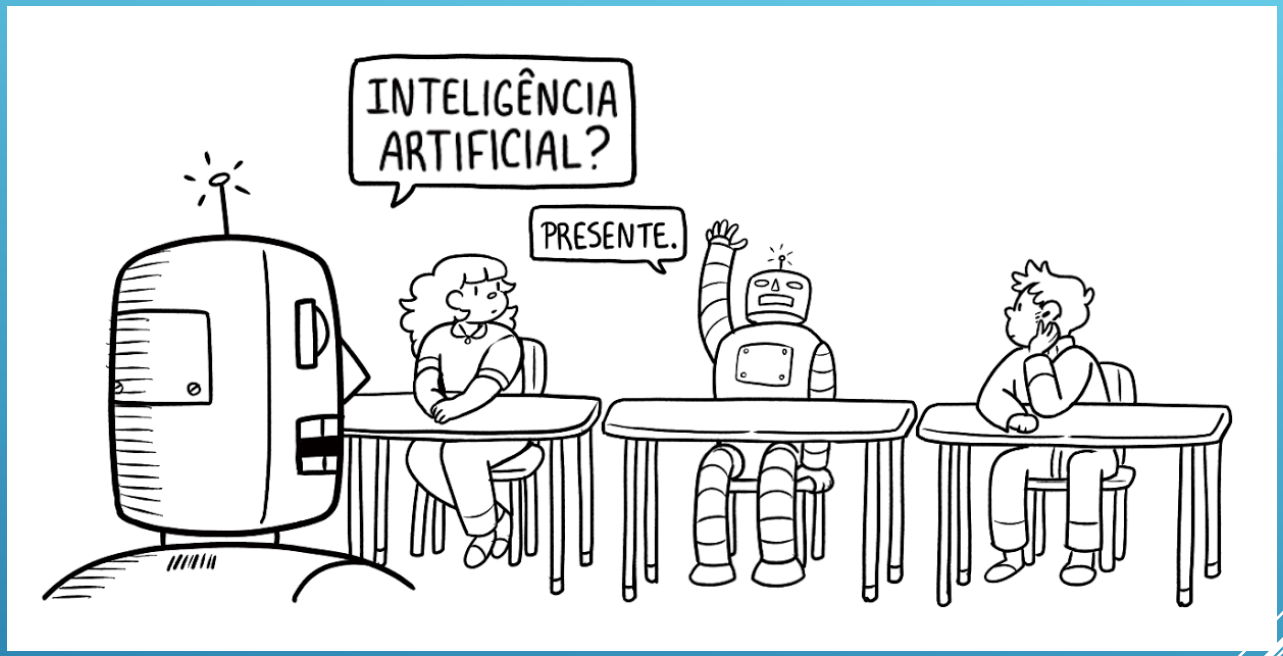

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CONTEÚDO

- Métodos baseados em procura
- Algoritmos para jogos
- Representação do conhecimento
- Geração de planos
- Modelos com incerteza
- Aprendizagem de máquina

BIBLIOGRAFIA

- Artificial Intelligence: a Modern Approach, 3rd. Edition. Peter Norvig and Stuart Russell, Prentice Hall
- Artificial Intelligence: a New Synthesis, Nils Nilsson
- Artificial Intelligence, Elaine Rich and Kevin Knight

AVALIAÇÃO

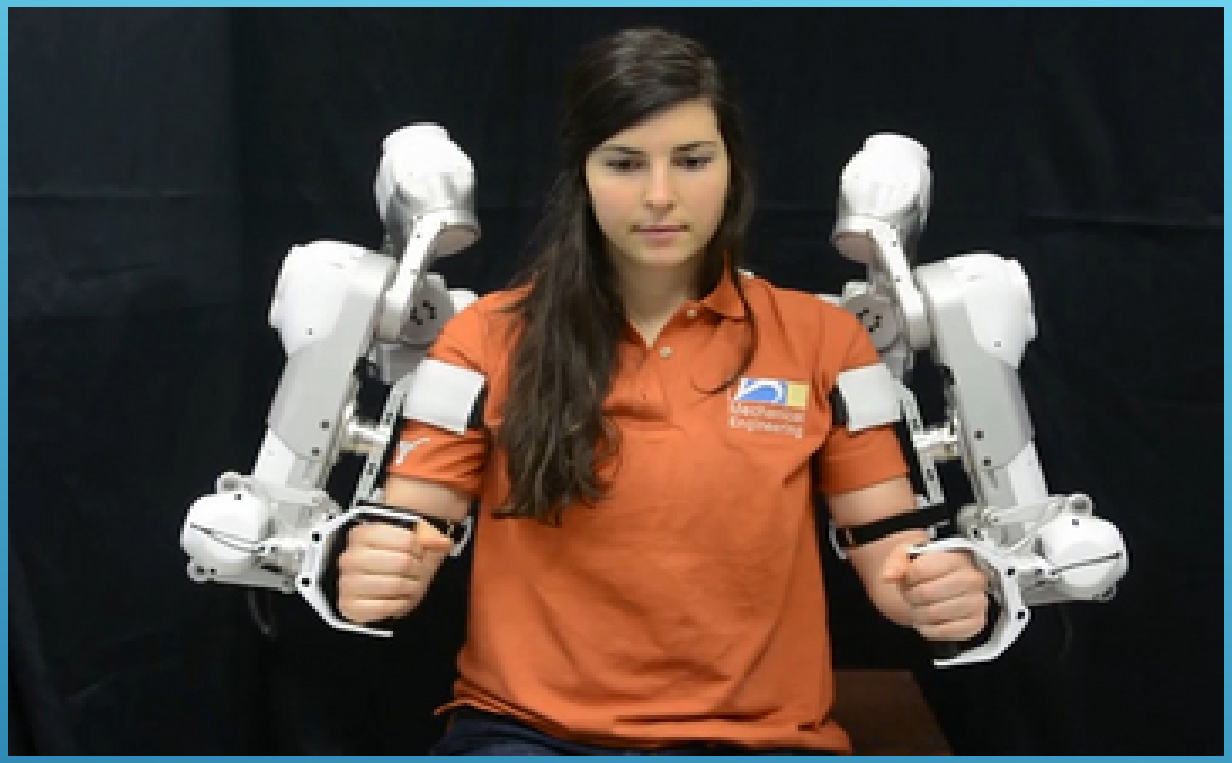
- Testes
- Trabalhos
- Exame
- Critérios de avaliação na ficha da unidade curricular

