

# A\* Pathfinding in Dynamic Environments

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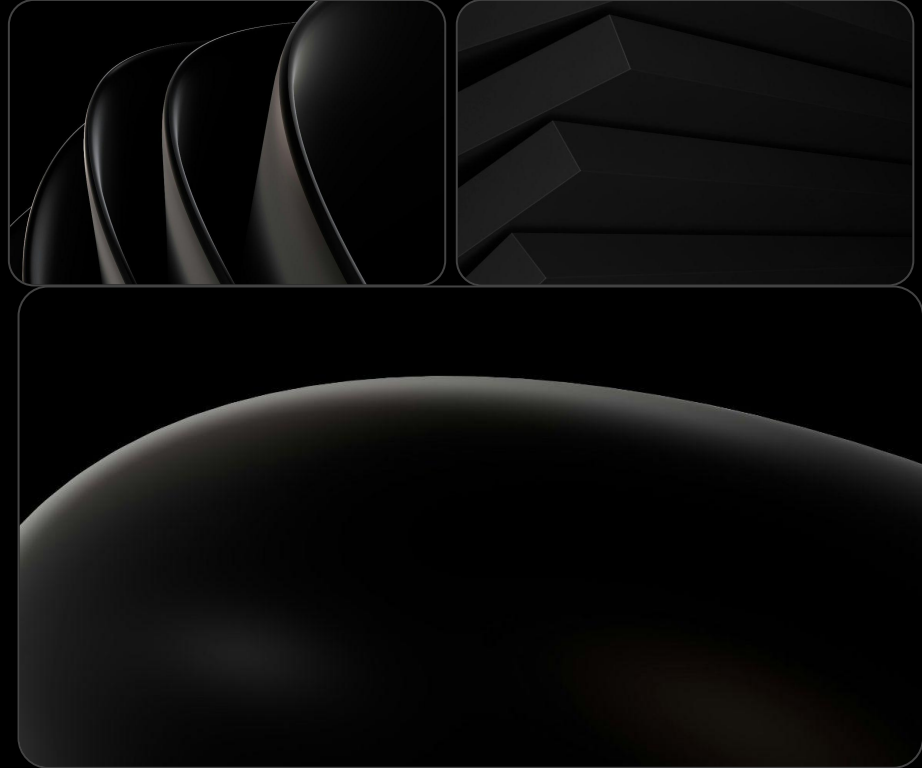


# pathfinding problem

## Problem Statement

Implement an AI agent that optimizes pathfinding in dynamic environments (e.g., urban traffic, warehouse robots) using informed heuristic search,  $A^*$ , or metaheuristic methods like genetic algorithms.

We choose  $A^*$  pathfinding in our dynamic environment



# We are fucked

1



Python for the A \* algorithm

2



Pygame for visualization

# Pseudocode for A\*

Initialize the frontier list

Initialize the visited list

Put starting source cell into frontier

While frontier list is not empty

- Get cell with smallest  $f$  value from frontier list and pop it off the list

- Get the cell's successors

- Add cell to visited list

- For each successor

  - If successor is goal, rebuild the list using cell's parent cell until source is reached and return the list

  - Otherwise

    - Compute  $g$  and  $h$  for successor then calculate  $f$

    - If successor cell is not in the frontier or it's  $f$  value is smaller than what already exists on the frontier, place cell on frontier

If path was not found

- Return empty path list

# Psuedo-code for constructing path

Start with current cell and empty path list

While not current cell is not source cell(source cell parent is itself):

- Append current cell to path list

- Get row and col of parent cell and make that the current cell

Append the source cell to empty path list

Reverse the list to get path from source to destination instead of destination to source

