CS-F407: Artificial Intelligence

02 Turing Test

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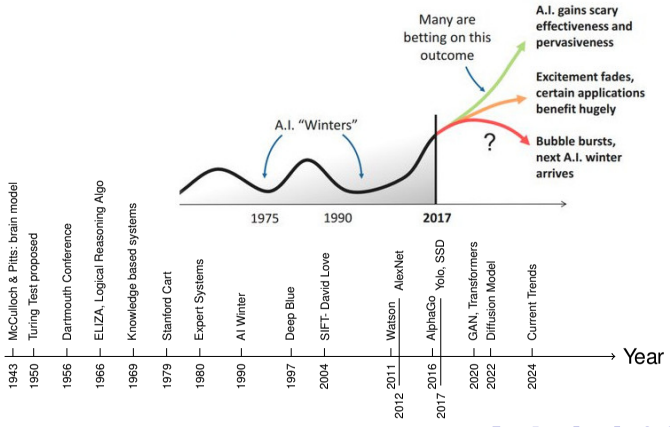
http://ktiwari.in/ai

Brief History?



Knowledge

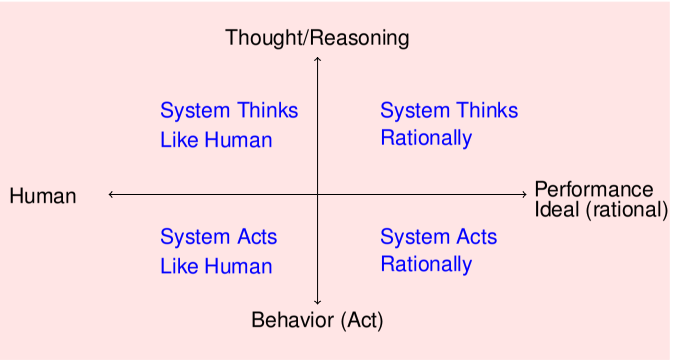
- Much of the early work focused on formal tasks such as game playing and theorem proving but
  - Russell's paradox. Does list of lists contain itself?
  - Halting problem of Turing Machine. Computers cannot do everything. Machines are bad in reading itself

Data, Information and Knowledge

- What is data? Fact or values
- What is information? Processed output of date
- What is knowledge? Understanding of information (needs intelligence)

Being very fast, computers could explore all possible next steps and choose the best one, why does it need intelligence?

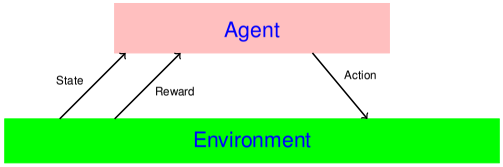
Rationality



Note: it is not like that the humans are necessarily irrational

Rational Agent

Agent is an entity that perceives and act. If is a function from percept history to action.



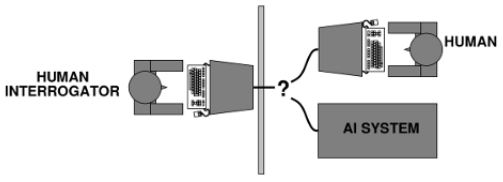
Goal is to choose a policy that maximizes rewards

Approaches

- **Strong AI:** Completely intelligent systems
- **Weak AI:** suitably programmed to act as intelligent

Turing Test

In 1950 Alan Turing introduced a test for computing intelligence



If the interrogator cannot reliably distinguish the human from the computer the test is passed

Problem: Turing test is not reproducible, constructive, or amenable to mathematical analysis. Also it can only test AI which human can do.

Total Turing test needs CV and robotics with NLP, KR, AR, ML [1]

[1] Computer Vision, Natural Language Processing, Knowledge Representation, Automated Reasoning, Machine Learning

Applications of AI

In many domains including finance, robotics, bioinformatics, vision, natural language, *etc*.

- Spam filtering
- Speech/handwriting recognition
- Object detection/recognition
- Weather prediction
- Stock market analysis
- Search engines (e.g, Google)
- Ad placement on websites
- Adaptive website design
- Credit-card fraud detection
- Web page clustering (e.g.,Google News)
- Machine Translation (e.g., Google Translate)
- Recommendation systems (e.g., Netflix, Amazon)
- Classifying DNA sequences
- Automatic vehicle navigation
- Performance tuning of computer systems
- Predicting good compilation flags for programs

and many more...

Types of Learning

- **Supervised:** "right answers" are provided by teacher for sufficient training examples. Computer tells "right answers" for new input. Performance measure. (Classification and regression)
- **Unsupervised:** "right answers" are NOT provided, computer tries to make sense of the data. How good the spread of items is. (clustering and association rule)
- **Semi-supervised:** "right answers" are provided for few training examples only
- **Active:** computer can ask questions. Needs less training. Opposite is passive learning
- **Lazy:** learner do not consolidate the findings.
- **Reinforced:** hit and trial method to minimize cost. (game playing)
- **Transfer:** Learning a task B to do A. (cycle riding for bike riding)
- **Deep:** processing like human brain

Challenges

1. How good is the model
   Accuracy, CRR, EER, FAR, FRR, ROC ...
2. How do I choose a model
   Decision Tree, SVM, Neural Network, ... ?
3. Do I have enough data
   Pre-processing, augmentation, ...?
4. Is data of sufficient quality
   Error/Noise in data, missing values ... ?
5. How confidence the result is
   Significance, Probability ... ?
6. Am I describing the data correctly
   whether features are correct ?
7. How fair the system is
   if it behaves equally to all?

Thank You!

Thank you very much for your attention!

Queries ?

(Reference[2])

[2] Book - *AIMA*, ch-01, Russell and Norvig.