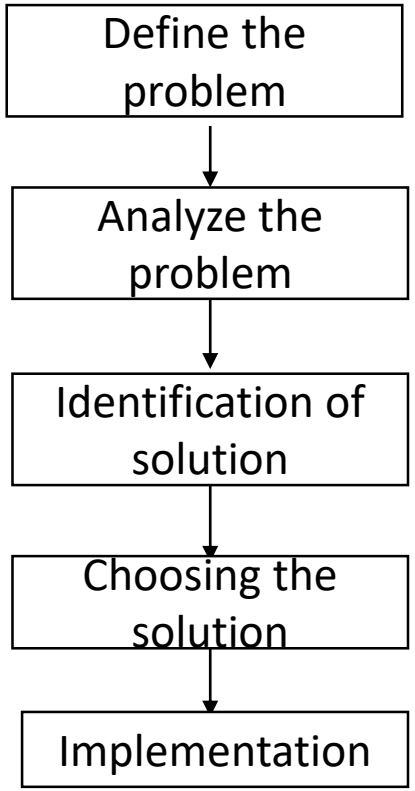
Data Acquisition and learning aspects in AI

1. **Knowledge discovery**: Data mining and Machine learning
2. **Computational Logic Theory(COLT):** Formal mathematical problems are defined. These models helps in analyzing and predicting the efficiency in terms of feasibility of algorithm.
3. **Neural and evolutionary computation**: used to speedup the mining of data.
4. **Intelligent agents and Multi agents systems:** IA are flexible in terms of action and get the desired outcome.
   Multi agents (group of IA)deals with the complex task. Overall performance is improved.
5. **Multi perspective integrated intelligence:** Different perspective used for decision-making.

Problem Solving

A problem-solving refers to a state where we wish to reach to a definite goal from a present state or condition.

Steps for Problem solving:



- Goal Formulation: organizes the steps required to formulate one goal out of multiple goals.
- Problem Formulation:
  - Initial state: starting step towards goal.
  - Actions: description of possible agents.
  - Transition model: describes model function.
  - Goal test: determines if current state is goal state.
  - Path cost: it assigns a numeric cost to each path that follows goal and the agent selects a cost function which reflects its performance measure.

  * An optimal solution has minimum path cost.

  Ex: Travelling salesman, N-queens problem, water jug problem, 8 puzzle problem etc.

Formulating Problems

Toy Problem : Ex: 8-Puzzle Problem

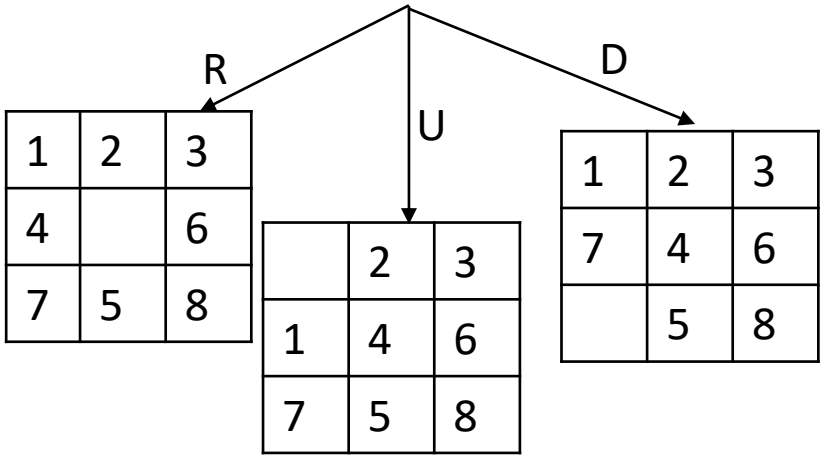
1	2	3
	4	6
7	5	8

Initial state

1	2	3
4	5	6
7	8	

Goal state

*Possible moves (Up, Down, Left, Right)



----------(continue until goal state obtained)

Algorithm

Step 1:- State= Initial state; existing state= state

Step 2:- while state ≠ final state

i. Existing state= state

ii. Apply operations from set{U, D, L, R}

iii. If new state∩ existing state ≠ ϕ

*existing state= existing state U new states

*state= new state

End while.

Problems type and Characterstics

1. **Deterministic or observable:** Each state is fully observed and goes to definite state after taking any action . Here the goal state is reachable at a single or sequence of states. Ex: doors with sensor, Sudoku game.
2. **Non- observable:** It comes under multiple state problem. Agent has no information about the state which may leads to multiple state in reaching to the goal state. Ex: Vacuum cleaner with sensor.
3. **Non-deterministic or partially observable:** Effect of the action is not clear. At every state some new information is added and then operator acts on it.
4. **Unknown state space:** Typically based on the exploration i.e., without having complete knowledge of the new search state. Ex: Online search portal