

# Introduction to Artificial Intelligence

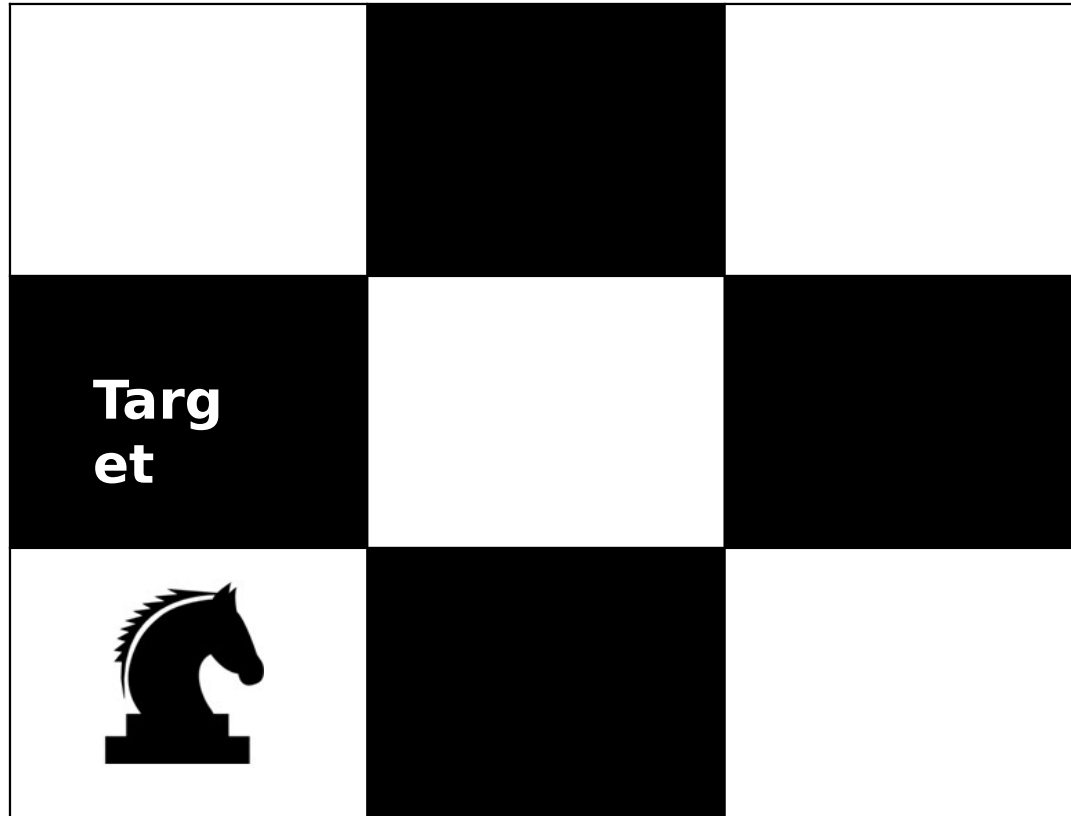
## IICT Lecture 08

# 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

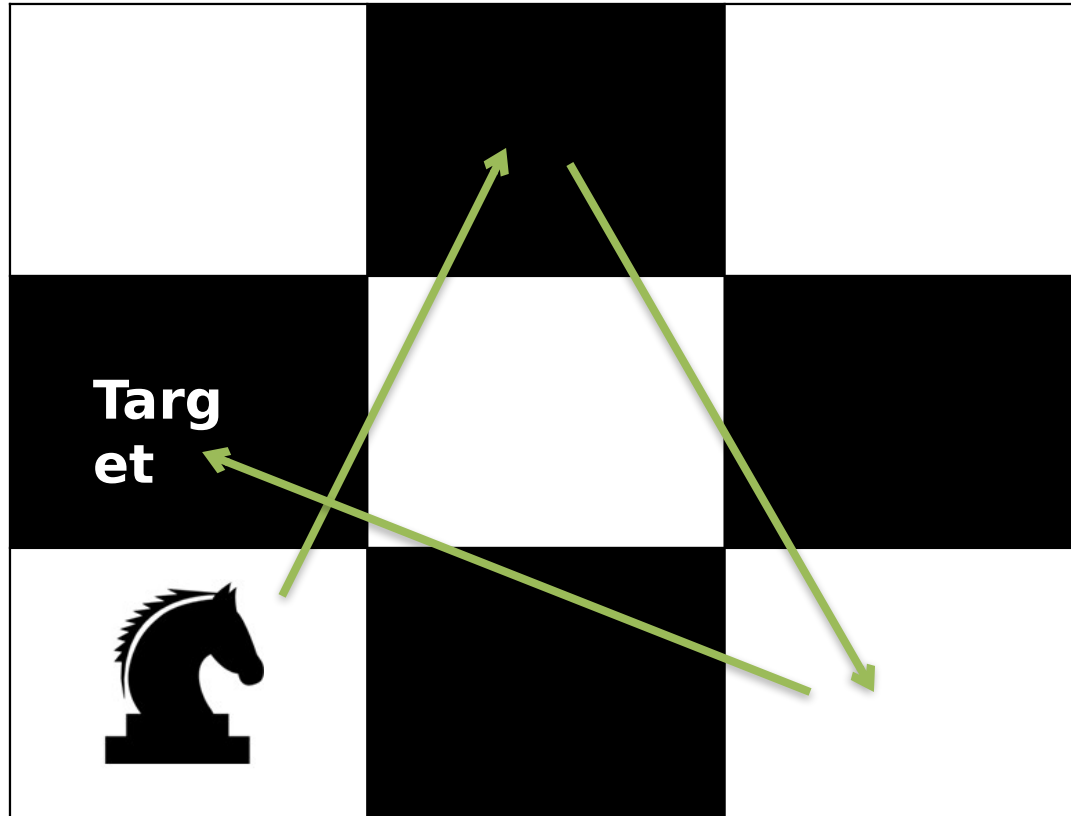
# Planning: Knight's Plight

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



# Planning: Knight's Plight

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# Calculative Puzzle:

## Calculation, Computation, Reasoning

The number of times the digit 0 appears in this puzzle is ?.

The number of times the digit 1 appears in this puzzle is ?.

The number of times the digit 2 appears in this puzzle is ?.

The number of times the digit 3 appears in this puzzle is ?.

The number of times the digit 4 appears in this puzzle is ?.

The number of times the digit 5 appears in this puzzle is ?.

The number of times the digit 6 appears in this puzzle is ?.

Replace ? Sign with count of numbers?

# Calculative Puzzle:

## Calculation, Computation, Reasoning

The number of times the digit 0 appears in this puzzle is 1.

The number of times the digit 1 appears in this puzzle is 11.

The number of times the digit 2 appears in this puzzle is 2.

The number of times the digit 3 appears in this puzzle is 1.

The number of times the digit 4 appears in this puzzle is 1.

The number of times the digit 5 appears in this puzzle is 1.

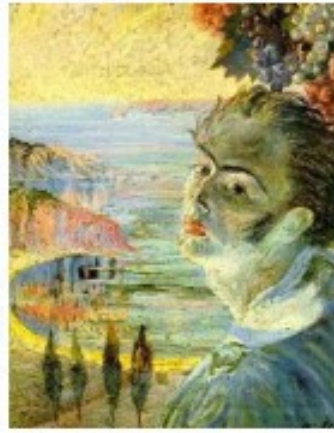
The number of times the digit 6 appears in this puzzle is 1.

Replace ? Sign with count of numbers?

