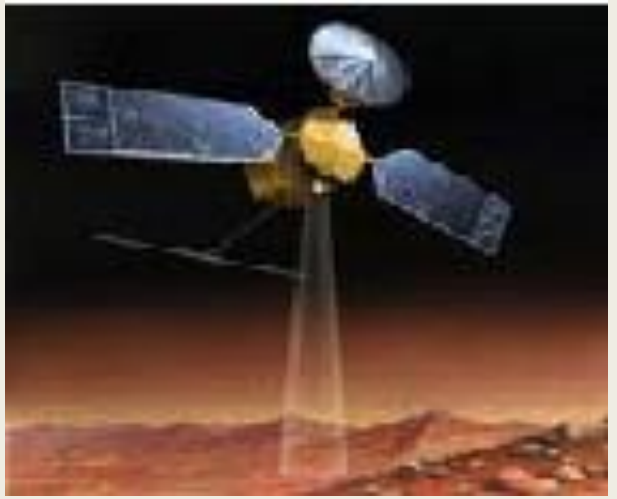
APPLICATIONS OF AI

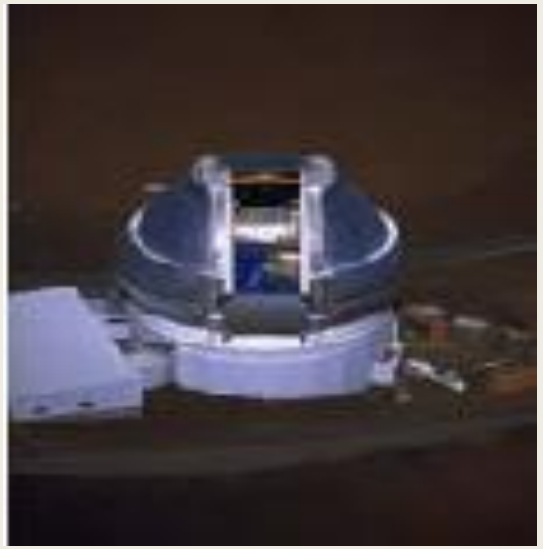
AI Applications

- Autonomous Planning & Scheduling:
  - *Autonomous rovers.*



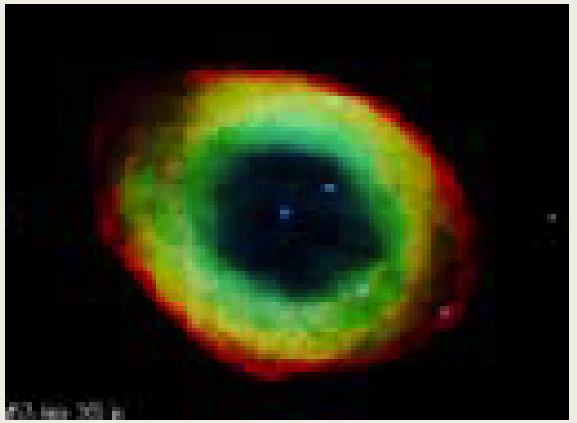
AI Applications

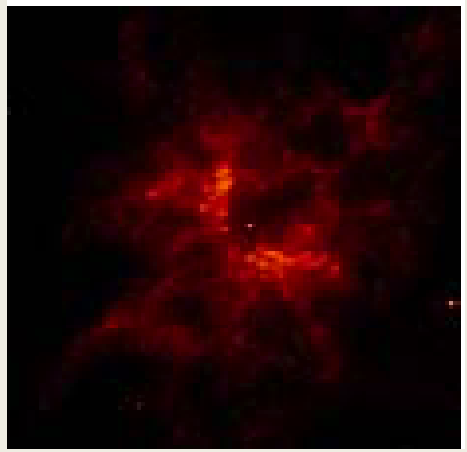
- Autonomous Planning & Scheduling:
  - *Telescope scheduling*



