

# Introduction to Artificial Intelligence

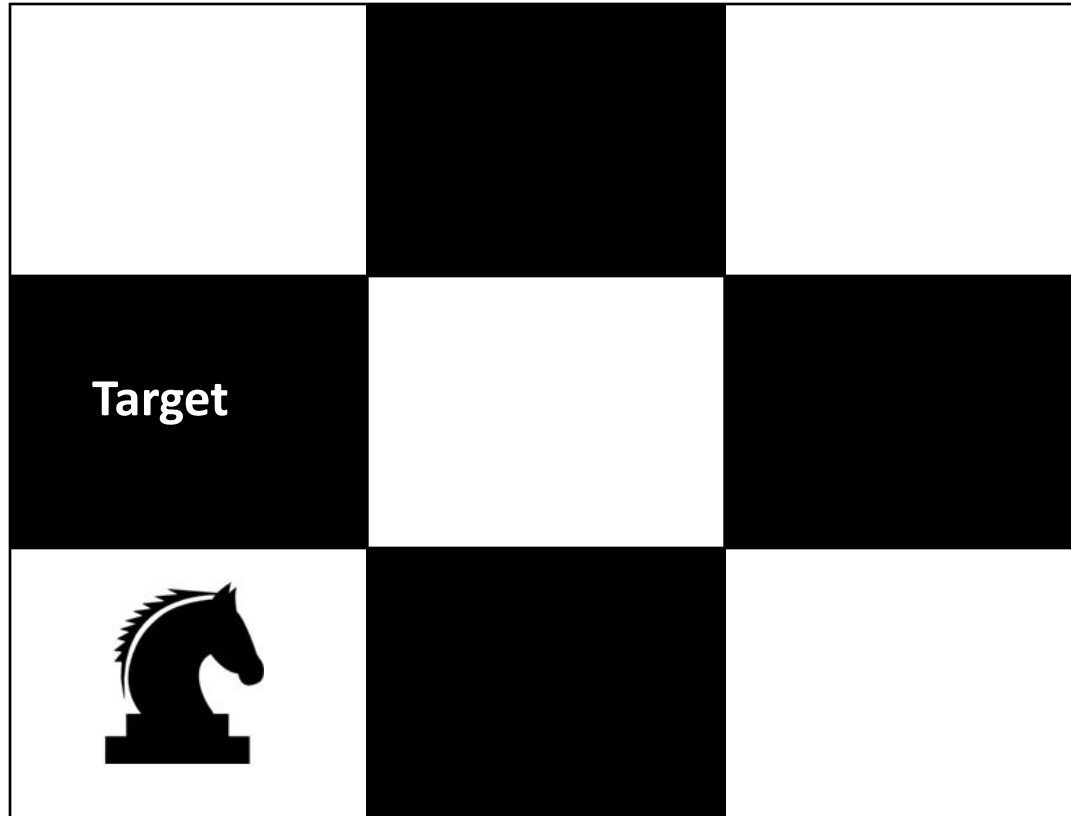
IICT Lecture 07

# Intelligence

- A very general mental capability that involves the ability to **reason**, **plan**, **solve problems**, **think abstractly**, **comprehend complex ideas**, **learn quickly** and **learn from experience**. [1]
- Measurement of Intelligence:
  - Intelligence Quotient (IQ)
    - An intelligence quotient or IQ is a score derived from a set of standardized tests developed to measure a person's cognitive abilities ("intelligence") in relation to their age group