# Painting by two different painters: Supervised Learning



**Painter A**



**Painter B**

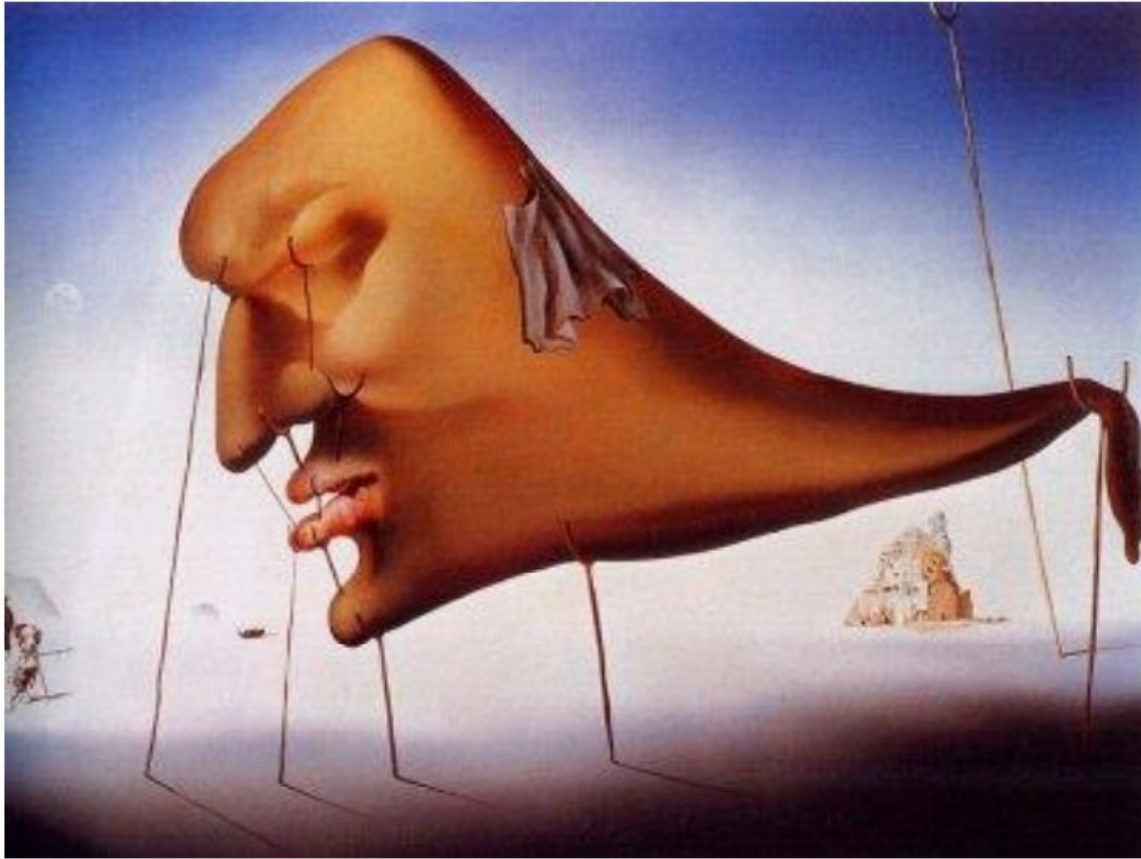
Now your turn...

Who's painting is this?



