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Machine Learning & Neural Networks

1.- Intelligence & Learning

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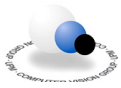

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Intelligence and learning

- *What is intelligence?*
- *What are intelligent machines?*
- *The learning relevance*
- *Building intelligent machines*
- *Objectives of the subject*
- *Applications*

related concepts

inteligence

machine intelligence

machine learning

artificial neural networs

dimensionality reduction

Data Mining

pattern recognition

¿ What is intelligence ?

"Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. […], it reflects a broader and deeper capability for comprehending our surroundings -- "catching on," "making sense" of things, or "figuring out" what to do"

statement signed by 52 experts in intelligence in the Wall Street Journal & in the Intelligence Journal 1994

¿ What is intelligence ?

- "Prediction is the real essence of cerebral function", Rodolfo Llinás "I and the vortex"
- "Intelligence is the capability of predicting future", Jeff Hawkins "On Intelligence"

Recognition, prediction and learning

an intelligent machine has to recognize the situation and predict the future based on learned previous experiences

¿ Machine intelligence ?

Lunes, 16 de abril de 2001. Archivo | Estrellas | Diario del Na

E-SOCIEDAD

MAQUINA PARA PENSAR

Científicos rusos logran crear un ordenador con el mismo potencial intelectual que el cerebro humano

«Hay que educarlo como a un recién nacido», asegura uno de los investigadores

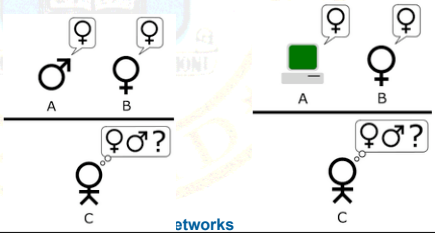
AFP

MOSCU.- Científicos rusos han anunciado la creación del primer cerebro artificial, un 'neuro-ordenador' dotado del mimso potencial intelectual que el cerebro humano, según informa la agencia Interfax.

¿ Machine intelligence ?

Alan Turing test:

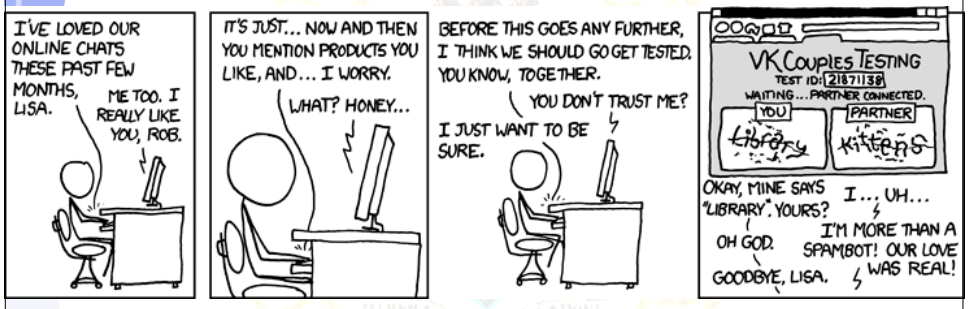
- original version: "a machine is said to be intelligent if it can fool a judge as often as a person in pretending to be a man/woman"
- later extended version: "a machine is said to be intelligent if it can fool a judge to be a person"



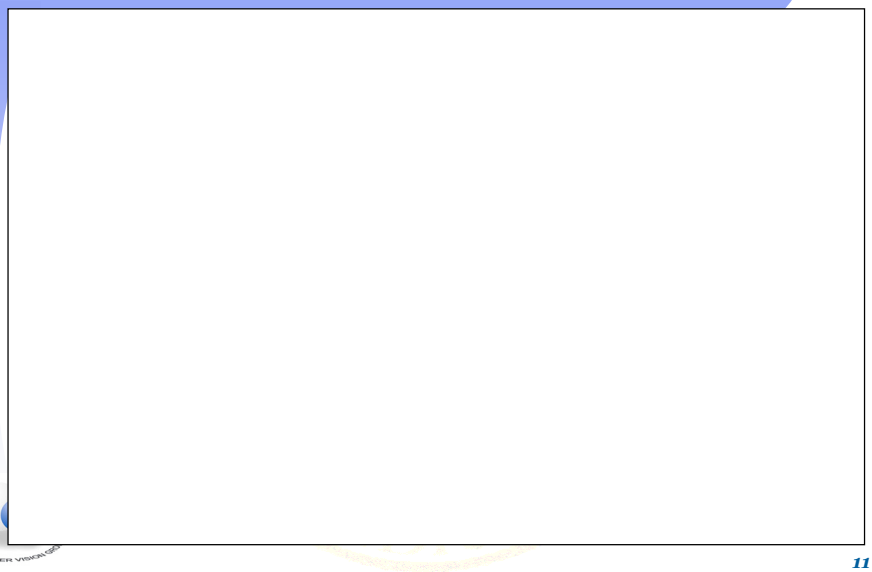
¿ Machine intelligence ?

