AI Project Report

AI-Driven Dynamic Disaster Response System with Predictive Multi-Hazard Reasoning

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Module 1: Bayesian Module

Objective

This module calculates the probability of a disaster using Bayes' theorem. The dependency links are found out from real factors affecting a certain area e.g. flood can lead to road block and if a certain area is isolated then rescuing is difficult. The root nodes are the ones which occur naturally and thus have no ancestors or are specific to a certain area.It combines prior probability with sensor evidence from a CSV file.

Inputs Used in Code

- A CSV file (odisha_data.csv) containing real sensor values
- Likelihood values learned from the dataset
- A CSV (queries.csv) containing the queries for inferences represents target variables and given evidence variables

How It Works

1. The module loads data from the CSV file.
2. It calculates:
    - **P(sensor | disaster)**
    - **P(sensor | no disaster)**
3. It uses Bayes' formula to compute:
    - **Posterior probability of disaster**

Test Case in Code

The module runs bayesian_inference() directly when executed.
It prints the posterior probability based on the dataset and evidence.

```
'Water_Borne_Disease', "{'Flood': 'Yes', 'PopulationDensity': 'Dense',
'SanitationLevel': 'Poor'}"

'Delayed_Rescue', "{'Road_Blockage': 'No'}"

'Drainage', "{'Flood': 'Yes'}"
```

Output Produced by Code

A single numeric probability value, e.g.:

Calculated Probability of Disaster: 0.72

All outputs of the queries in the queries.csv file stored in the file `query_results.csv`

This value depends purely on the CSV data.

Output of query: `'Water_Borne_Disease', "{'Flood': 'Yes', 'PopulationDensity': 'Dense', 'SanitationLevel': 'Poor'}"`

Water_Borne_Disease	phi(Water_Borne_Disease)
Water_Borne_Disease(Moderate)	0.0067
Water_Borne_Disease(No)	0.0067
Water_Borne_Disease(Yes)	0.9866

Sample Sensor data (these are independent variables)

	Rainfall	SoilSaturation	RiverLevel	Drainage	InfrastructureAge	\
0	High	High	High	Poor	Old	
1	High	High	High	Poor	Old	
2	High	High	High	Poor	New	
3	Low	Low	Low	Efficient	New	
4	Moderate	Moderate	Moderate	Moderate	Old	

	PopulationDensity	WindSpeed	TransformerLoad	SanitationLevel	Flood	Landslide	\
0	Dense	High	High	Poor	Yes	Yes	
1	VeryDense	High	High	Poor	Yes	Yes	
2	Sparse	High	Moderate	Moderate	Yes	No	
3	Sparse	Low	Low	Good	No	No	
4	Dense	Moderate	Moderate	Poor	Yes	Moderate	

	Bridge_Collapse	Water_Borne_Disease	Power_Grid_Failure	Road_Blockage	\
0	Yes	Yes	Yes	Yes	
1	Moderate	Yes	Yes	Yes	
2	No	Moderate	Moderate	No	
3	No	No	No	No	
4	Moderate	Yes	Moderate	Moderate	

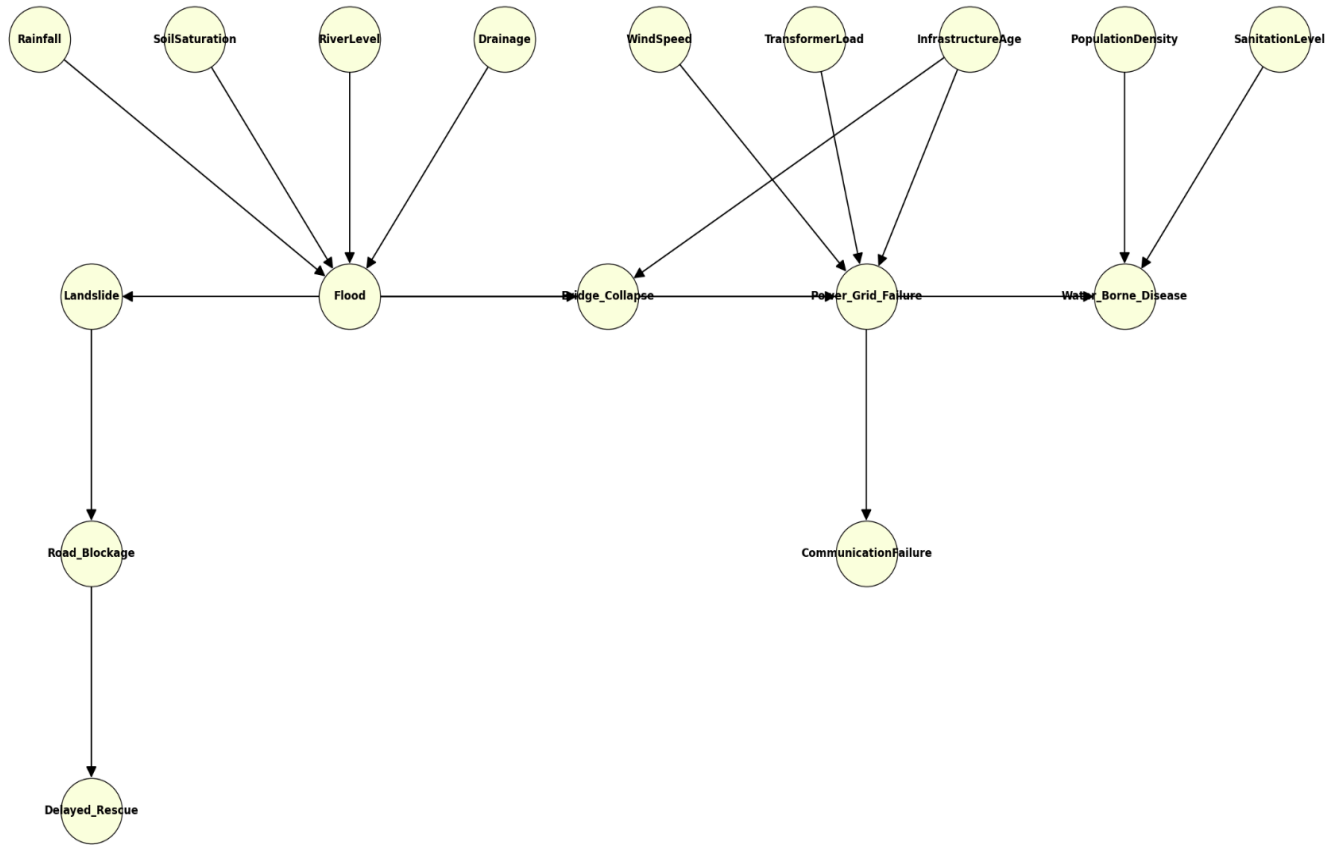
	Delayed_Rescue	CommunicationFailure
0	High	Yes
1	High	Yes
2	Low	Moderate
3	Low	No
4	Moderate	Moderate

Conditional Probability Table (for node Water_Borne_Disease conditioned on Flood, PopulationDensity, Sanitationlevel, like this, all nodes have CPTs)

Here lower three rows represent water_borne_disease variable, three possible value's probabilities and upper three row show the possible combinations of parent variables.

Flood	...	Flood(Yes)
PopulationDensity	...	PopulationDensity(VeryDense)
SanitationLevel	...	SanitationLevel(Poor)
Water_Borne_Disease(Moderate)	...	0.011904761904761904
Water_Borne_Disease(No)	...	0.011904761904761904
Water_Borne_Disease(Yes)	...	0.9761904761904763

Bayesian Network - showing conditional dependencies



Module 2: Search Module

Objective

This module performs an optimal path search using the best first search algorithm and the A* search algorithm. The path with the lowest risk will be taken into consideration and not the one which is shortest to prove its effectiveness in the long run.The initial nodes are the various flood prone areas and they are also assessed with respect to how easily they are flooded. The goal nodes are the nearby hospitals, schools and other government buildings which can be used as evacuation centers .The edges are the

paths between the areas and the nearby evacuation spot. When the risk score goes to infinity the path is considered closed.

