Search Agents are just one kind of algorithms in Artificial Intelligence

**Defining the problem**

The agent should be clear about the goal. ***This means we need to program the agent, such that it can clearly classify a state as goal.*** ***Since there are many ways to reach that goal, the agent should also be able to evaluate a solution and determine its preference for a solution.*** Let’s look at the factors that need to be defined for formulation of a problem.

* **Initial State** : The state in which the agent starts or initial condition of the agent.
* **States** : All states that are reachable from initial state by any sequence of actions or all possible states that the agent can take. This is also referred to as State space.
* **Actions** : All possible actions that the agent can execute. Specifically, it provides the list of actions, that an agent can perform in a particular state. This is also referred to as Action space.
* **Transition Model** : This property describes the results of each action taken in a particular state.
* **Goal Test** : A way to check, whether a state is the goal.
* **Path Cost**: A function that assigns a numeric cost to a path w.r.t. performance measure

#### Search Space

The search space is an abstract conﬁguration represented by a search tree or graph of possible solutions.

**A search tree is used to model the sequence of actions. It is constructed with initial state as the root.** **The actions taken make the branches and the nodes are results of those actions.** A node has depth, path cost and associated state in the state space.

The search space is divided into 3 regions, namely

* **Explored**
* **Frontier**
* **Unexplored**

**Search involves moving the nodes from unexplored region to the explored region**

#### Types of Search

There are 2 kinds of search, based on whether they use information about the goal.

#### Uninformed Search

**This type of search does not use any domain knowledge**. This means that it does not use any information that helps it reach the goal, like closeness or location of the goal. The strategies or algorithms, using this form of search, ignore where they are going until they find a goal and report success.

E.g: BFS(Beadth First Search), DFS(Depth First Search).

#### Informed Search

**This type of search uses domain knowledge.** It generally uses a heuristic function that estimates how close a state is to the goal. This heuristic need not be perfect. This function is used to estimate the cost from a state to the closest goal.

**The basic informed search strategies are:**

* Greedy search (best first search) : It expands the node that appears to be closest to goal
* A\* search : Minimize the total estimated solution cost, that includes cost of reaching a state and cost of reaching goal from that state.