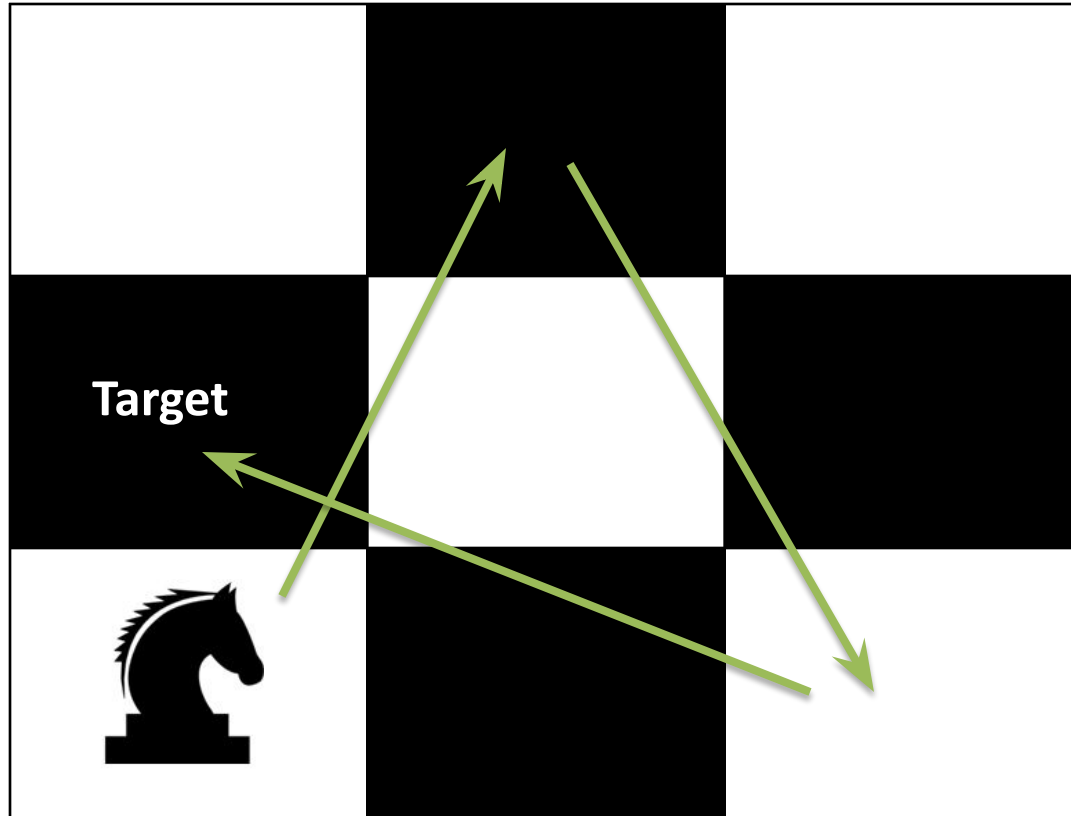
# Planning: Knight's Plight

Can we move the given knight to the “Target” location?



# Planning: Knight's Plight

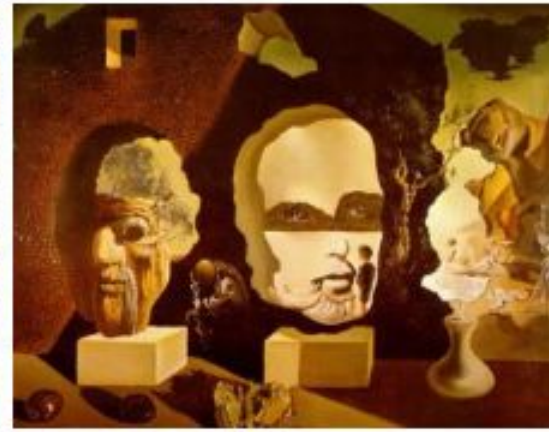
Can we move the given knight to the “Target” location?