Inputs Used in Code

- Fixed graph defined directly in the file
- The heuristic value used in the Search module is derived from the probabilities computed in the Bayesian Network module multiplied with euclidean distance.
- Hardcoded start node and goal node

How It Works

1. The graph is a dictionary mapping each node to its neighbors.
2. The A* algorithm uses:
    - g(n) → actual cost so far
    - h(n) → heuristic estimate (euclidean distance * risk score)
3. It returns the path with the lowest estimated total cost.

Test Case in Code

Start = "A"
 Goal = "G"

Output Produced by Code

Finding path from 'KIIT Square' to 'Lingaraj Temple'...

A* Algorithm Trace: From 'KIIT Square' to 'Lingaraj Temple'

Heuristic: euclidean_distance * goal's_risk_score

Goal (Lingaraj Temple) Risk Score: 0.10

Initial State:

  Start node: 'KIIT Square'

  Initial g-score: 0

Initial h-score: 0.01

Initial f-score: 0.01

Open Set: [(0, 1)]

--- Expanding node: 'KIIT Square' (ID: 1) ---

Popped with f-score: 0.00

(g-score: 0.00 + h-score: 0.01)

Checking neighbors:

-> Neighbor: 'Jaydev Vihar' (ID: 2)

Travel cost from current: 7.5

Tentative g-score: 7.50 (current_g: 0.00 + travel: 7.5)

* This is a better path to 'Jaydev Vihar'! (Old g-score: inf)

New g-score: 7.50

Heuristic (h): 0.01

New f-score (g+h): 7.51

Updating came_from and adding to open set.

-> Neighbor: 'Rasulgarh' (ID: 6)

Travel cost from current: 10.0

Tentative g-score: 10.00 (current_g: 0.00 + travel: 10.0)

* This is a better path to 'Rasulgarh'! (Old g-score: inf)

New g-score: 10.00

Heuristic (h): 0.01

New f-score (g+h): 10.01

Updating came_from and adding to open set.

```
  Current Open Set (f-score, ID): [(7.51, 2), (10.01, 6)]


--- Expanding node: 'Jaydev Vihar' (ID: 2) ---
  Popped with f-score: 7.51
  (g-score: 7.50 + h-score: 0.01)
  Checking neighbors:
    -> Neighbor: 'KIIT Square' (ID: 1)
       Travel cost from current: 7.5
       Tentative g-score: 15.00 (current_g: 7.50 + travel: 7.5)
      - Path not better (Current best g: 0.00 <= Tentative g: 15.00)
    -> Neighbor: 'Railway Station' (ID: 3)
       Travel cost from current: 4.0
       Tentative g-score: 11.50 (current_g: 7.50 + travel: 4.0)
      * This is a better path to 'Railway Station'! (Old g-score: inf)
        New g-score: 11.50
        Heuristic (h): 0.00
        New f-score (g+h): 11.50
        Updating came_from and adding to open set.
    -> Neighbor: 'Airport' (ID: 5)
       Travel cost from current: 6.0
       Tentative g-score: 13.50 (current_g: 7.50 + travel: 6.0)
      * This is a better path to 'Airport'! (Old g-score: inf)
        New g-score: 13.50
        Heuristic (h): 0.00
```

```
      New f-score (g+h): 13.50
      Updating came_from and adding to open set.
  Current Open Set (f-score, ID): [(10.01, 6), (11.5, 3), (13.5, 5)]


--- Expanding node: 'Rasulgarh' (ID: 6) ---
  Popped with f-score: 10.01
  (g-score: 10.00 + h-score: 0.01)
  Checking neighbors:
    -> Neighbor: 'KIIT Square' (ID: 1)
       Travel cost from current: 10.0
       Tentative g-score: 20.00 (current_g: 10.00 + travel: 10.0)
      - Path not better (Current best g: 0.00 <= Tentative g: 20.00)
    -> Neighbor: 'Railway Station' (ID: 3)
       Travel cost from current: 3.0
       Tentative g-score: 13.00 (current_g: 10.00 + travel: 3.0)
      - Path not better (Current best g: 11.50 <= Tentative g: 13.00)
    -> Neighbor: 'Lingaraj Temple' (ID: 4)
       Travel cost from current: 6.5
       Tentative g-score: 16.50 (current_g: 10.00 + travel: 6.5)
      * This is a better path to 'Lingaraj Temple'! (Old g-score: inf)
       New g-score: 16.50
       Heuristic (h): 0.00
       New f-score (g+h): 16.50
       Updating came_from and adding to open set.
```

```
  Current Open Set (f-score, ID): [(11.5, 3), (13.5, 5), (16.5, 4)]


--- Expanding node: 'Railway Station' (ID: 3) ---
  Popped with f-score: 11.50
  (g-score: 11.50 + h-score: 0.00)
  Checking neighbors:
    -> Neighbor: 'Jaydev Vihar' (ID: 2)
       Travel cost from current: 4.0
       Tentative g-score: 15.50 (current_g: 11.50 + travel: 4.0)
      - Path not better (Current best g: 7.50 <= Tentative g: 15.50)
    -> Neighbor: 'Lingaraj Temple' (ID: 4)
       Travel cost from current: 4.5
       Tentative g-score: 16.00 (current_g: 11.50 + travel: 4.5)
      * This is a better path to 'Lingaraj Temple'! (Old g-score: 16.50)
        New g-score: 16.00
        Heuristic (h): 0.00
        New f-score (g+h): 16.00
        Updating came_from and adding to open set.
    -> Neighbor: 'Rasulgarh' (ID: 6)
       Travel cost from current: 3.0
       Tentative g-score: 14.50 (current_g: 11.50 + travel: 3.0)
      - Path not better (Current best g: 10.00 <= Tentative g: 14.50)
  Current Open Set (f-score, ID): [(13.5, 5), (16.0, 4), (16.5, 4)]
```

--- Expanding node: 'Airport' (ID: 5) ---

Popped with f-score: 13.50

(g-score: 13.50 + h-score: 0.00)

Checking neighbors:

-> Neighbor: 'Jaydev Vihar' (ID: 2)

Travel cost from current: 6.0

Tentative g-score: 19.50 (current_g: 13.50 + travel: 6.0)

- Path not better (Current best g: 7.50 <= Tentative g: 19.50)

-> Neighbor: 'Lingaraj Temple' (ID: 4)

Travel cost from current: 3.5

Tentative g-score: 17.00 (current_g: 13.50 + travel: 3.5)

- Path not better (Current best g: 16.00 <= Tentative g: 17.00)

Current Open Set (f-score, ID): [(16.0, 4), (16.5, 4)]

--- Expanding node: 'Lingaraj Temple' (ID: 4) ---

Popped with f-score: 16.00

(g-score: 16.00 + h-score: 0.00)

Goal Reached!

Total cost (g-score): 16.00

Reconstructing path...

Final Path Found:

KIIT Square -> Jaydev Vihar -> Railway Station -> Lingaraj Temple

Module 3: GraphPlan Module

Objective

This module implements a simplified **GraphPlan-style planning structure**.

Inputs Used in Code

- A set of actions (hardcoded)
- Precondition rules
- Effect rules

The actions used and its precondition and effects are:

Action 1: Pre-DeployRescueTeam(Z1)

Preconditions:
• ForecastFlood(Z1)

Add Effects:
• RescueTeamPredeployed(Z1)

Action 2: PrepareShelterAndBoats(Z1,S2)

Preconditions:
• ForecastFlood(Z1)

Add Effects:
• ShelterOpen(S2)
• BoatsStaged(Z1)

Action 3: StockMedicalKitsInAdvance(S2,D1)

Preconditions:
• KitsAtDepot(D1)
• ShelterOpen(S2)

Add Effects:
• ShelterStocked(S2)

Action 4: ShiftRouteDueToBridgeRisk(R1,R2,B3)

Preconditions:
• BridgeAtRisk(B3)
• AltRouteClear(R2)

Add Effects:
• SafeRouteSelected(R2)

Action 5: EvacuateBeforeFlood(Z1,S2)

Preconditions:
• RescueTeamPredeployed(Z1)
• BoatsStaged(Z1)
• SafeRouteSelected(R2)
• ShelterStocked(S2)
• WeatherWindowOpen

Add Effects:
• EvacuatedTo(Z1,S2)

How It Works

1. It constructs:
    - Proposition (state) layers
    - Action layers
2. It expands layers until the goal propositions appear.
3. It extracts a simple valid plan.

