

CSB 310: Artificial Intelligence

Homework Assignment 1

Submitted By:

Name: Umang Kumar

Roll No: 201210051

Branch: CSE

Semester: 5th Sem

Submitted To: Dr. Chandra Prakash



NATIONAL INSTITUTE OF TECHNOLOGY DELHI

Department of Computer Science and Engineering

2022

Q1 Read the Niti Aayog discussion paper on AI, June 2018. Find the key areas for AI intervention in India. Consider one area and suggest how would you contribute in the selected area.

→ Focus areas for AI Intervention:-

- 1) Health Care
- 2) Agriculture
- 3) Education
- 4) Smart Cities and Infrastructure
- 5) Smart Mobility and Transportation

Agriculture

In India, despite impressive progress and receiving government attention, the sector continues to be dependent on unpredictable variables, has weak supply chain and low productivity.

India has not been able to completely remove its exploitative dependence on resource intensive agricultural practices. Degradation of land, reduction in soil fertility, increased dependence on inorganic fertilizers for higher production, rapidly dropping water tables and emerging pest resistance are some of the several manifestations of India's unsustainable agricultural practices. As global climate becomes more vulnerable and unpredictable, dependence on unsustainable and resource intensive agriculture will only heighten the risks of food scarcity and agricultural distress.

The sector suffers from poor resource utilisation, with the production quantum and productivity still being quite low.

For example, yields of cereals, comprising a major share of food grain production, in terms of magnitude is significant lower than that of China and the USA.

Scope of improvement through AI

Use of AI and related technologies have the potential to impact productivity and efficiency at all of the above stages of the agricultural value chain.

1.

1. Soil health monitoring and restoration:-

Image recognition and deep learning models have enabled distributed soil health monitoring without the need of laboratory testing infrastructure. AI solutions integrated with data signals from remote satellites, as well as local image capture in the farm, have made it possible for farmers to take immediate actions to restore soil health.

2. Crop health monitoring and providing real time action advisories to farmers:-

AI can be used to predict advisories for sowing, pest control, input control can help in ensuring increased income and providing stability for the agricultural community.

For example, many agronomic factors (such as vegetative health and soil moisture) can be monitored up to the farm level through remote sensing. Using remote sensed data, high resolution weather data, AI technologies, and AI platform, it is possible to monitor crops holistically and provide additional insights to the extension workers/farmers for their farms as & when required.

3. Increasing efficiency of farm mechanisation!

Image classification tools combined with remote and local sensed data can bring a revolutionary change in utilisation and efficiency of farm machinery, in areas of weed removal, early disease identification, produce harvesting and grading.

Horticultural practices require a lot monitoring at all levels of plant growth and AI tools provide round the clock monitoring of these high value products.

Q2 Read Turing original paper on AI (Turing, 1950). In this paper, he discusses several potential objections to his proposed enterprise, and his test for intelligence.

(a) Discuss the 'Heads in the Sand' objection mentioned in his article.

⇒ If there were thinking machine, then various consequences would follow. First, we should lose the best reasons that we have for thinking that we are superior to everything else in the Universe.

Second, the possibility that we might be supplanted by machine would become a genuine worry. If there were thinking machine, then very likely there would be machines that could think much better than we can.

Third, the possibility that we might be dominated by machines would also become a genuine who's to say that they were thinking machine who's to say that they would not take over the Universe and else enslave or exterminate us.

(b) According to you which objection still carry some importance?

⇒ Alan Turing is undoubtedly one of the most significant personalities in Computer Science. He is often credited as father of modern computer science. His objection "The imitation game" is the one of the most popular. Objection still carry some importance in today's world because we cannot have any machine that can pass Turing test completely and can replace human with machine but today we are working on such type of machine and the machines which can think.

(c) Can you think of new objections arising from developments since he wrote the paper for the next 50 years?

⇒ As of today we can say that the variation in the skill of interrogator depending more rather than on the program, the chance today is 10%.

In upcoming 50 years to credible impersonators the entertainment industry made sufficient investment in artificial actors.

Q3 Are reflex actions (such as flinching from a hot fire) rational? Are they intelligent? Justify your answer.

Ans Yes, indeed. "reflex actions" such as flinching from a hot stove are highly intelligent. In fact, they are intelligent enough to keep you alive in many situations where your thought processes would fail you.

For example:- If a small child riding a tricycle were to dart in front of your car as you're driving down a street,

are you going to try analyzing the situations, computing how fast he/she is travelling versus how fast your car is moving, along with the weight of your car times its velocity, and as well, trying to figure out the math involved in calculating the distance you'll continue travelling after you push down hard on the breaks.