# Painting by two different painters: Supervised Learning



Painter **A**



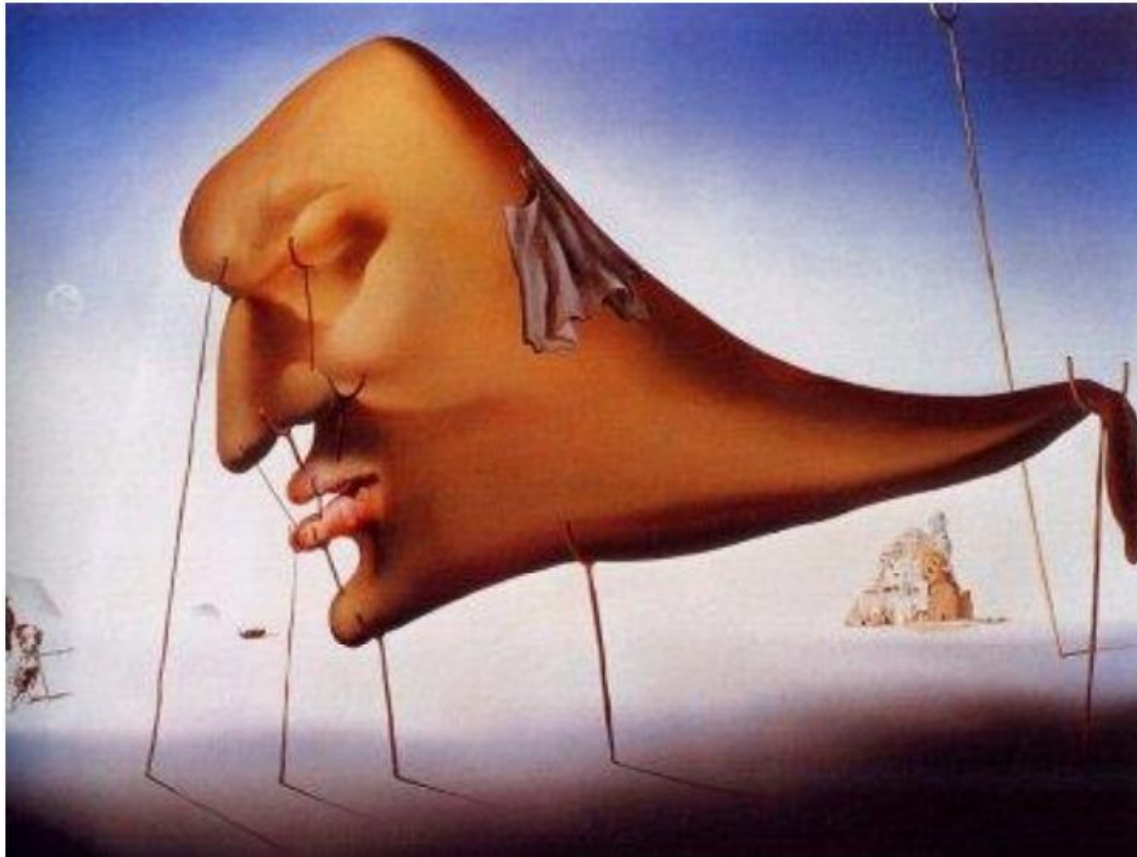
Painter **B**

Now your turn...

Who's painting is this?



