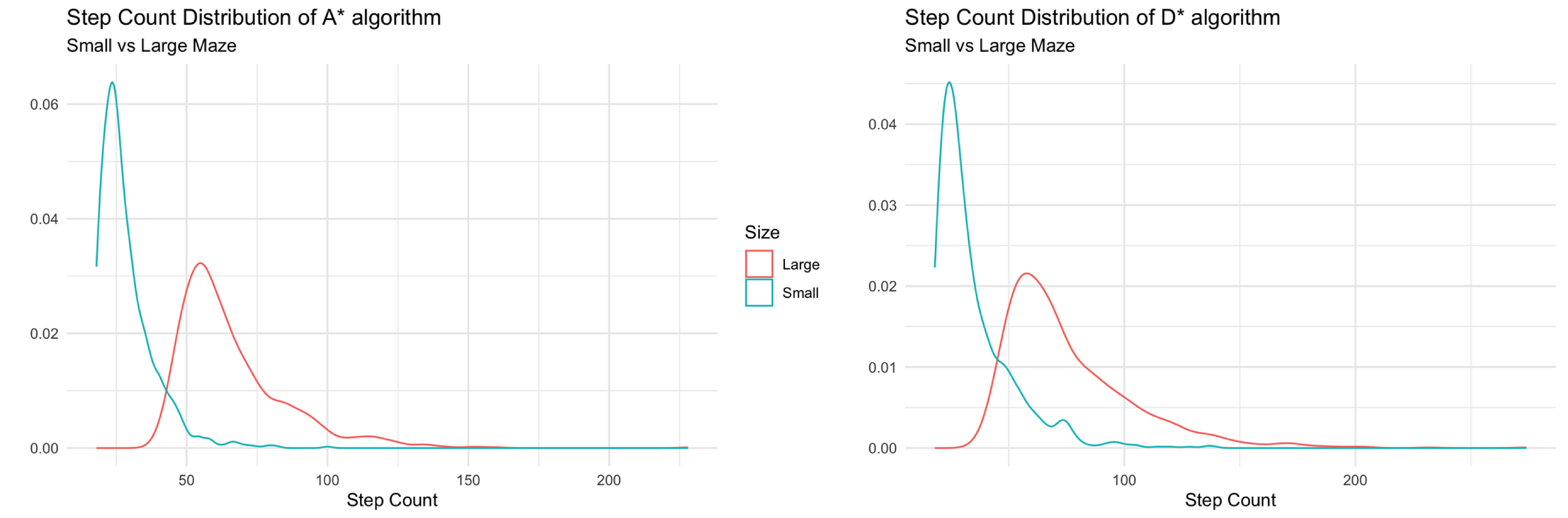
SMALL

LARGE

STATISTICAL PERFORMANCE ANALYSIS



STATISTICAL PERFORMANCE ANALYSIS



Step Count Distribution of A* algorithm
Small vs Large Maze

Step Count Distribution of D* algorithm
Small vs Large Maze

A*

D*

ALGORTHMS' PROPERTIES

Algorithm / Size	**Small**	**Large**
Greedy-Best-first	**96.6**	**752.3**
A* with Real-Time Updates	**28.7**	**66.1**
D* Lite	**34.7**	**76.1**

Q&A

Ask Us Anything—But Don't Expect O(1) Responses!

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THANK YOU

WE TOOK THE LONGEST PATH TO GET HERE, BUT WE MADE IT!