Return the path

# Implementation details

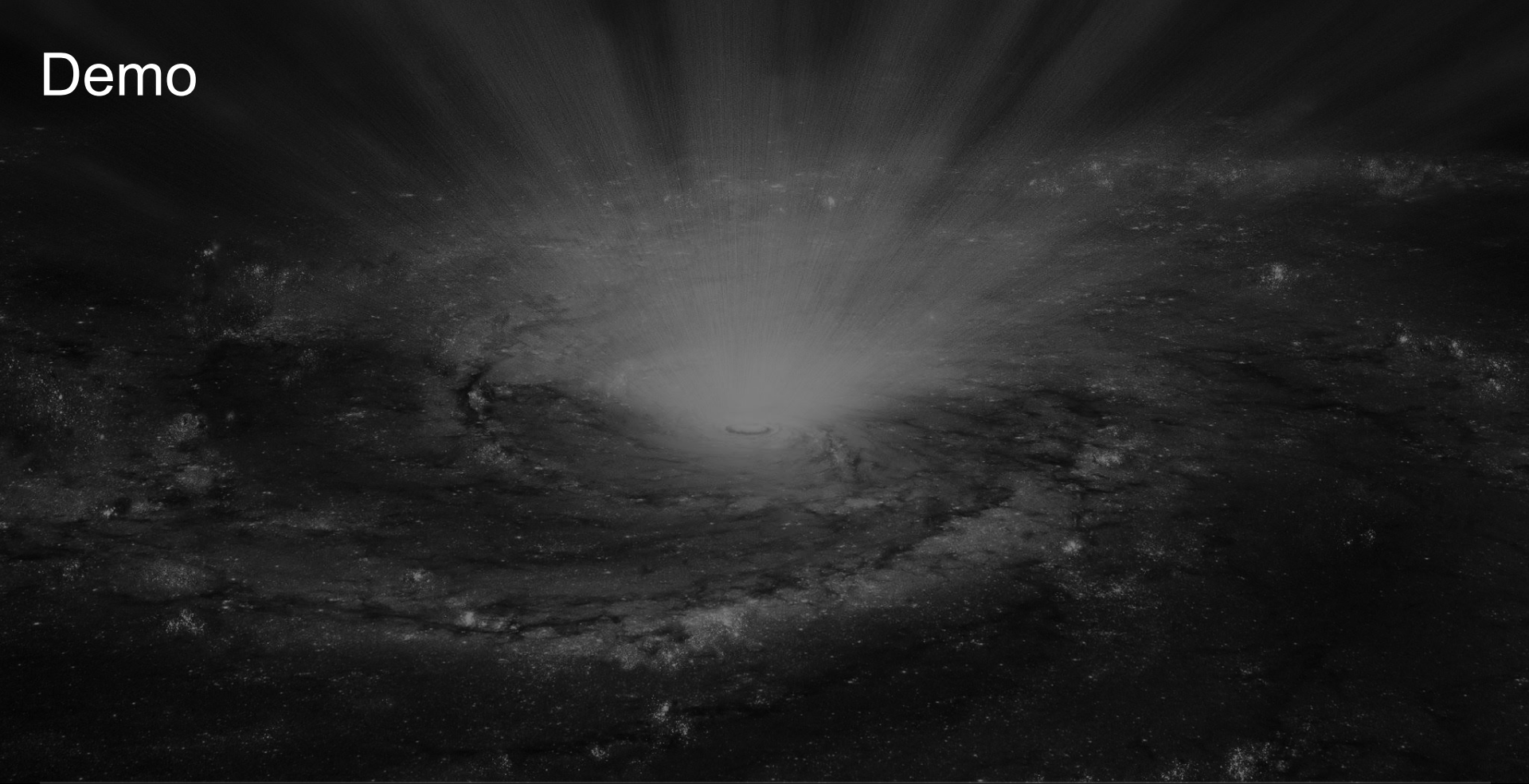
(open code and explain)

## Resources used for implementation

- <https://www.geeksforgeeks.org/a-search-algorithm-in-python/>
- <https://www.redblobgames.com/pathfinding/a-star/introduction.html>
- <https://www.pygame.org/docs/>
- <https://stackoverflow.com/questions/33963361/how-to-make-a-grid-in-pygame>
- <https://stackoverflow.com/questions/19117062/how-to-add-text-into-a-pygame-rectangle>
- <https://www.geeksforgeeks.org/a-search-algorithm-in-python/>
- <https://medium.com/@sabahat.usman.su/a-small-paint-program-1d6cb64f8da7>



# Demo





Thank you

Any Question