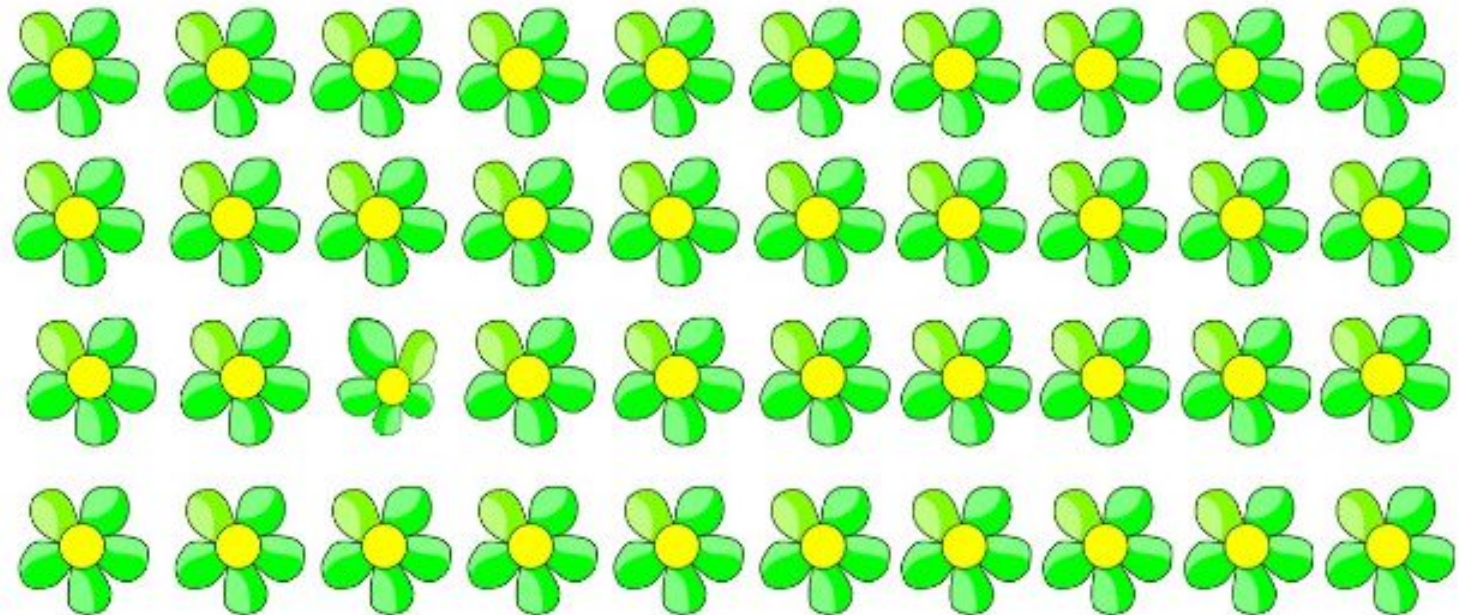
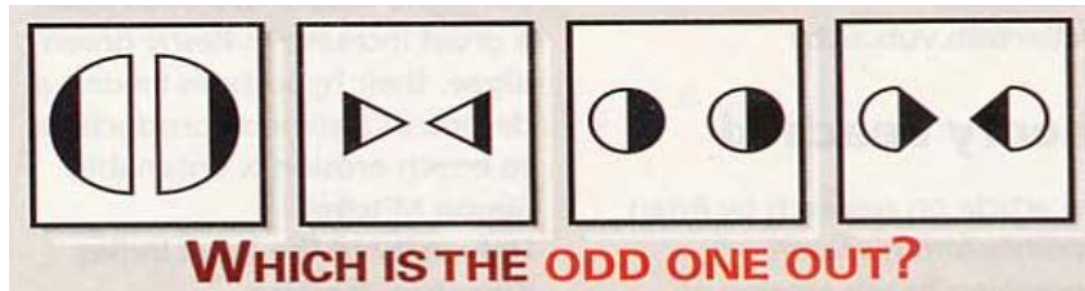
And this?





# Finding the odd one out:

## Unsupervised Learning



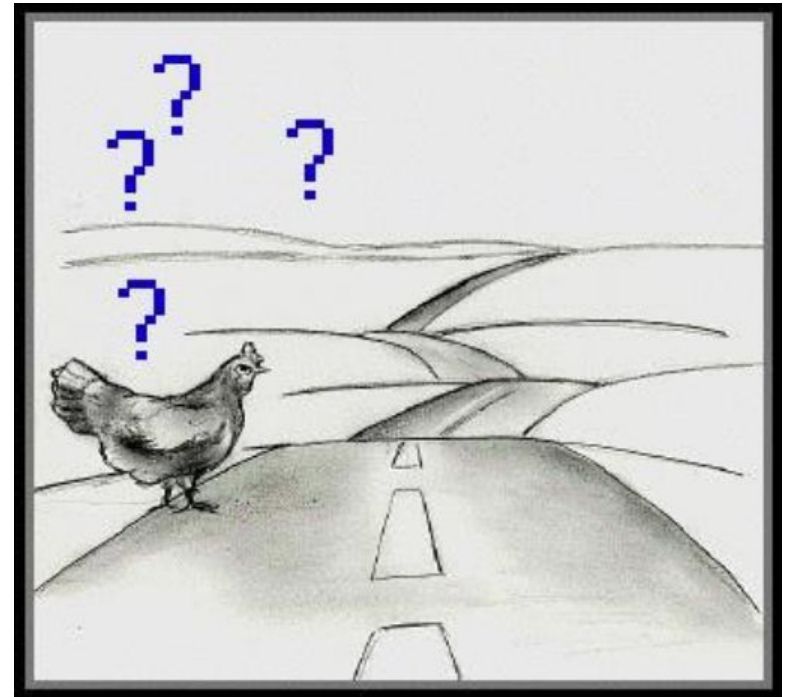


# Some more...

What is the next number in this series?