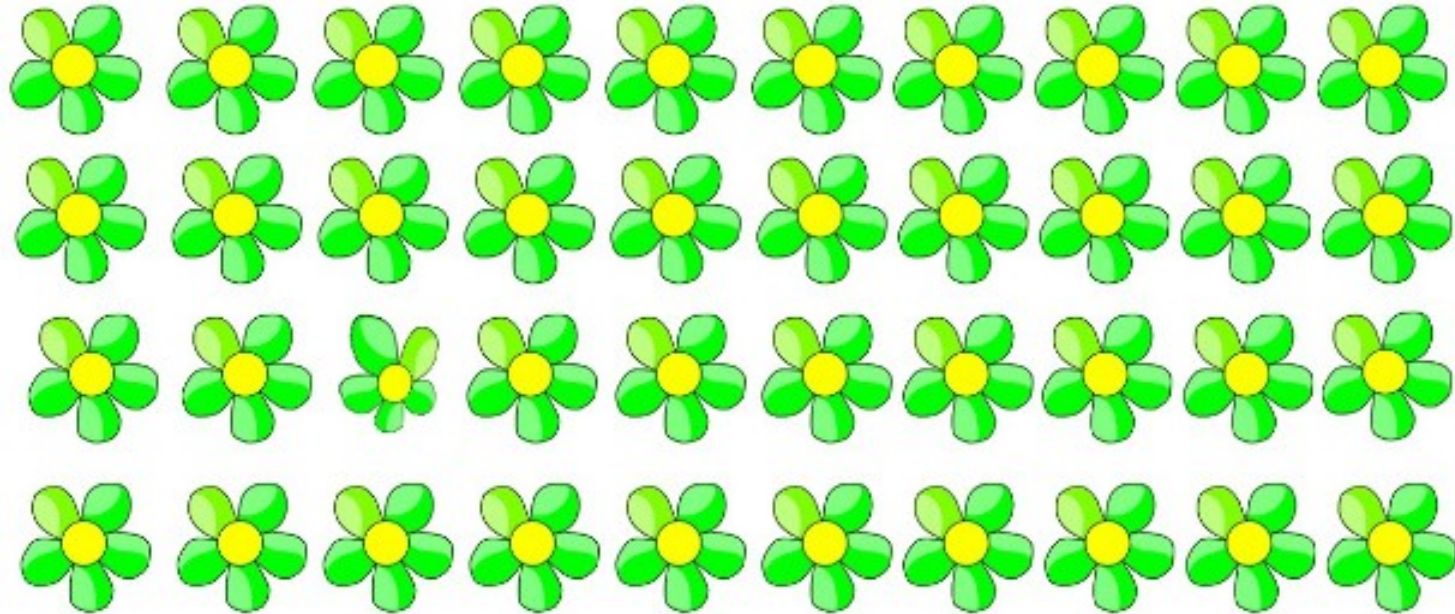


And this?



# Finding the odd one out:

## Unsupervised Learning

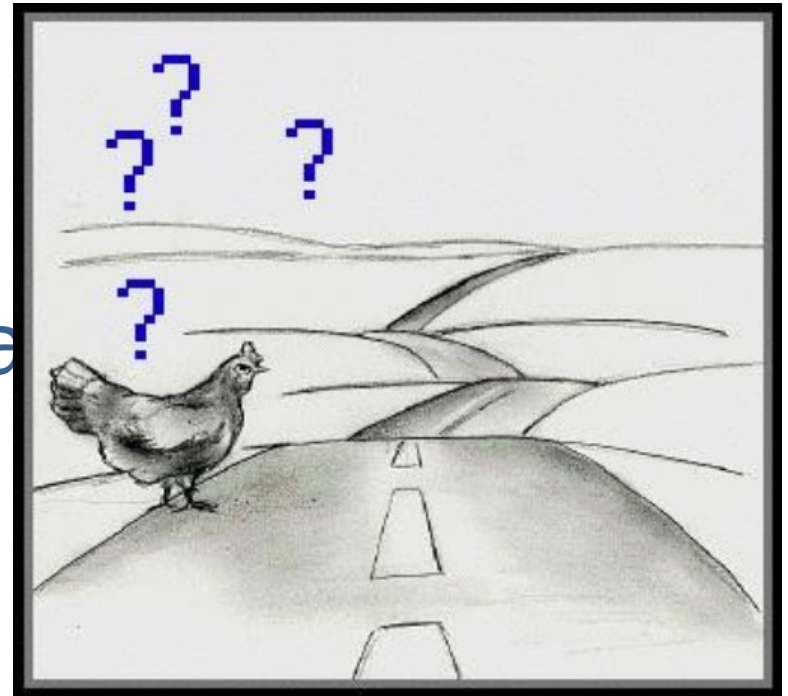


# Some more...

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
- Calculative Puzzle
  - Calculation, Computation, Reasoning
- Finding the odd one out
  - Unsupervised Learning
- Painting by two different pairs
  - Supervised Learning
- Series Completion
  - Prediction
- Road Crossing
  - Rational Actions
- Process of Writing this Conclusion
  - Summarizing, Abstraction



