

CSA1733

## Assignment-1

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# The role of Heuristics in AI search for Amazon logistics.

## objective:

To understand how heuristic enhance the performance of AI search of algorithms in complex, real-time Amazon's logistic systems, and to critically evaluate both the benefits and limitations of heuristics in these scenarios.

## Scenario recap:

Amazon wants to develop an AI-driven system for predicting delivery delays. The system must make fast and accurate decisions in areas like delivery routing, warehouse robotics, and inventory management. Heuristic such plays a key role.

# Questions to Answers:

- a) Define what a heuristic is in the context of the AI.

  - \* Differentiate between heuristic and brute-force search.
  - \* Explain how heuristics help AI systems make faster decision in complex situations.

Ques. Define Deliverables:

  - Submit a short report (1000 - 1500 words) or presentation (8-10 slides) that answers all questions.
  - \* Clearly define key items.
  - It must demonstrate real-world applications by analyzing both advantages and disadvantages of the system.
  - \* It must show how data-driven improvements can refine heuristics.
  - \* It can be the demonstration of a real-world application.

Implement a simple A\* algorithm in Python for a grid-based map and simulate how changing the heuristic affects the efficiency and path chosen by the algorithm.

# The Overview

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To keep Amazon's logistics system must to make intelligent decisions in real time - from deciding which warehouse to ship from to predicting

the delivery delays and routing

Packages. AI system can't afford to evaluate every possibility.

exhaustives.

Westerly "Spoon-Long," 60° 00' 00" S. 90° 00' E.

960 (1097) ~~this~~ assignment expenses how

The heuristics help optimize the

the search algorithm and compare it

60. 62% performance on Amazon's logistics

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## TASK:

Define heuristics and explain their role in search algorithms for AI system such as Amazon's delivery prediction.

### \* Definition:

A heuristic is a strategy of approximation, that guides:

Problem-solving and decision-making in AI. It provides a cost estimate of how close a state is to the goal, helping to reduce the number of possibilities the system must evaluate

### \* Role of AI:

AI helps to find a good solution.

• Heuristics deduce computational complexity.

• They allow for "good-enough" solutions

when the optimal solution are either otherwise impractical.

• In Amazon's case, heuristic estimate delivery time, traffic impact, or warehouse processing time.

## \* Example:

- Estimating delivery delay based on:
  - Current traffic
  - Distance delay data
  - Historical delay data
  - Weather forecasts

## RISKS OF inaccurate heuristics

### TASKS:

Discuss potential risks associated with inaccurate heuristics in the real-world systems like the Amazon's logistics.

### content to include:

#### underestimation risks:

- leads to choosing paths that appears fast but actually slows down
- traffic heuristic assumes the clean roads, but there's a jam - delivery is late.

## Conclusion:

This assignment will help you to understand how heuristic-based AI search methods allow companies like Amazon to operate at scale, responding quickly and intelligently in complex environments.