Q4 Every year the Loebner prize is awarded to the program that come closest to passing a version of the Turing test.

(a) Research and report on the last winner of the Loebner prize. What techniques does it use? How does it advance the state of the art in AI?

⇒ Steve Warwick won the Loebner Prize competition for 2019. He is the creator of the famous Mitsuku bot. It is a digital secretary and companion. It can remember and remind us about our appointments. It can keep an address book, phone book, and even dial phone numbers for us. It can also run programs and recent documents on command. It can help with most of our Windows programs.

Mitsuku is artificial intelligence software that utilize natural language processing, which is the understanding of natural human languages. Specifically, Mitsuku is a Chatterbot, a computer program designed to simulate an intelligent conversation. It utilizes an AI engine that is capable of learning from all conversations.

Every sentences that we say is recorded in its database and used to come up with responses in future conversational with other people or us.

Used techniques

Mitsuku is a chatbot from Pandorabots AIML technology by Steve Worswick, and it succeeded in fooling a quarter of the people chatting with it into believing it was human during one Loebner Prize competition and came close to being the first to pass the Turing Test.

Advancing the State of the art in AI

The developed Pandorabots is to converse with users about any topic under the sun, rather than a specialized and self-contained set of FAQs as is usually the case for commercial systems.

"The completely open range of subject matter required various new strategies to make the most of a finite knowledge base, with an eye towards keeping the conversational experience fun, entertaining and meaningful, though not necessarily to fool the user into thinking that the application is human."

(b) How would you participate in the contest?

⇒ Make a chatbot which is capable of fooling humans by making use of techniques of Artificial intelligence and natural processing language.

Q8 for each of the following activities, give a PEAS description of the task environment and characterize it in terms of the properties listed in Book "Artificial Intelligence: A Modern Approach".

	Agent	Performance	Environment	Actuator	Sensor
1.	Playing Soccer	Scoring, no penalties, not allowing the other team to score	Soccer field, players, goalie, legs, referees, coach, head, soccer ball, net.	Player hands	Eyes, ears.
2.	Exploring the Subsurface oceans of Titan	Accurate mapping of the oceans and identification of the environment.	Water, Submersible	Arms, propeller	Cameras, Sonars, motor Sensor.
3.	Shopping for used AI books on the Internet	Low price cost of procuring an AI book.	Internet, rival shopping sites, customers	Keyboard, mouse	Monitor.
4.	Playing a tennis match	Attaining highest score to win the match	Rackets, net, referee, ball, players	Human body	Eyes, ears
5.	Practicing tennis against a wall	Keeping good form	Wall, racket, ball	Human body	Eyes, ears
6.	Performing a high jump	Attaining maximum height	Jumping pole, padding, jumper, referee	Legs.	Eyes, ears

7.	Knitting a sweater	Creating a full made full sweater	knitter, yarn, knitting needles, direct	Hands	Eyes, touch
8.	Bidding on an item at an auction	Auctioning an item for lowest cost possible	Auctioneer, Bidders, Item	Voice	Eyes, ears.

Q6 Identify the type of agent for the given activities:-

1. Playing Soccer:

- Partially observable (Observable)
- Stochastic (Deterministic)
- Sequential (Episodic)
- dynamic (Static)
- continuous (Discrete)
- Multiagent (Agents)

2. Shopping for AI books on the Internet.

- Partially (observable)
- deterministic (Deterministic)
- Sequential (Episodic)
- static (Static)
- Discrete (Discrete)
- Single agent (Agents)

3. Playing a tennis match.

- Fully (observable)
- Stochastic episodic (Episodic)
- dynamic (Static)
- continuous (Discrete)
- multi-agent (Agents)
- Stochastic (Deterministic)

4. Playing tennis against a wall.

- fully (observable)
- Stochastic (& Deterministic)
- episodic (Episodic)
- dynamic (Static)
- continuous (Discrete)
- single agent (Agents)

Q7 formulate the following 8-Puzzle problem as State Space Representation in AI. Explain the difference between Depth first search and Breadth First Search with reference to below mentioned Problem.

⇒ Eight puzzle problem goes by the name of N puzzle problem or Sliding puzzle problem.

In our the given example, $N=8$ having 3 rows and 3 columns.

Our aim is to transform the initial state to final state.