# What is Artificial Intelligence?

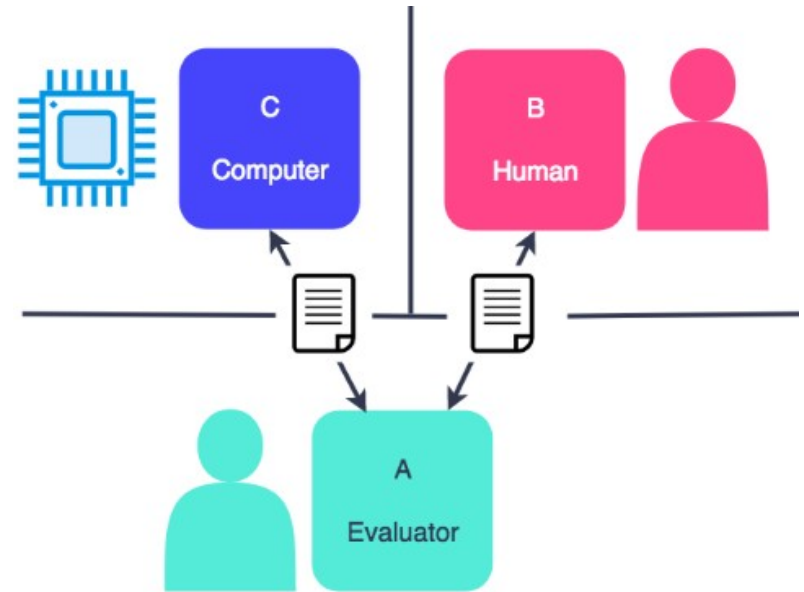
- Computers are Dumb.
- Making a machine (computer) to perform the same tasks which you have just done is called \_\_\_\_\_.
  - Artificial Intelligence
- If you learn to do these tasks using existing data, then this is called \_\_\_\_\_.
  - Machine Learning