- 1, 1, 2, 3, 5, ?

Would you cross a road when a fast car is approaching?



These are the very characteristics of  
Intelligent beings!!

# Conclusion

- Knight's Plight
  - Planning
- Finding the odd one out
  - Unsupervised Learning
- Painting by two different painters
  - Supervised Learning
- Series Completion
  - Prediction
- Road Crossing
  - Rational Actions
- Process of Writing this Conclusion
  - Summarizing, Abstraction



# What is Artificial Intelligence?

- Computers are Dumb.
- Making a machine (computer) to perform the same tasks which you have just done is called \_\_\_\_\_.
  - Artificial Intelligence
- If you learn to do these tasks using existing data, then this is called \_\_\_\_\_.
  - Machine Learning

# Artificial Intelligence

- Artificial Intelligence takes the problem of understanding *how we think* a step further
  - It attempts not just to understand it – but – also to build intelligent entities
- A more proper definition of Artificial Intelligence
  - *The art of creating machines that perform functions that require intelligence when performed by people [1]*
- Measurement of Artificial Intelligence
  - Turing Test

# Artificial Intelligence

- Artificial Intelligence has many subfields. For example, machine learning, natural language processing, computer vision, big data, data mining, robotics, etc.
- Many of these subfields have a huge overlap.

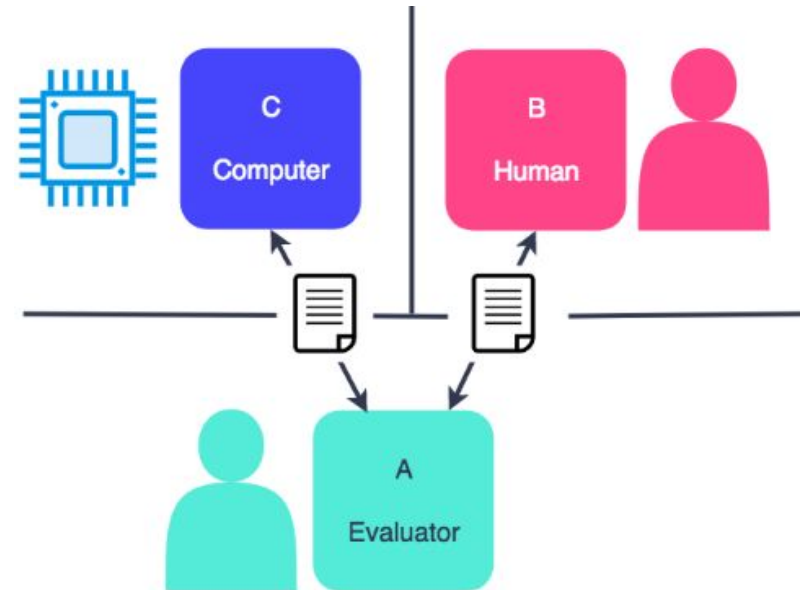
# Turing Test

- A method proposed by Alan Turing to determine whether a machine can demonstrate human intelligence.
- The machine will engage in a conversation with a human. The conversation will not be face to face.
- If after the human cannot detect that the other person is actually a machine, then the machine has human intelligence.



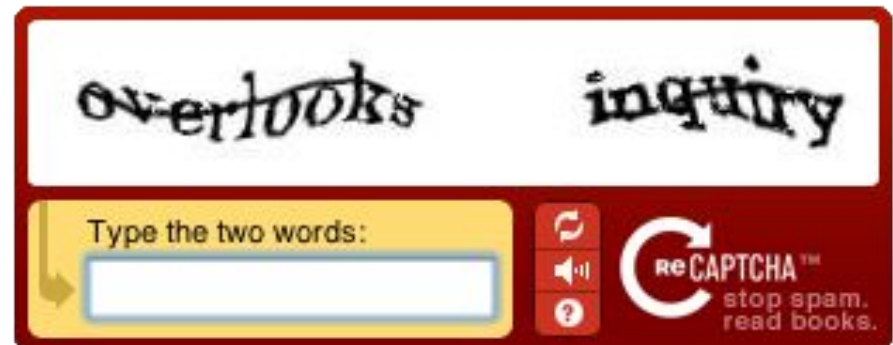
# Turing Test

- Turing Test
  - Suggested major components of AI: knowledge, reasoning, language understanding, learning
- Application of the Turing Test
  - CAPTCHA: **C**ompletely **A**utomated **P**ublic **T**uring test to tell **C**omputers and **H**umans **A**part