Test Case in Code

start= {“AltRootClear”,”BridgeAtRisk”,”KitsAtDepot”,”ForecastFlood”,”WeatherWindowOpen”}

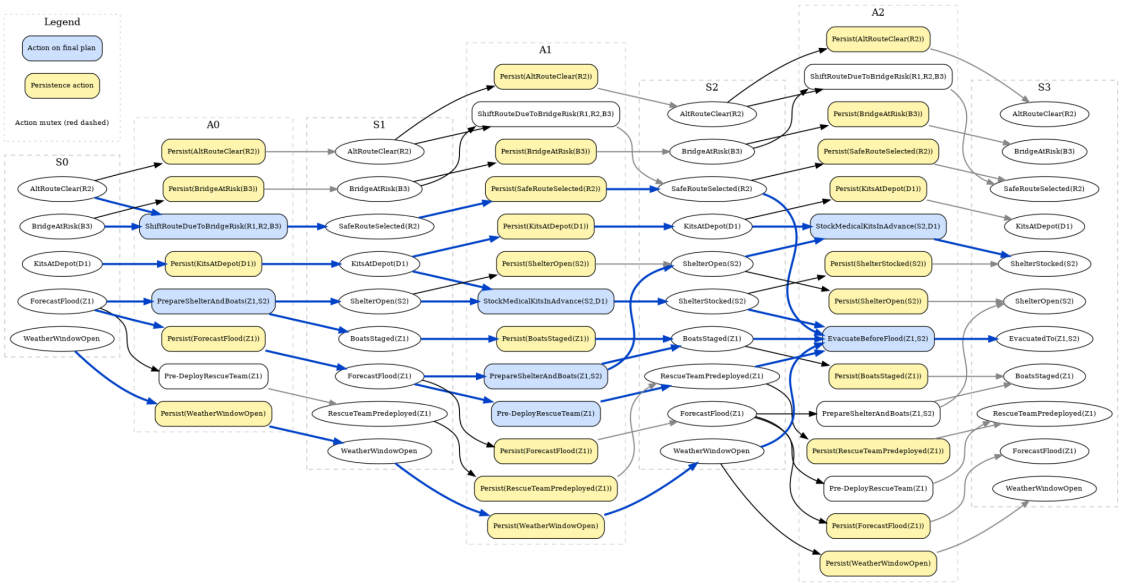
Goal = {"EvacuatedTo", “ShelterStocked”}

Output Produced

The code prints:

Plan: ['TriggerAlarm', 'GuidePeople']

It also exports a .dot file (graphplan_output.dot) showing the planning graph.



Module: POP – Partial Order Planning Module

Objective

Implements a simplified Partial-Order Planner (POP) for a flood-preparedness domain using actions, causal links, and ordering constraints, and generates all valid linear plans plus a visualization.

Inputs Used in Code

Probabilistic conditions from the Bayesian network module, these are threshold-based conditions used in preconditions.

P_flood=0.55

P_infra=0.8

Initial state

Goal states (rescue, communication, medical)

Actions with preconditions & effects

Causal links (supports relationships)

Precedence links (ordering to avoid conflicts)

How It Works

1. Builds the planning domain: initial facts, actions, goals.

2. Constructs causal and precedence links to form a POP graph.

3. Creates a Graphviz visualization with team-based clusters.

4. Converts POP constraints into a directed graph and computes all valid linearizations via topological sorting.

Test Case in Code

Domain goal set includes:

People safe (rescue)

Communication backup operational

Medical supplies ready

POP generates every sequence that satisfies all of these.

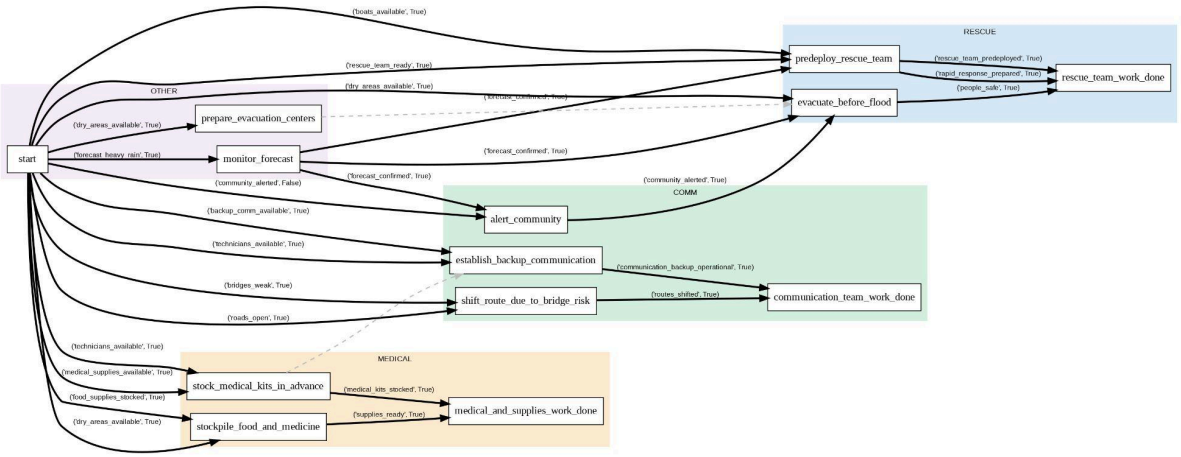
Output Produced

Total valid linear plans: 43,881

Prints the first few valid plans

Exports POP visualization as:

flood_POP_graph_better.png and .pdf




```
One valid linearization:
  1. start
  2. monitor_forecast
  3. shift_route_due_to_bridge_risk
  4. stock_medical_kits_in_advance
  5. stockpile_food_and_medicine
  6. predeploy_rescue_team
  7. alert_community
  8. establish_backup_communication
  9. medical_and_supplies_work_done
  10. evacuate_before_flood
  11. communication_team_work_done
  12. rescue_team_work_done
===============
```

Module 4: Reinforcement Learning Module

Objective

This module trains a Q-learning agent that learns optimal emergency actions.

Inputs Used in Code

- Q-table loaded from qtable.csv if available
- State list: hardcoded
- Action list: hardcoded
- Learning rate and discount factor

How It Works

1. Initializes or loads a Q-table.
2. Simulates episodes where the agent:
    - Observes the state
    - Chooses an action
    - Receives a reward
    - Updates Q-values
3. Saves the updated Q-table to qtable.csv.

Test Case in Code

When run directly, it trains for a fixed number of episodes.

Output Produced:

```
Solving MDP with 400 states...
Iteration  | Max Change
----------------------------
5          | 4.97586
10         | 2.48589
15         | 1.43433
20         | 0.81558
25         | 0.46269
30         | 0.26242
35         | 0.14883
40         | 0.08441
45         | 0.04787
50         | 0.02715
55         | 0.01549
60         | 0.00893
65         | 0.00515
70         | 0.00297
75         | 0.00171
80         | 0.00098

Converged in 80 iterations.

--- OPTIMAL MDP POLICY (Selected Examples) ---
State Description                       | Best Action
-----------------------------------------------------------------
H:0/9, Res:9/9, Stat:NoDmg              | DelayAndObserve
H:2/9, Res:9/9, Stat:NoDmg              | DelayAndObserve
H:4/9, Res:9/9, Stat:Threat             | PreemptiveRelocation
H:5/9, Res:5/9, Stat:Threat             | PreemptiveRelocation
H:8/9, Res:9/9, Stat:Threat             | PreemptiveRelocation
H:8/9, Res:2/9, Stat:Impact             | ImmediateEvacuation
H:9/9, Res:1/9, Stat:Impact             | ImmediateEvacuation
```

QLearning Output:

Training on dataset for 50 epochs...