AI Applications

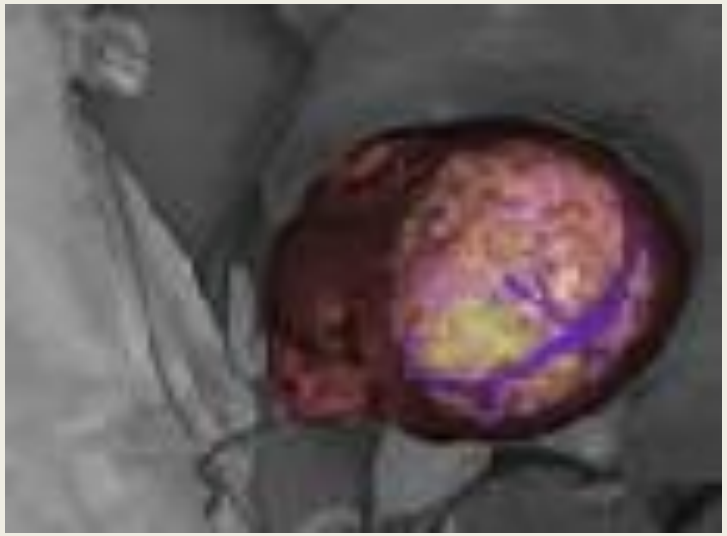
- Autonomous Planning & Scheduling:
  - *Analysis of data:*





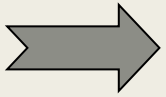
AI Applications

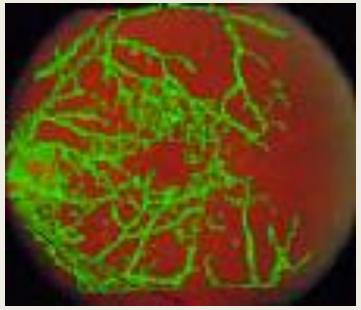
- Medicine:
  - *Image guided surgery*

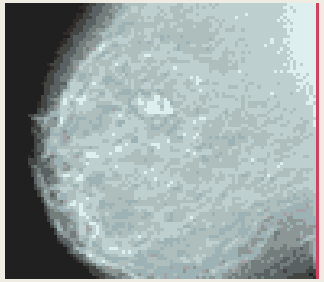


AI Applications

- Medicine:
  - *Image analysis and enhancement*







AI Applications

- Transportation:
  - *Autonomous vehicle control:*

AI Applications

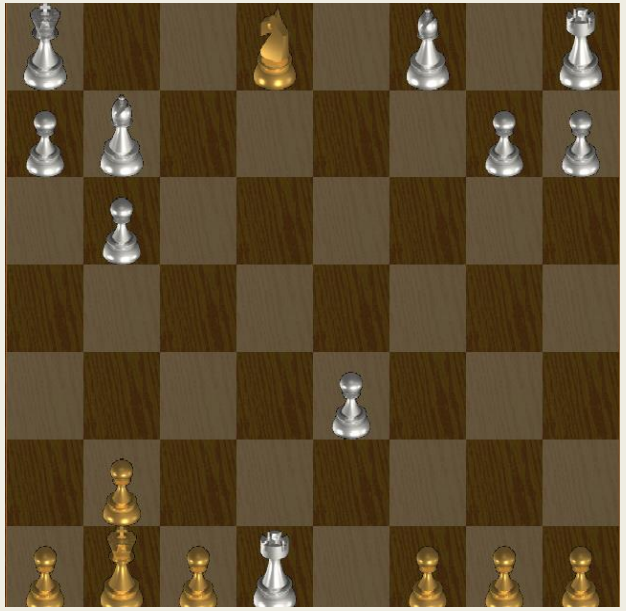
- Transportation:
  - *Pedestrian detection:*

AI Applications

Games:

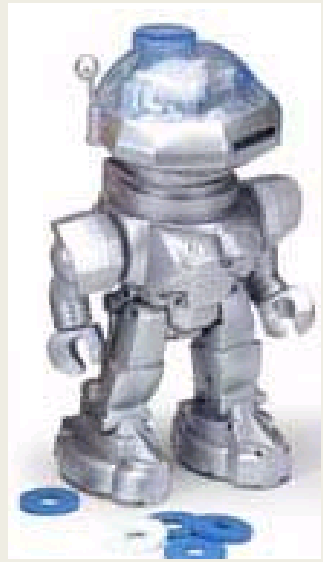
AI Applications

Games:



AI Applications

- Robotic toys:



AI Applications

Other application areas:

- Bioinformatics:
  - *Gene expression data analysis*
  - *Prediction of protein structure*
- Text classification, document sorting:
  - *Web pages, e-mails*
  - *Articles in the news*
- Video, image classification
- Music composition, picture drawing
- Natural Language Processing .
- Perception.

The Foundation of AI

Computer Engineering

- *How to build an efficient computer?*
- *Provides the artifact that makes AI application possible*
- *The power of computer makes computation of large and difficult problems more easily*
- *AI has also contributed its own work to computer science, including: time-sharing, the linked list data type, OOP, etc.*

The Foundation of AI

Control theory and Cybernetics

- *How can artifacts operate under their own control?*
- *The artifacts adjust their actions*
  - To do better for the environment over time
  - Based on an objective function and feedback from the environment
- *Not limited only to linear systems but also other problems*
  - as language, vision, and planning, etc.

The Foundation of AI

Linguistics

- *For understanding natural languages*
  - different approaches has been adopted from the linguistic work
- *Formal languages*
- *Syntactic and semantic analysis*
- *Knowledge representation*

The main topics in AI

Artificial intelligence can be considered under a number of headings:

- *Search (includes Game Playing).*
- *Representing Knowledge and Reasoning with it.*
- *Planning.*
- *Learning.*
- *Natural language processing.*
- *Expert Systems.*
- *Interacting with the Environment*
  (e.g. Vision, Speech recognition, Robotics)

Search

- Search is the fundamental technique of AI.
  - *Possible answers, decisions or courses of action are structured into an abstract space, which we then search.*
- Search is either "blind" or “uninformed":
  - *blind*
    - we move through the space without worrying about what is coming next, but recognising the answer if we see it
  - *informed*
    - we guess what is ahead, and use that information to decide where to look next.
- We may want to search for the first answer that satisfies our goal, or we may want to keep searching until we find the best answer.

Knowledge Representation & Reasoning

- The second most important concept in AI
- If we are going to act rationally in our environment, then we must have some way of describing that environment and drawing inferences from that representation.
  - *how do we describe what we know about the world ?*
  - *how do we describe it concisely ?*
  - *how do we describe it so that we can get hold of the right piece of knowledge when we need it ?*
  - *how do we generate new pieces of knowledge ?*
  - *how do we deal with uncertain knowledge ?*

Planning

Given a set of goals, construct a sequence of actions that achieves those goals:

- *often very large search space*
- *but most parts of the world are independent of most other parts*
- *often start with goals and connect them to actions*
- *no necessary connection between order of planning and order of execution*
- *what happens if the world changes as we execute the plan and/or our actions don't produce the expected results?*

Learning

If a system is going to act truly appropriately, then it must be able to change its actions in the light of experience:

- *how do we generate new facts from old ?*
- *how do we generate new concepts ?*
- *how do we learn to distinguish different situations in new environments ?*

Interacting with the Environment

- In order to enable intelligent behaviour, we will have to interact with our environment.
- Properly intelligent systems may be expected to:
  - *accept sensory input*
    - vision, sound, …
  - *interact with humans*
    - understand language, recognise speech,
      generate text, speech and graphics,
      …
  - *modify the environment*
    - robotics

OK Google (Duplex)

IBM Watson

Alexa (virtual assistant)

THANK YOU

-Sohrab Ardeshar Vakharia