# 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

# 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





# Is AI intelligent?

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



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

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

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

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

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

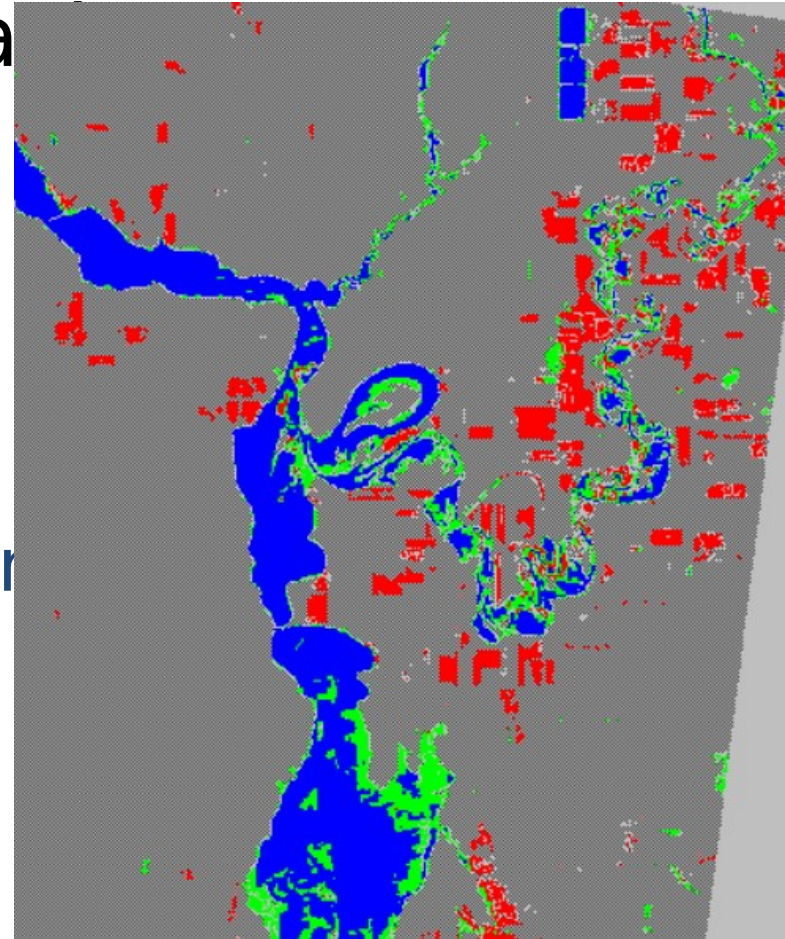


# Is AI intelligent?

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

ERDAS:

- World Class Remote Sensing Software

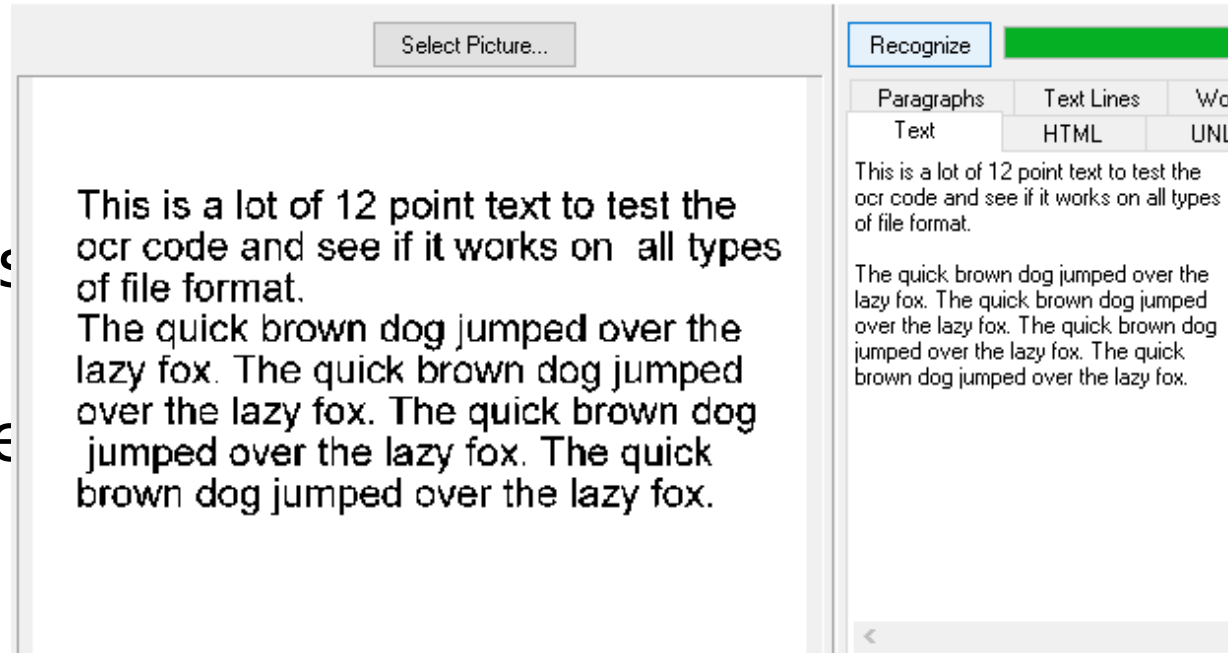


■ = water; ■ = wetland; ■ = marginal habitats; ■ = upland (non-useable habitats).