Epoch 0 | Avg Q-Change: 4.0819

Epoch 1 | Avg Q-Change: 3.6096

Epoch 2 | Avg Q-Change: 3.2087

Epoch 3 | Avg Q-Change: 2.8651

Epoch 4 | Avg Q-Change: 2.5702

Epoch 5 | Avg Q-Change: 2.3132

Epoch 6 | Avg Q-Change: 2.0843

Epoch 7 | Avg Q-Change: 1.8802

Epoch 8 | Avg Q-Change: 1.6981

Epoch 9 | Avg Q-Change: 1.5355

Epoch 10 | Avg Q-Change: 1.3906

Epoch 11 | Avg Q-Change: 1.2608

Epoch 12 | Avg Q-Change: 1.1449

Epoch 13 | Avg Q-Change: 1.0411

Epoch 14 | Avg Q-Change: 0.9481

Epoch 15 | Avg Q-Change: 0.8649

Epoch 16 | Avg Q-Change: 0.7904

Epoch 17 | Avg Q-Change: 0.7234

Epoch 18 | Avg Q-Change: 0.6632

Epoch 19 | Avg Q-Change: 0.6088

Epoch 20 | Avg Q-Change: 0.5599

Epoch 21 | Avg Q-Change: 0.5157

Epoch 22 | Avg Q-Change: 0.4759

Epoch 23 | Avg Q-Change: 0.4400

Epoch 24 | Avg Q-Change: 0.4075

Epoch 25 | Avg Q-Change: 0.3782

Epoch 26 | Avg Q-Change: 0.3517

Epoch 27 | Avg Q-Change: 0.3277

Epoch 28 | Avg Q-Change: 0.3061

Epoch 29 | Avg Q-Change: 0.2865

Epoch 30 | Avg Q-Change: 0.2689

Epoch 31 | Avg Q-Change: 0.2530

Epoch 32 | Avg Q-Change: 0.2386

Epoch 33 | Avg Q-Change: 0.2255

Epoch 34 | Avg Q-Change: 0.2136

Epoch 35 | Avg Q-Change: 0.2029

Epoch 36 | Avg Q-Change: 0.1931

Epoch 37 | Avg Q-Change: 0.1842

Epoch 38 | Avg Q-Change: 0.1762

Epoch 39 | Avg Q-Change: 0.1689

Epoch 40 | Avg Q-Change: 0.1622

Epoch 41 | Avg Q-Change: 0.1562

Epoch 42 | Avg Q-Change: 0.1507

Epoch 43 | Avg Q-Change: 0.1457

Epoch 44 | Avg Q-Change: 0.1412

Epoch 45 | Avg Q-Change: 0.1371

Epoch 46 | Avg Q-Change: 0.1333

Epoch 47 | Avg Q-Change: 0.1299

Epoch 48 | Avg Q-Change: 0.1267

Epoch 49 | Avg Q-Change: 0.1239

--- COMPLETE OPTIMAL POLICY (All 400 States) ---

State Description | Best Action

H:0 R:0 S:NoDmg | ImmediateEvacuation

H:0 R:0 S:Threat | ImmediateEvacuation

H:0 R:0 S:Impact | ImmediateEvacuation

H:0 R:0 S:Evac | (Already Safe)

H:0 R:1 S:NoDmg | ImmediateEvacuation

H:0 R:1 S:Threat | ImmediateEvacuation

H:0 R:1 S:Impact | ImmediateEvacuation

H:0 R:1 S:Evac | (Already Safe)

H:0 R:2 S:NoDmg | ImmediateEvacuation

H:0 R:2 S:Threat | ImmediateEvacuation

H:0 R:2 S:Impact | ImmediateEvacuation

H:0 R:2 S:Evac | (Already Safe)

H:0 R:3 S:NoDmg | ImmediateEvacuation

H:0 R:3 S:Threat | DelayAndObserve

H:0 R:3 S:Impact | ImmediateEvacuation

H:0 R:3 S:Evac | (Already Safe)

H:0 R:4 S:NoDmg | ImmediateEvacuation

H:0 R:4 S:Threat | ImmediateEvacuation

H:0 R:4 S:Impact | ImmediateEvacuation

H:0 R:4 S:Evac | (Already Safe)

H:0 R:5 S:NoDmg | ImmediateEvacuation

H:0 R:5 S:Threat | ImmediateEvacuation

H:0 R:5 S:Impact | DelayAndObserve

H:0 R:5 S:Evac | (Already Safe)

H:0 R:6 S:NoDmg | ImmediateEvacuation

H:0 R:6 S:Threat | DelayAndObserve

H:0 R:6 S:Impact | DelayAndObserve

H:0 R:6 S:Evac | (Already Safe)

H:0 R:7 S:NoDmg | ImmediateEvacuation

H:0 R:7 S:Threat | ImmediateEvacuation

H:0 R:7 S:Impact | ImmediateEvacuation

H:0 R:7 S:Evac | (Already Safe)

H:0 R:8 S:NoDmg | ImmediateEvacuation

H:0 R:8 S:Threat | ImmediateEvacuation

H:0 R:8 S:Impact | ImmediateEvacuation

H:0 R:8 S:Evac | (Already Safe)

H:0 R:9 S:NoDmg | DelayAndObserve

H:0 R:9 S:Threat | ImmediateEvacuation

H:0 R:9 S:Impact | ImmediateEvacuation

H:0 R:9 S:Evac | (Already Safe)

H:1 R:0 S:NoDmg | ImmediateEvacuation

H:1 R:0 S:Threat | ImmediateEvacuation

H:1 R:0 S:Impact | ImmediateEvacuation

H:1 R:0 S:Evac | (Already Safe)

H:1 R:1 S:NoDmg | ImmediateEvacuation

H:1 R:1 S:Threat | ImmediateEvacuation

H:1 R:1 S:Impact | ImmediateEvacuation

H:1 R:1 S:Evac | (Already Safe)

H:1 R:2 S:NoDmg | ImmediateEvacuation

H:1 R:2 S:Threat | ImmediateEvacuation

H:1 R:2 S:Impact | ImmediateEvacuation

H:1 R:2 S:Evac | (Already Safe)

H:1 R:3 S:NoDmg | ImmediateEvacuation

H:1 R:3 S:Threat | DelayAndObserve

H:1 R:3 S:Impact | ImmediateEvacuation

H:1 R:3 S:Evac | (Already Safe)

H:1 R:4 S:NoDmg | ImmediateEvacuation

H:1 R:4 S:Threat | ImmediateEvacuation

H:1 R:4 S:Impact | ImmediateEvacuation

H:1 R:4 S:Evac | (Already Safe)

H:1 R:5 S:NoDmg | ImmediateEvacuation

H:1 R:5 S:Threat | ImmediateEvacuation

H:1 R:5 S:Impact | ImmediateEvacuation

H:1 R:5 S:Evac | (Already Safe)

H:1 R:6 S:NoDmg | DelayAndObserve

H:1 R:6 S:Threat | ImmediateEvacuation

H:1 R:6 S:Impact | DelayAndObserve

H:1 R:6 S:Evac | (Already Safe)

H:1 R:7 S:NoDmg | DelayAndObserve

H:1 R:7 S:Threat | ImmediateEvacuation

H:1 R:7 S:Impact | DelayAndObserve

H:1 R:7 S:Evac | (Already Safe)

H:1 R:8 S:NoDmg | DelayAndObserve

H:1 R:8 S:Threat | ImmediateEvacuation

H:1 R:8 S:Impact | ImmediateEvacuation

H:1 R:8 S:Evac | (Already Safe)

H:1 R:9 S:NoDmg | DelayAndObserve

H:1 R:9 S:Threat | DelayAndObserve

H:1 R:9 S:Impact | ImmediateEvacuation

H:1 R:9 S:Evac | (Already Safe)

H:2 R:0 S:NoDmg | ImmediateEvacuation

H:2 R:0 S:Threat | ImmediateEvacuation

H:2 R:0 S:Impact | ImmediateEvacuation

H:2 R:0 S:Evac | (Already Safe)

H:2 R:1 S:NoDmg | ImmediateEvacuation

H:2 R:1 S:Threat | ImmediateEvacuation

H:2 R:1 S:Impact | DelayAndObserve

H:2 R:1 S:Evac | (Already Safe)

H:2 R:2 S:NoDmg | ImmediateEvacuation

H:2 R:2 S:Threat | ImmediateEvacuation

H:2 R:2 S:Impact | ImmediateEvacuation

H:2 R:2 S:Evac | (Already Safe)

H:2 R:3 S:NoDmg | ImmediateEvacuation

H:2 R:3 S:Threat | ImmediateEvacuation

H:2 R:3 S:Impact | ImmediateEvacuation

H:2 R:3 S:Evac | (Already Safe)