# CAPTCHA

- Completely Automated Public Turing Test To Tell Computers and Humans Apart
- CAPTCHA protects websites against bots by generating and grading tests that humans can pass but computer programs cannot. For example, humans can read distorted text as the one shown below, but current computer programs can't:



# CAPTCHA

- USES:

1. Preventing Comment Spam
2. Preventing Automated Registrations
3. Protecting online voting/polls.

# Is AI intelligent?

- Planning
  - Kasparov Vs. IBM Blue (1997)
- Calculation
  - Symbolic Integration in Mathematica
  - Theorem Provers



$$\int e^{2x} \cos 3x \, dx = \frac{1}{3} e^{2x} \sin 3x + \frac{2}{9} e^{2x} \cos 3x - \frac{4}{9} \int e^{2x} \cos 3x \, dx$$
$$+ \frac{4}{9} \int e^{2x} \cos 3x \, dx \qquad + \frac{4}{9} \int e^{2x} \cos 3x \, dx$$

$$\frac{13}{9} \int e^{2x} \cos 3x \, dx = \frac{1}{3} e^{2x} \sin 3x + \frac{2}{9} e^{2x} \cos 3x$$

$$\frac{9}{13} \frac{13}{9} \int e^{2x} \cos 3x \, dx = \frac{9}{13} \left( \frac{1}{3} e^{2x} \sin 3x + \frac{2}{9} e^{2x} \cos 3x \right)$$

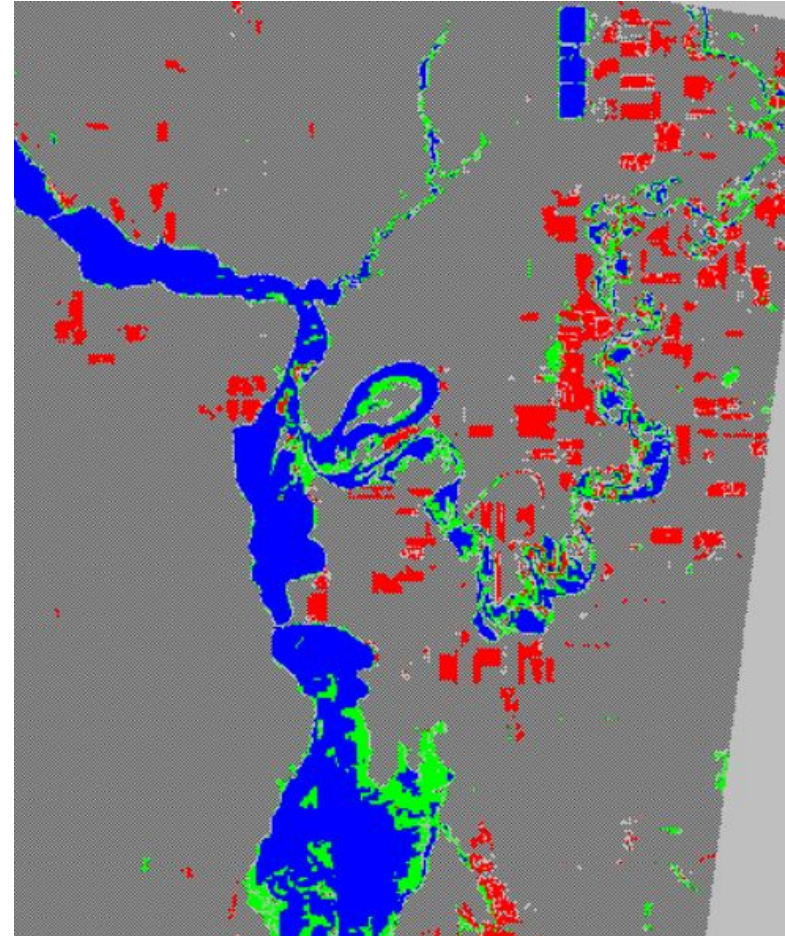
$$\int e^{2x} \cos 3x \, dx = \frac{3}{13} e^{2x} \sin 3x + \frac{2}{13} e^{2x} \cos 3x + C$$