# 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%

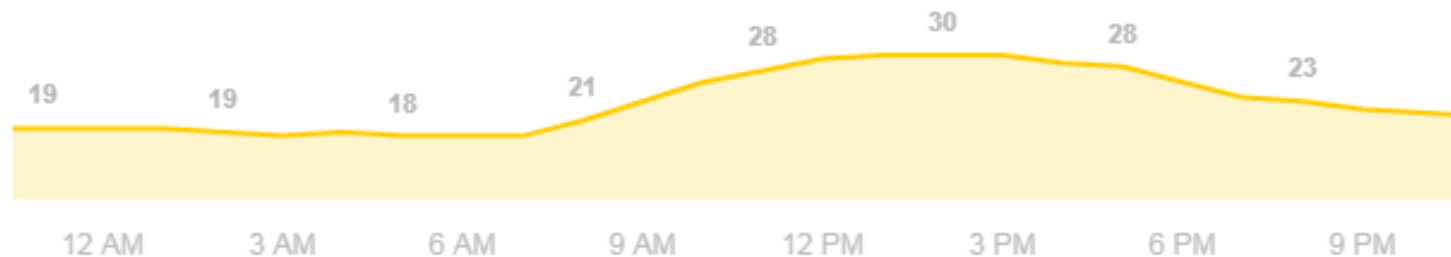
Humidity: 83%

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?

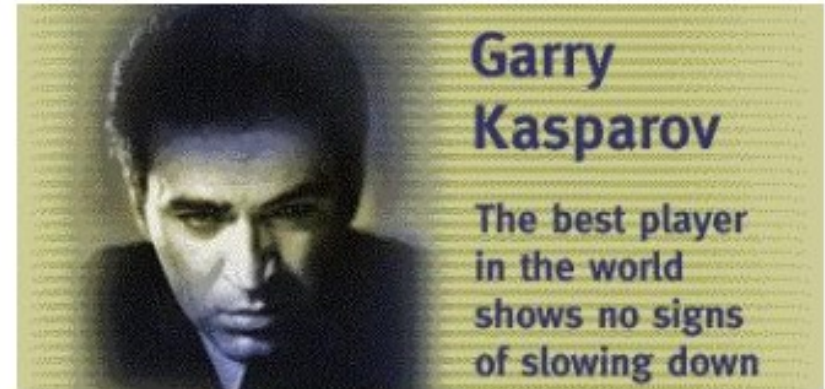


Deep Blue defeated the world chess champion Garry Kasparov. Does this make Deep Blue **an intelligent machine?**

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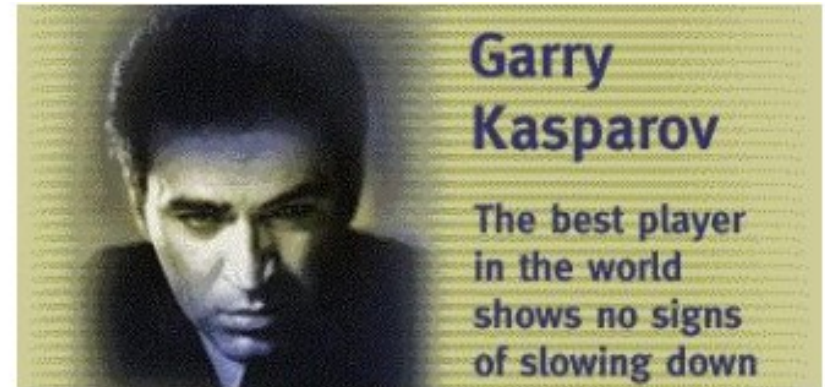
Has **huge knowledge** about chess, but a considerably **smaller computational capacity**

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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

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

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

# Natural Language Understanding

- *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

# Case Study: Self-driving Car