H:2 R:4 S:NoDmg | ImmediateEvacuation

H:2 R:4 S:Threat | DelayAndObserve

H:2 R:4 S:Impact | DelayAndObserve

H:2 R:4 S:Evac | (Already Safe)

H:2 R:5 S:NoDmg | ImmediateEvacuation

H:2 R:5 S:Threat | ImmediateEvacuation

H:2 R:5 S:Impact | ImmediateEvacuation

H:2 R:5 S:Evac | (Already Safe)

H:2 R:6 S:NoDmg | ImmediateEvacuation

H:2 R:6 S:Threat | DelayAndObserve

H:2 R:6 S:Impact | ImmediateEvacuation

H:2 R:6 S:Evac | (Already Safe)

H:2 R:7 S:NoDmg | DelayAndObserve

H:2 R:7 S:Threat | ImmediateEvacuation

H:2 R:7 S:Impact | ImmediateEvacuation

H:2 R:7 S:Evac | (Already Safe)

H:2 R:8 S:NoDmg | ImmediateEvacuation

H:2 R:8 S:Threat | DelayAndObserve

H:2 R:8 S:Impact | ImmediateEvacuation

H:2 R:8 S:Evac | (Already Safe)

H:2 R:9 S:NoDmg | DelayAndObserve

H:2 R:9 S:Threat | ImmediateEvacuation

H:2 R:9 S:Impact | ImmediateEvacuation

H:2 R:9 S:Evac | (Already Safe)

H:3 R:0 S:NoDmg | ImmediateEvacuation

H:3 R:0 S:Threat | ImmediateEvacuation

H:3 R:0 S:Impact | DelayAndObserve

H:3 R:0 S:Evac | (Already Safe)

H:3 R:1 S:NoDmg | ImmediateEvacuation

H:3 R:1 S:Threat | ImmediateEvacuation

H:3 R:1 S:Impact | ImmediateEvacuation

H:3 R:1 S:Evac | (Already Safe)

H:3 R:2 S:NoDmg | DelayAndObserve

H:3 R:2 S:Threat | ImmediateEvacuation

H:3 R:2 S:Impact | ImmediateEvacuation

H:3 R:2 S:Evac | (Already Safe)

H:3 R:3 S:NoDmg | ImmediateEvacuation

H:3 R:3 S:Threat | ImmediateEvacuation

H:3 R:3 S:Impact | ImmediateEvacuation

H:3 R:3 S:Evac | (Already Safe)

H:3 R:4 S:NoDmg | PreemptiveRelocation

H:3 R:4 S:Threat | ImmediateEvacuation

H:3 R:4 S:Impact | ImmediateEvacuation

H:3 R:4 S:Evac | (Already Safe)

H:3 R:5 S:NoDmg | ImmediateEvacuation

H:3 R:5 S:Threat | ImmediateEvacuation

H:3 R:5 S:Impact | ImmediateEvacuation

H:3 R:5 S:Evac | (Already Safe)

H:3 R:6 S:NoDmg | ImmediateEvacuation

H:3 R:6 S:Threat | ImmediateEvacuation

H:3 R:6 S:Impact | SendDroneFirst

H:3 R:6 S:Evac | (Already Safe)

H:3 R:7 S:NoDmg | PreemptiveRelocation

H:3 R:7 S:Threat | ImmediateEvacuation

H:3 R:7 S:Impact | SendDroneFirst

H:3 R:7 S:Evac | (Already Safe)

H:3 R:8 S:NoDmg | ImmediateEvacuation

H:3 R:8 S:Threat | ImmediateEvacuation

H:3 R:8 S:Impact | ImmediateEvacuation

H:3 R:8 S:Evac | (Already Safe)

H:3 R:9 S:NoDmg | ImmediateEvacuation

H:3 R:9 S:Threat | ImmediateEvacuation

H:3 R:9 S:Impact | ImmediateEvacuation

H:3 R:9 S:Evac | (Already Safe)

H:4 R:0 S:NoDmg | DelayAndObserve

H:4 R:0 S:Threat | ImmediateEvacuation

H:4 R:0 S:Impact | DelayAndObserve

H:4 R:0 S:Evac | (Already Safe)

H:4 R:1 S:NoDmg | ImmediateEvacuation

H:4 R:1 S:Threat | ImmediateEvacuation

H:4 R:1 S:Impact | ImmediateEvacuation

H:4 R:1 S:Evac | (Already Safe)

H:4 R:2 S:NoDmg | ImmediateEvacuation

H:4 R:2 S:Threat | ImmediateEvacuation

H:4 R:2 S:Impact | ImmediateEvacuation

H:4 R:2 S:Evac | (Already Safe)

H:4 R:3 S:NoDmg | ImmediateEvacuation

H:4 R:3 S:Threat | ImmediateEvacuation

H:4 R:3 S:Impact | ImmediateEvacuation

H:4 R:3 S:Evac | (Already Safe)

H:4 R:4 S:NoDmg | ImmediateEvacuation

H:4 R:4 S:Threat | ImmediateEvacuation

H:4 R:4 S:Impact | ImmediateEvacuation

H:4 R:4 S:Evac | (Already Safe)

H:4 R:5 S:NoDmg | ImmediateEvacuation

H:4 R:5 S:Threat | ImmediateEvacuation

H:4 R:5 S:Impact | PreemptiveRelocation

H:4 R:5 S:Evac | (Already Safe)

H:4 R:6 S:NoDmg | ImmediateEvacuation

H:4 R:6 S:Threat | PreemptiveRelocation

H:4 R:6 S:Impact | ImmediateEvacuation

H:4 R:6 S:Evac | (Already Safe)

H:4 R:7 S:NoDmg | ImmediateEvacuation

H:4 R:7 S:Threat | ImmediateEvacuation

H:4 R:7 S:Impact | PreemptiveRelocation

H:4 R:7 S:Evac | (Already Safe)

H:4 R:8 S:NoDmg | ImmediateEvacuation

H:4 R:8 S:Threat | ImmediateEvacuation

H:4 R:8 S:Impact | PreemptiveRelocation

H:4 R:8 S:Evac | (Already Safe)

H:4 R:9 S:NoDmg | ImmediateEvacuation

H:4 R:9 S:Threat | ImmediateEvacuation

H:4 R:9 S:Impact | PreemptiveRelocation

H:4 R:9 S:Evac | (Already Safe)

H:5 R:0 S:NoDmg | ImmediateEvacuation

H:5 R:0 S:Threat | DelayAndObserve

H:5 R:0 S:Impact | ImmediateEvacuation

H:5 R:0 S:Evac | (Already Safe)

H:5 R:1 S:NoDmg | ImmediateEvacuation

H:5 R:1 S:Threat | ImmediateEvacuation

H:5 R:1 S:Impact | ImmediateEvacuation

H:5 R:1 S:Evac | (Already Safe)

H:5 R:2 S:NoDmg | ImmediateEvacuation

H:5 R:2 S:Threat | ImmediateEvacuation

H:5 R:2 S:Impact | ImmediateEvacuation

H:5 R:2 S:Evac | (Already Safe)

H:5 R:3 S:NoDmg | ImmediateEvacuation

H:5 R:3 S:Threat | DelayAndObserve

H:5 R:3 S:Impact | ImmediateEvacuation

H:5 R:3 S:Evac | (Already Safe)

H:5 R:4 S:NoDmg | ImmediateEvacuation

H:5 R:4 S:Threat | ImmediateEvacuation

H:5 R:4 S:Impact | PreemptiveRelocation

H:5 R:4 S:Evac | (Already Safe)

H:5 R:5 S:NoDmg | ImmediateEvacuation

H:5 R:5 S:Threat | ImmediateEvacuation

H:5 R:5 S:Impact | ImmediateEvacuation

H:5 R:5 S:Evac | (Already Safe)

H:5 R:6 S:NoDmg | ImmediateEvacuation

H:5 R:6 S:Threat | PreemptiveRelocation

H:5 R:6 S:Impact | ImmediateEvacuation

H:5 R:6 S:Evac | (Already Safe)

H:5 R:7 S:NoDmg | ImmediateEvacuation

H:5 R:7 S:Threat | SendDroneFirst

H:5 R:7 S:Impact | ImmediateEvacuation

H:5 R:7 S:Evac | (Already Safe)