# Is AI intelligent?

- Learning without a Teacher
  - ERDAS Imagine
  - Classification of Land Use

ERDAS:

- World Class Remote Sensing Software



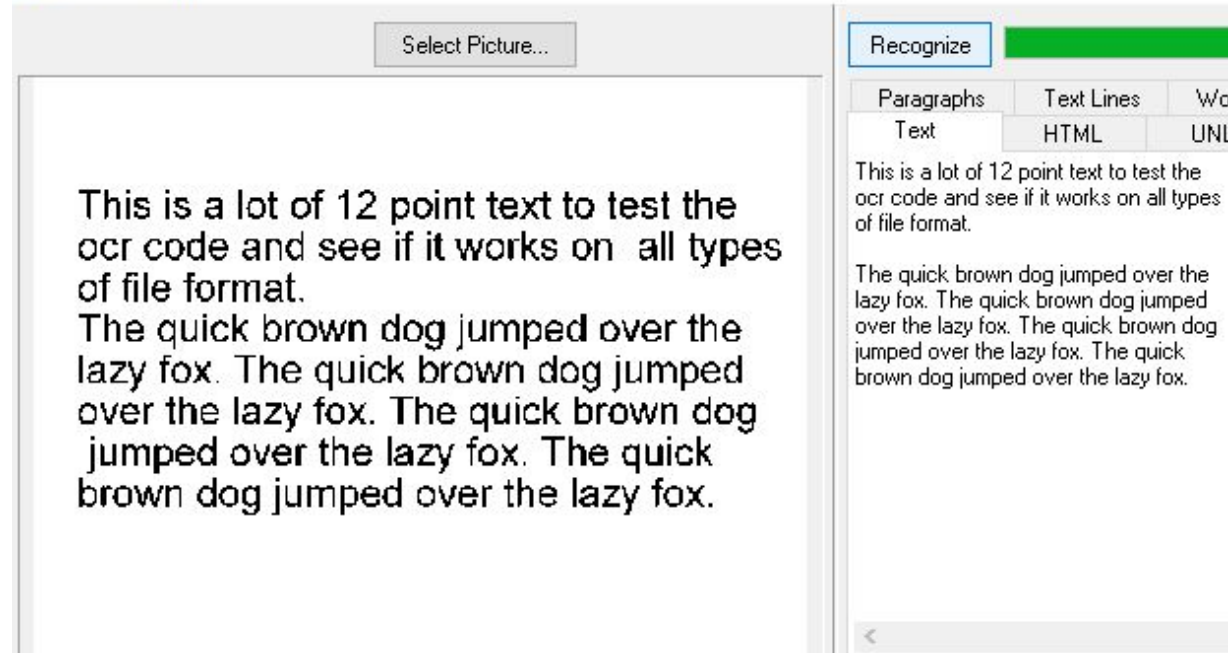
■ = water; ■ = wetland; ■ = marginal habitats; ■ = upland (non-useable habitats).



# Is AI intelligent?

7 OCR Example

- Learning with a teacher
  - No Hands Across America!
  - Optical Character Recognition