- "Chinese room paradigm: suppose that a machine convinces a human Chinese speaker that the program is itself a human Chinese speaker, then the machine is substitute by a non Chinese speaking person in a room provided with the same algorithm and information as the machine had. Does he/she understand Chinese? " de John Searle

"A real person's answered it. I hate that. I'll call back when their voicemail's activated."



Learning relevance



learning relevance

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¿How to build intelligent machines?

- Explicit model
  - top-down methodology

- Example learning
  - boton-up methodology

Knwoledge based systems	Learning based systems
▪ *Programmed* ▪ *Serial Processing* ▪ *Symbolic data* ▪ *High dimensional state space searching*	▪ *Self-learning* ▪ *Parallel processing* ▪ *Symbolic Patterns* ▪ *Signal processing*
- paradigms: ▪ physical equations ▪ expert systems	- paradigms: ▪ experimental parameters ▪ neural networks

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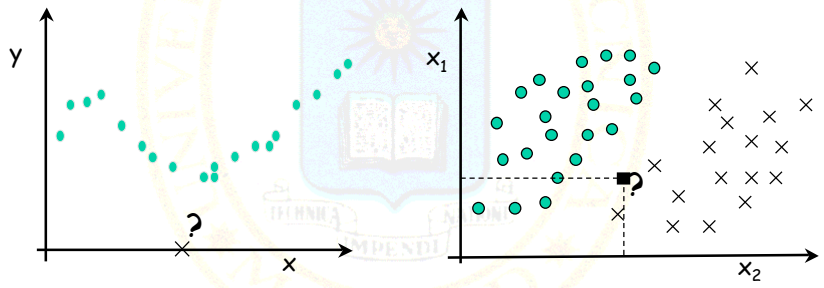
Ojectives of the subject

Find a model that predicts the right output to a new input, considering outputs to previous inputs.



Learning applications

- *Pattern Recognition*
- *Control*
- *Identification*
- *Associative memory*
- *Optimization*

Pattern Reconition Applications

- ***Representation, recognition and prediction of the state of a multidimensional input vector, which can be:***
  - The state of an industrial process from the field sensors (includes also alarm management)
  - The state of an electrical net
  - The atmospheric state from a spread net of sensors
  - The seismical or geological state
  - The state of a vehicle (e.g. airplane, car, …)
  - The commercial situation of a company from its whole accountability
  - Patterns in images (e.g. visual, IR, electromagnetic, ..)

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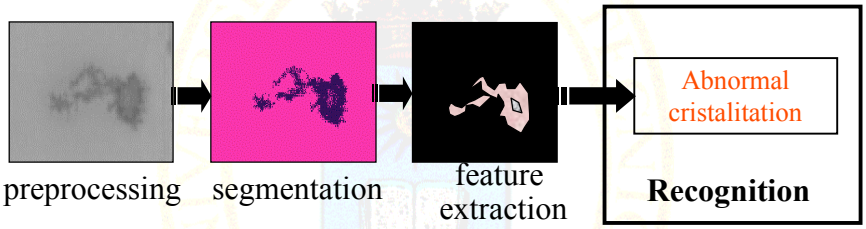
Computer Vision applications



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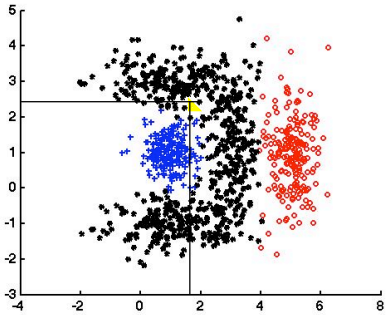
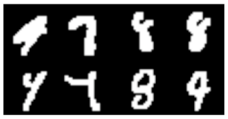
Your applications

1. Synthetic data



2. Real data



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