H:5 R:8 S:NoDmg | ImmediateEvacuation

H:5 R:8 S:Threat | ImmediateEvacuation

H:5 R:8 S:Impact | ImmediateEvacuation

H:5 R:8 S:Evac | (Already Safe)

H:5 R:9 S:NoDmg | ImmediateEvacuation

H:5 R:9 S:Threat | ImmediateEvacuation

H:5 R:9 S:Impact | SendDroneFirst

H:5 R:9 S:Evac | (Already Safe)

H:6 R:0 S:NoDmg | ImmediateEvacuation

H:6 R:0 S:Threat | DelayAndObserve

H:6 R:0 S:Impact | ImmediateEvacuation

H:6 R:0 S:Evac | (Already Safe)

H:6 R:1 S:NoDmg | ImmediateEvacuation

H:6 R:1 S:Threat | ImmediateEvacuation

H:6 R:1 S:Impact | ImmediateEvacuation

H:6 R:1 S:Evac | (Already Safe)

H:6 R:2 S:NoDmg | ImmediateEvacuation

H:6 R:2 S:Threat | ImmediateEvacuation

H:6 R:2 S:Impact | ImmediateEvacuation

H:6 R:2 S:Evac | (Already Safe)

H:6 R:3 S:NoDmg | ImmediateEvacuation

H:6 R:3 S:Threat | DelayAndObserve

H:6 R:3 S:Impact | ImmediateEvacuation

H:6 R:3 S:Evac | (Already Safe)

H:6 R:4 S:NoDmg | ImmediateEvacuation

H:6 R:4 S:Threat | ImmediateEvacuation

H:6 R:4 S:Impact | PreemptiveRelocation

H:6 R:4 S:Evac | (Already Safe)

H:6 R:5 S:NoDmg | ImmediateEvacuation

H:6 R:5 S:Threat | ImmediateEvacuation

H:6 R:5 S:Impact | PreemptiveRelocation

H:6 R:5 S:Evac | (Already Safe)

H:6 R:6 S:NoDmg | ImmediateEvacuation

H:6 R:6 S:Threat | ImmediateEvacuation

H:6 R:6 S:Impact | ImmediateEvacuation

H:6 R:6 S:Evac | (Already Safe)

H:6 R:7 S:NoDmg | ImmediateEvacuation

H:6 R:7 S:Threat | ImmediateEvacuation

H:6 R:7 S:Impact | ImmediateEvacuation

H:6 R:7 S:Evac | (Already Safe)

H:6 R:8 S:NoDmg | ImmediateEvacuation

H:6 R:8 S:Threat | DelayAndObserve

H:6 R:8 S:Impact | ImmediateEvacuation

H:6 R:8 S:Evac | (Already Safe)

H:6 R:9 S:NoDmg | ImmediateEvacuation

H:6 R:9 S:Threat | PreemptiveRelocation

H:6 R:9 S:Impact | ImmediateEvacuation

H:6 R:9 S:Evac | (Already Safe)

H:7 R:0 S:NoDmg | (Failed/Crisis)

H:7 R:0 S:Threat | (Failed/Crisis)

H:7 R:0 S:Impact | (Failed/Crisis)

H:7 R:0 S:Evac | (Already Safe)

H:7 R:1 S:NoDmg | ImmediateEvacuation

H:7 R:1 S:Threat | ImmediateEvacuation

H:7 R:1 S:Impact | ImmediateEvacuation

H:7 R:1 S:Evac | (Already Safe)

H:7 R:2 S:NoDmg | ImmediateEvacuation

H:7 R:2 S:Threat | ImmediateEvacuation

H:7 R:2 S:Impact | DelayAndObserve

H:7 R:2 S:Evac | (Already Safe)

H:7 R:3 S:NoDmg | ImmediateEvacuation

H:7 R:3 S:Threat | ImmediateEvacuation

H:7 R:3 S:Impact | DelayAndObserve

H:7 R:3 S:Evac | (Already Safe)

H:7 R:4 S:NoDmg | ImmediateEvacuation

H:7 R:4 S:Threat | ImmediateEvacuation

H:7 R:4 S:Impact | ImmediateEvacuation

H:7 R:4 S:Evac | (Already Safe)

H:7 R:5 S:NoDmg | ImmediateEvacuation

H:7 R:5 S:Threat | ImmediateEvacuation

H:7 R:5 S:Impact | ImmediateEvacuation

H:7 R:5 S:Evac | (Already Safe)

H:7 R:6 S:NoDmg | ImmediateEvacuation

H:7 R:6 S:Threat | PreemptiveRelocation

H:7 R:6 S:Impact | ImmediateEvacuation

H:7 R:6 S:Evac | (Already Safe)

H:7 R:7 S:NoDmg | ImmediateEvacuation

H:7 R:7 S:Threat | SendDroneFirst

H:7 R:7 S:Impact | ImmediateEvacuation

H:7 R:7 S:Evac | (Already Safe)

H:7 R:8 S:NoDmg | ImmediateEvacuation

H:7 R:8 S:Threat | ImmediateEvacuation

H:7 R:8 S:Impact | ImmediateEvacuation

H:7 R:8 S:Evac | (Already Safe)

H:7 R:9 S:NoDmg | SendDroneFirst

H:7 R:9 S:Threat | ImmediateEvacuation

H:7 R:9 S:Impact | ImmediateEvacuation

H:7 R:9 S:Evac | (Already Safe)

H:8 R:0 S:NoDmg | (Failed/Crisis)

H:8 R:0 S:Threat | (Failed/Crisis)

H:8 R:0 S:Impact | (Failed/Crisis)

H:8 R:0 S:Evac | (Already Safe)

H:8 R:1 S:NoDmg | ImmediateEvacuation

H:8 R:1 S:Threat | DelayAndObserve

H:8 R:1 S:Impact | ImmediateEvacuation

H:8 R:1 S:Evac | (Already Safe)

H:8 R:2 S:NoDmg | ImmediateEvacuation

H:8 R:2 S:Threat | ImmediateEvacuation

H:8 R:2 S:Impact | ImmediateEvacuation

H:8 R:2 S:Evac | (Already Safe)

H:8 R:3 S:NoDmg | ImmediateEvacuation

H:8 R:3 S:Threat | ImmediateEvacuation

H:8 R:3 S:Impact | ImmediateEvacuation

H:8 R:3 S:Evac | (Already Safe)

H:8 R:4 S:NoDmg | ImmediateEvacuation

H:8 R:4 S:Threat | ImmediateEvacuation

H:8 R:4 S:Impact | ImmediateEvacuation

H:8 R:4 S:Evac | (Already Safe)

H:8 R:5 S:NoDmg | ImmediateEvacuation

H:8 R:5 S:Threat | ImmediateEvacuation

H:8 R:5 S:Impact | ImmediateEvacuation

H:8 R:5 S:Evac | (Already Safe)

H:8 R:6 S:NoDmg | ImmediateEvacuation

H:8 R:6 S:Threat | PreemptiveRelocation

H:8 R:6 S:Impact | ImmediateEvacuation

H:8 R:6 S:Evac | (Already Safe)

H:8 R:7 S:NoDmg | ImmediateEvacuation

H:8 R:7 S:Threat | ImmediateEvacuation

H:8 R:7 S:Impact | ImmediateEvacuation

H:8 R:7 S:Evac | (Already Safe)

H:8 R:8 S:NoDmg | ImmediateEvacuation

H:8 R:8 S:Threat | ImmediateEvacuation

H:8 R:8 S:Impact | ImmediateEvacuation

H:8 R:8 S:Evac | (Already Safe)

H:8 R:9 S:NoDmg | ImmediateEvacuation

H:8 R:9 S:Threat | ImmediateEvacuation

H:8 R:9 S:Impact | ImmediateEvacuation

H:8 R:9 S:Evac | (Already Safe)

H:9 R:0 S:NoDmg | (Failed/Crisis)

H:9 R:0 S:Threat | (Failed/Crisis)

H:9 R:0 S:Impact | (Failed/Crisis)

H:9 R:0 S:Evac | (Already Safe)