Initial State:-

5	4	
6	1	8
7	3	2

Goal State

1	4	7
2	5	8
3	6	

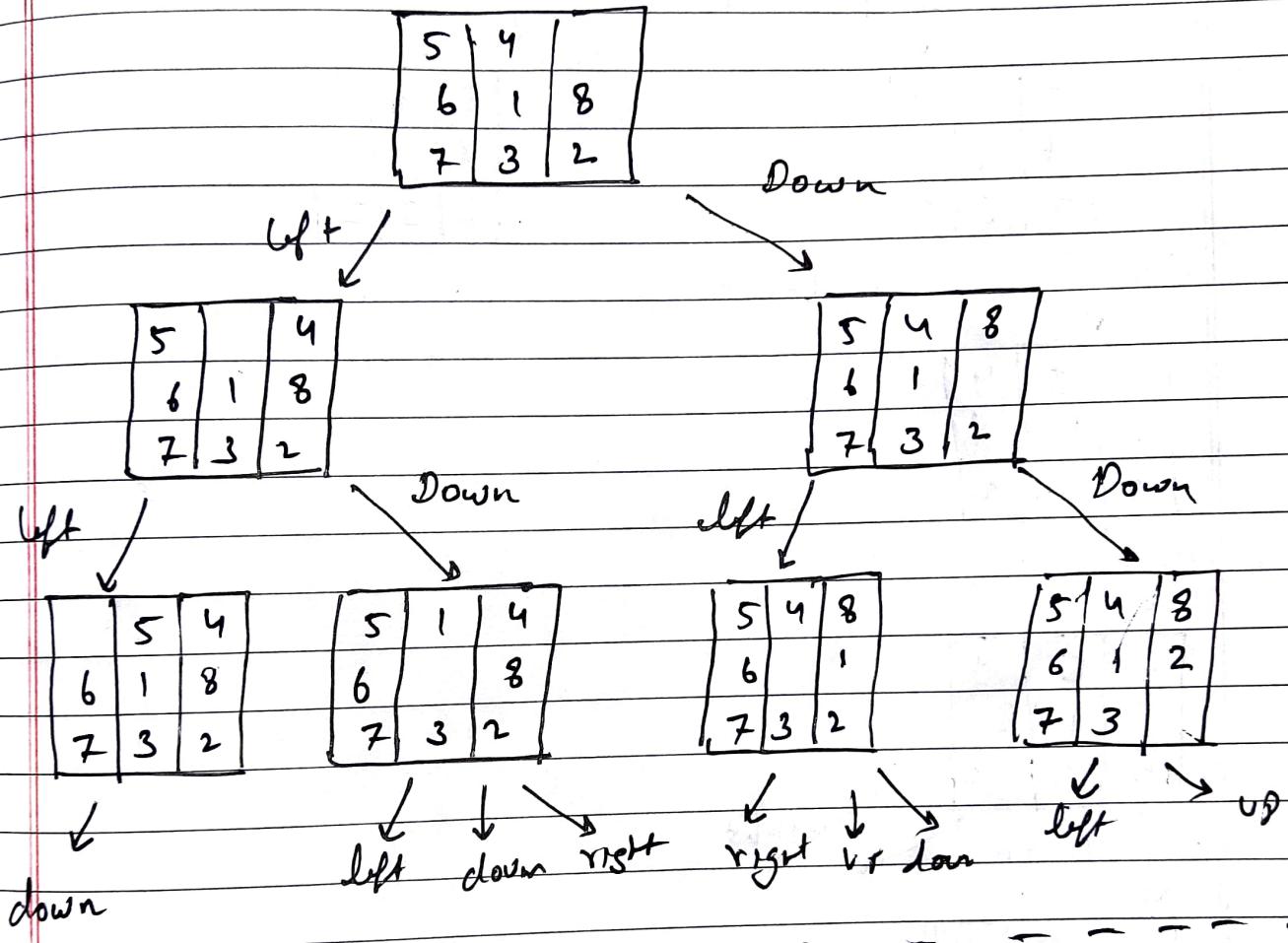
Approach! -

Instead of moving tiles in the empty space we can visualise moving the empty space in place of tile and we can move empty space in ^{maximum} four directions.

1. Up (if possible)
2. down (if possible)
3. right (if possible)
4. left (if possible)

We can solve using uninformed search like breadth first search or depth first search.

1) Breadth first Search.



By exploring all possible paths we can reach to own goal and then we can trace a path from initial to final state in order to know the set moves have been taken to reach final state.

2) Depth first Search:-

5	4	
6	1	8
7	3	2

left ↘

down ↗

5		4
6	1	8
7	3	2

5	4	8
6	1	
7	3	2

left ↘ down ↗

	5	4
6	1	8
7	3	2

down ↘

6	5	4
	1	8
7	3	2

down ↘ right ↗

6	5	4
7	1	8
	3	2

We will explore all the patterns in depth first fashion and after exploring all arrangements we will back track and try another moves and explores that completely and so on. until we get our final state.