# Forecasting and Prediction

Block B, Lahore

Monday

Clear with periodic clouds



30°C | °F

Precipitation: 0%

Humidity: 83%

Wind: 0 km/h

Temperature

Precipitation

Wind



12 AM

3 AM

6 AM

9 AM

12 PM

3 PM

6 PM

9 PM

Mon



30° 18°

Tue



31° 17°

Wed



31° 18°

Thu



31° 18°

Fri



27° 16°

Sat



27° 14°

Sun



26° 13°

Mon



26° 13°

# Is deep blue Intelligent?

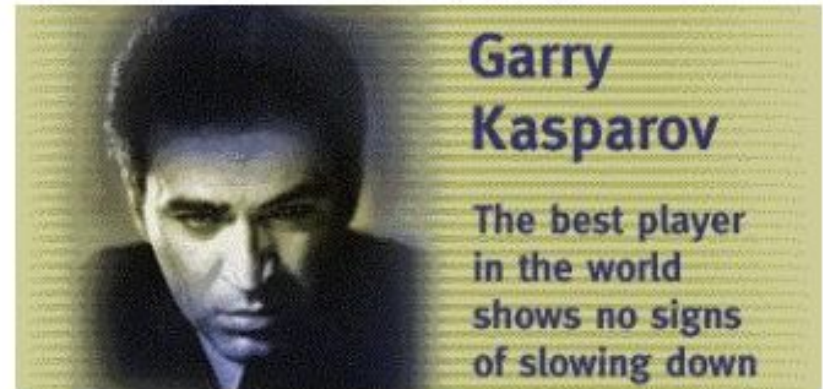


Deep Blue defeated the world chess champion Garry Kasparov.

Does this make Deep Blue **an intelligent machine**?

- Think about it for a few seconds and take a stance
- **Write down at least two items** that support your claim either way
- Pair up with your neighbor and Exchange opinions
- Try to argue for your stance
- Listen carefully to the arguments of your neighbor
- Try to reach an agreement, if possible
- Make your verdict: YES (machine is intelligent) or NO (machine is not intelligent) or X (no agreement)

# Deep Blue Vs Garry Kasparov



**200,000,000 board configurations**  
per second

**3 board configurations** per second

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Has **small knowledge** about chess,  
but a **huge computational**  
**capacity**

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Has **huge knowledge** about chess,  
but a considerably **smaller**  
**computational capacity**

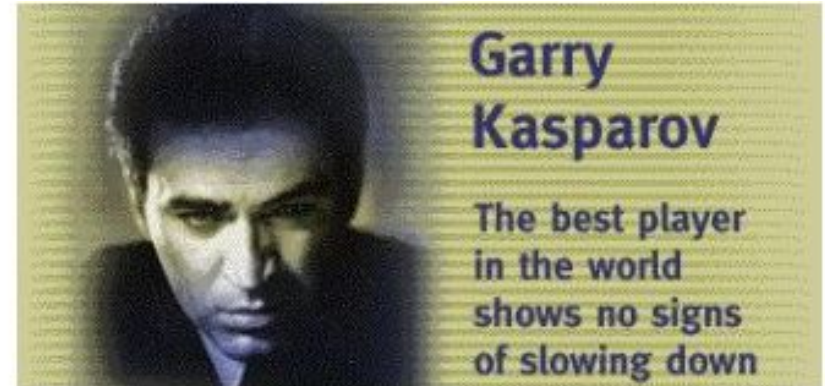
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A machine **has no emotions nor**  
**intuition**, it does not forget, cannot  
be confused or feel uncomfortable

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Has feelings and **brilliant intuition**,  
but can experience **fatigue and**  
**boredom** and loss of concentration





Deep Blue **does not learn**, therefore it can't use artificial intelligence to learn from its opponent

Deep Blue is incredibly efficient in **solving problems from the domain of chess** but is less "intelligent" even compared to a small child

Garry Kasparov can learn and **adapt quickly** based on his success or failure

Garry Kasparov is **generally very intelligent**: he authored several books and speaks many languages

# Natural Language Processing

- *A branch of AI*
- *The man tried to take a picture of a man with a turban.*
  - Did the man try to take a picture with a turban, or
  - take a picture of a man who is wearing a turban?
- *The man saw the boy with the telescope*
- Communicating in natural language assumes **world knowledge** and **the understanding of context**, both of which are required to resolve the ambiguities

# Natural Language Processing

- Google Now, Apple's Siri, Microsoft's Cortana, Amazon Alexa, etc. are examples of natural language processing.
- They help to find useful information when we ask for using speech.
- They can also perform other tasks when you ask, such as setting the alarm, making a phone call, etc.



# Computer Vision

- A branch of AI that enables computer to understand the content of images and videos.
- Applications:
  1. Optical character recognition (OCR)
  2. Traffic Rule Violation
  3. Object Detection and Recognition

**END**