H:9 R:1 S:NoDmg | ImmediateEvacuation

H:9 R:1 S:Threat | ImmediateEvacuation

H:9 R:1 S:Impact | ImmediateEvacuation

H:9 R:1 S:Evac | (Already Safe)

H:9 R:2 S:NoDmg | ImmediateEvacuation

H:9 R:2 S:Threat | DelayAndObserve

H:9 R:2 S:Impact | DelayAndObserve

H:9 R:2 S:Evac | (Already Safe)

H:9 R:3 S:NoDmg | ImmediateEvacuation

H:9 R:3 S:Threat | ImmediateEvacuation

H:9 R:3 S:Impact | ImmediateEvacuation

H:9 R:3 S:Evac | (Already Safe)

H:9 R:4 S:NoDmg | ImmediateEvacuation

H:9 R:4 S:Threat | ImmediateEvacuation

H:9 R:4 S:Impact | ImmediateEvacuation

H:9 R:4 S:Evac | (Already Safe)

H:9 R:5 S:NoDmg | ImmediateEvacuation

H:9 R:5 S:Threat | ImmediateEvacuation

H:9 R:5 S:Impact | ImmediateEvacuation

H:9 R:5 S:Evac | (Already Safe)

H:9 R:6 S:NoDmg | ImmediateEvacuation

H:9 R:6 S:Threat | ImmediateEvacuation

H:9 R:6 S:Impact | ImmediateEvacuation

H:9 R:6 S:Evac | (Already Safe)

H:9 R:7 S:NoDmg | ImmediateEvacuation

H:9 R:7 S:Threat | PreemptiveRelocation

H:9 R:7 S:Impact | ImmediateEvacuation

H:9 R:7 S:Evac | (Already Safe)

H:9 R:8 S:NoDmg | ImmediateEvacuation

H:9 R:8 S:Threat | ImmediateEvacuation

H:9 R:8 S:Impact | ImmediateEvacuation

H:9 R:8 S:Evac | (Already Safe)

H:9 R:9 S:NoDmg | ImmediateEvacuation

H:9 R:9 S:Threat | ImmediateEvacuation

H:9 R:9 S:Impact | ImmediateEvacuation

H:9 R:9 S:Evac | (Already Safe)

Module 5: LLM Module

Objective

This module generates a simple text response using a locally stored dummy “LLM”. The response gives an early warning and advice for other disasters that may happen because of the disaster in a calm tone. It gives advice based on probabilities calculated from Bayesian network module, shows possible safe routes from Search module, and plan of rescue from the planning module.

Inputs Used in Code (automatically inputs are passed to llm module taken)

- Plan produced by POP and Graph plans for advisory text
- A text prompt provided to generate_message()
- Posterior probability of disasters from the Bayesian model.

How It Works

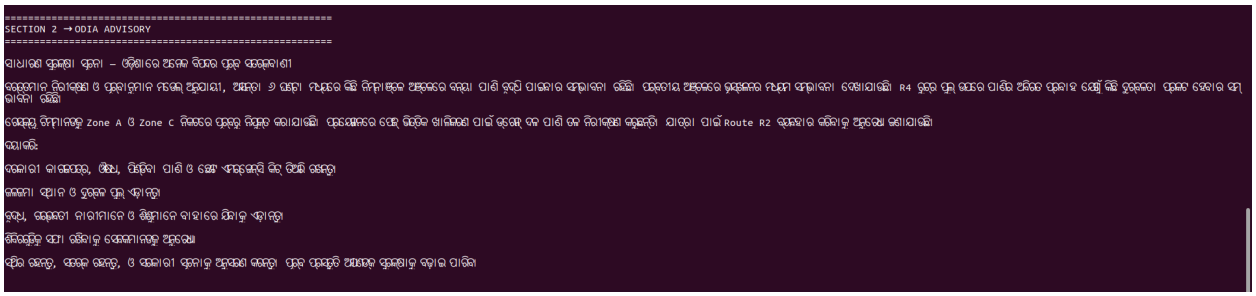
- It uses prompt engineering to generate response.
- It formats the prompt with the given probability value.

Test Case in Code

Prompt example used inside the file:

"Give alert message for disaster probability 0.7"

Output Produced



```
============================================================
SECTION 1 → ENGLISH ADVISORY
============================================================

**URGENT DISASTER EARLY WARNING ADVISORY**

A severe weather event is predicted to affect our region, posing a significant threat to life and property. We urge all residents to take immediate action to ensure their safety.

**FLOOD PROBABILITY:** 55% - Heavy rain is expected, leading to flash flooding in low-lying areas.

**LANDSLIDE PROBABILITY:** 35% - Steep terrain may experience landslides, blocking escape routes and causing damage.

**BRIDGE COLLAPSE PROBABILITY:** 80% - Weak bridges are at high risk of collapse, disrupting emergency response efforts.

**DISEASE OUTBREAK PROBABILITY:** 25% - Poor sanitation and hygiene conditions may lead to a disease outbreak in affected areas.

**TAKE IMMEDIATE ACTION:**

* Elderly, children, and pregnant women should prioritize their safety above all else.
* Stock up on essential supplies, including non-perishable food, water, and medications.
* Secure outdoor furniture, decorations, and other loose items that could become projectiles in strong winds or floodwaters.

**SAFE ROUTE:** Follow the designated Safe Route (A*) to ensure safe passage:

Zone_A → Checkpoint_1 → Zone_C → Safe_Zone

**A* COST:** 12.50 - This cost includes emergency response services, evacuation efforts, and other critical measures to ensure public safety.

**GRAPH PLAN ACTIONS:**

* Monitor forecast updates for flood and landslide warnings.
* Alert the community through emergency broadcasts and social media channels.
* Predeploy rescue teams and equipment.
* Shift routes due to bridge risk assessments.
* Establish backup communication networks in case of infrastructure failures.
* Stock medical kits and supplies in advance.

**RL ACTION:** Prioritize evacuation of low-lying areas to minimize risks.

**PLANNED ACTIONS FROM POP (Partial Order Planner):**

* Rescue Team:
        + Predeploy rescue team.
        + Evacuate before floodwaters rise.
        + Conduct rescue operations as needed.
* Communication Team:
        + Shift routes due to bridge risk assessments.
        + Establish backup communication networks.
        + Coordinate emergency response efforts.
* Medical & Supplies Team:
        + Stock medical kits and supplies in advance.
        + Stockpile food and medicine for affected areas.
```

```
======================================================================
LLM DISASTER ADVISORY SYSTEM
======================================================================



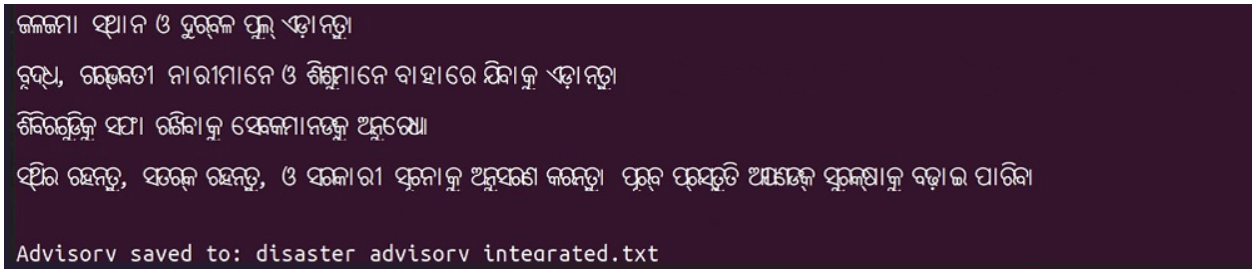
PLANNED ACTIONS FROM POP (Partial Order Planner):

Team Assignments & Actions:
- Rescue Team: predeploy_rescue_team, evacuate_before_flood, rescue_team_work_done
- Communication Team: shift_route_due_to_bridge_risk, establish_backup_communication, communication_team_work_done
- Medical & Supplies Team: stock_medical_kits_in_advance, stockpile_food_and_medicine, medical_and_supplies_work_done

Initial State Conditions:
- Forecast: Heavy rain predicted (P=55%)
- Infrastructure: Bridges weak (P=80%)
- Resources Available: Boats, rescue team, medical supplies, technicians
- Community Status: Not yet alerted

Goal States to Achieve:
1. Rescue: People safe, rescue team predeployed, rapid response ready
2. Communication: Backup communication operational, routes shifted
3. Medical: Medical kits stocked, supplies ready

Key Constraints & Dependencies:
- Rescue predeployment requires forecast confirmation
- Community evacuation requires community alerting first
- Route shifting depends on bridge vulnerability assessment
- Medical kits require technician availability
- Backup communication depends on technician coordination
```



Actual Prompt used:

Odia Prompt

```
"""

ସାଧାରଣ ସୁରକ୍ଷା ସୂଚନା – ଓଡ଼ିଶାରେ ଅନେକ ବିପଦର ପୂର୍ବ ସତର୍କବାଣୀ



ବର୍ତ୍ତମାନ ନିରୀକ୍ଷଣ ଓ ପୂର୍ବାନୁମାନ ମଡେଲ୍ ଅନୁଯାୟୀ, ଆସନ୍ତା ୬ ଘଣ୍ଟା ମଧ୍ୟରେ କିଛି ନିମ୍ନାଞ୍ଚଳ ଅଞ୍ଚଳରେ ବନ୍ୟା ପାଣି ବୃଦ୍ଧି ପାଇବାର ସମ୍ଭାବନା ରହିଛି। ପର୍ବତୀୟ ଅଞ୍ଚଳରେ ଭୂସ୍ଖଳନର ମଧ୍ୟମ ସମ୍ଭାବନା ଦେଖାଯାଉଛି। R4 ରୁଟ୍‌ର ପୁଲ୍ ଉପରେ ପାଣିର ଅବିରତ ପ୍ରବାହ ଯୋଗୁଁ କିଛି ଦୁର୍ବଳତା ପ୍ରକଟ ହେବାର ସମ୍ଭାବନା ରହିଛି।



ରେସ୍‌କ୍ୟୁ ଟିମ୍‌ମାନଙ୍କୁ Zone A ଓ Zone C ନିକଟରେ ପୂର୍ବରୁ ନିଯୁକ୍ତ କରାଯାଉଛି। ପ୍ରୟୋଜନରେ ଫେଜ୍ ଭିତ୍ତିକ ଖାଲିକରଣ ପାଇଁ ଡ୍ରୋନ୍ ଦଳ ପାଣି ତଳ ନିରୀକ୍ଷଣ କରୁଛନ୍ତି। ଯାତ୍ରା ପାଇଁ Route R2 ବ୍ୟବହାର କରିବାକୁ ଅନୁରୋଧ ଜଣାଯାଉଛି।

ଦୟାକରି:

ଦରକାରୀ କାଗଜପତ୍ର, ଔଷଧ, ପିଣ୍ଡିବା ପାଣି ଓ ଛୋଟ ଏମର୍‌ଜେନ୍ସି କିଟ୍ ତିଆରି ରଖନ୍ତୁ।

ଜଳଜମା ସ୍ଥାନ ଓ ଦୁର୍ବଳ ପୁଲ୍ ଏଡ଼ାନ୍ତୁ।

ବୃଦ୍ଧ, ଗର୍ଭବତୀ ନାରୀମାନେ ଓ ଶିଶୁମାନେ ବାହାରେ ଯିବାକୁ ଏଡ଼ାନ୍ତୁ।

ଶିବିରଗୁଡିକୁ ସଫା ରଖିବାକୁ ସେବକମାନଙ୍କୁ ଅନୁରୋଧ।
```

ସ୍ଥିର ରହନ୍ତୁ, ସତର୍କ ରହନ୍ତୁ, ଓ ସରକାରୀ ସୂଚନାକୁ ଅନୁସରଣ କରନ୍ତୁ। ପୂର୍ବ ପ୍ରସ୍ତୁତି ଆପଣଙ୍କ ସୁରକ୍ଷାକୁ ବଢ଼ାଇ ପାରିବ।

"""{pop_planning}

==========

SECTION 1 → ENGLISH ADVISORY

==========

{english_text}

==========

SECTION 2 → ODIA ADVISORY

==========

ସାଧାରଣ ସୁରକ୍ଷା ସୂଚନା – ଓଡ଼ିଶାରେ ଅନେକ ବିପଦର ପୂର୍ବ ସତର୍କବାଣୀ

ବର୍ତ୍ତମାନ ନିରୀକ୍ଷଣ ଓ ପୂର୍ବାନୁମାନ ମଡେଲ୍ ଅନୁଯାୟୀ, ଆସନ୍ତା ୬ ଘଣ୍ଟା ମଧ୍ୟରେ କିଛି ନିମ୍ନାଞ୍ଚଳ ଅଞ୍ଚଳରେ ବନ୍ୟା ପାଣି ବୃଦ୍ଧି ପାଇବାର ସମ୍ଭାବନା ରହିଛି। ପର୍ବତୀୟ ଅଞ୍ଚଳରେ ଭୂସ୍ଖଳନର ମଧ୍ୟମ ସମ୍ଭାବନା ଦେଖାଯାଉଛି। R4 ରୁଟ୍‌ର ପୁଲ୍ ଉପରେ ପାଣିର ଅବିରତ ପ୍ରବାହ ଯୋଗୁଁ କିଛି ଦୁର୍ବଳତା ପ୍ରକଟ ହେବାର ସମ୍ଭାବନା ରହିଛି।

ରେସ୍‌କ୍ୟୁ ଟିମ୍‌ମାନଙ୍କୁ Zone A ଓ Zone C ନିକଟରେ ପୂର୍ବରୁ ନିଯୁକ୍ତ କରାଯାଉଛି। ପ୍ରୟୋଜନରେ ଫେଜ୍ ଭିତ୍ତିକ ଖାଲିକରଣ ପାଇଁ ଡ୍ରୋନ୍ ଦଳ ପାଣି ତଳ ନିରୀକ୍ଷଣ କରୁଛନ୍ତି। ଯାତ୍ରା ପାଇଁ Route R2 ବ୍ୟବହାର କରିବାକୁ ଅନୁରୋଧ ଜଣାଯାଉଛି।

ଦୟାକରି:

ଦରକାରୀ କାଗଜପତ୍ର, ଔଷଧ, ପିଣ୍ଡିବା ପାଣି ଓ ଛୋଟ ଏମର୍‌ଜେନ୍ସି କିଟ୍ ତିଆରି ରଖନ୍ତୁ।

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ଜଳଜମା ସ୍ଥାନ ଓ ଦୁର୍ବଳ ପୁଲ୍ ଏଡ଼ାନ୍ତୁ।


ବୃଦ୍ଧ, ଗର୍ଭବତୀ ନାରୀମାନେ ଓ ଶିଶୁମାନେ ବାହାରେ ଯିବାକୁ ଏଡ଼ାନ୍ତୁ।

ଶିବିରଗୁଡିକୁ ସଫା ରଖିବାକୁ ସେବକମାନଙ୍କୁ ଅନୁରୋଧ।

ସ୍ଥିର ରହନ୍ତୁ, ସତର୍କ ରହନ୍ତୁ, ଓ ସରକାରୀ ସୂଚନାକୁ ଅନୁସରଣ କରନ୍ତୁ। ପୂର୍ବ ପ୍ରସ୍ତୁତି ଆପଣଙ୍କ ସୁରକ୍ଷାକୁ ବଢ଼ାଇ ପାରିବ।

"""
```

Here pop_planning is ouput from pop planning module and english_text is output of english prompt.

English Prompt:

```
facts = """

Flood probability: {bayes['Flood']*100:.0f}%

Landslide probability: {bayes['Landslide']*100:.0f}%

Bridge collapse probability: {bayes['Bridge_Collapse']*100:.0f}%

Disease outbreak probability: {bayes['Water_Borne_Disease']*100:.0f}%

Safe Route (A*): {search['astar_path']}

A* Cost: {search['astar_cost']:.2f}

GraphPlan Actions: {", ".join(plan_actions)}

RL Action: {rl_action}


{pop_planning}"""
```

```
"""

Write a FULL LONG disaster early-warning advisory in English.

Requirements:

- Minimum 12–15 sentences

- Calm, preventive, early-warning tone

- Must include advice for elderly, children, pregnant women



- Based on these real analytics:

{facts}



"""
```