MEIOS DE COMUNICAÇÃO

- **Email: ines@dcc.fc.up.pt (pf, não usem dutra@fc.up.pt)**
- **Página da disciplina no sigarra**
- **Mailing list interna do DCC: ia1617@dcc.fc.up.pt**

- **Página da disciplina:**
- **http://www.dcc.fc.up.pt/~ines/aulas/1617/IA/IA.html**

AT ROBOT RESTAURANT 20 ROBOTS DELIVER FOOD TO THE TABLE, COOK DUMPLINGS AND NOODLES, USHER DINERS AND ENTERTAIN THEM IN HARBIN, HEILONGJIANG PROVINCE IN CHINA.



NSF-FUNDED UNIVERSITY OF TEXAS AUSTIN DESIGNED HARMONY TO DELIVER PHYSICAL THERAPY AND AID NEUROLOGICAL DISORDERS SUCH AS STROKE AND SPINAL CORD INJURY

IS IT ALL ABOUT ROBOTS?

OUTLINE

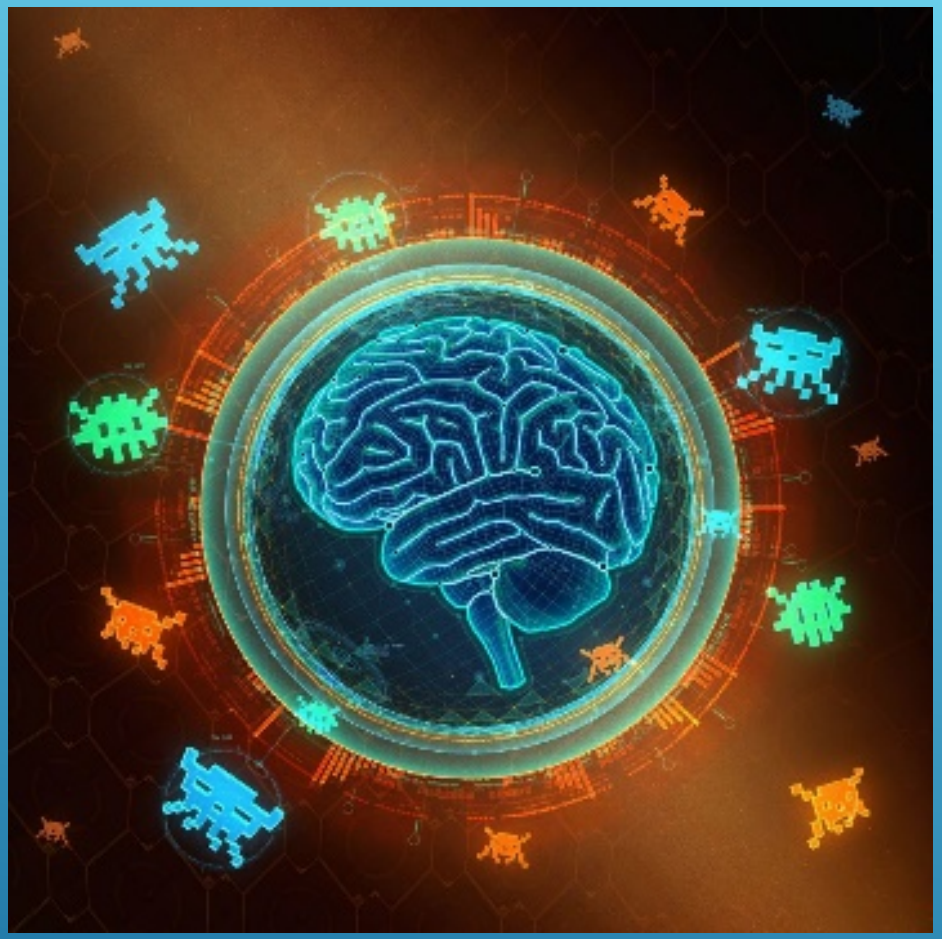
- Current AI
- AI in Portugal

- **(Meta)Heuristic Search**
  - **Classical search**
  - **Constraint satisfaction**
  - **Simulated annealing**
  - **Hill climbing**
  - **Genetic algorithms**
  - **Evolutionary algorithms**
  - **Randomized algorithms**
  - **Tabu search**
- **Adversarial games**
- **Knowledge Representation**
- **Knowledge Engineering**
- **Knowledge Discovery / Data Mining / Machine Learning**
- **Planning and Scheduling**
- **Natural Language Processing**
- **Pattern Recognition (image and voice)**
-

APPLICATIONS → MULTIDISCIPLINARITY

(META)HEURISTIC SEARCH

- New heuristics and formulations for problems are published every year in main stream conferences and journals



Google’s DQN
(deep learning)

GAMES

Google achieves AI 'breakthrough' by beating Go champion

27 January 2016 | Technology

Google's DeepMind division has achieved a landmark in AI

KNOWLEDGE REPRESENTATION

- Logic
- Probabilistic relational models (PRM)
- Graphical models
- NO-SQL databases

Patient	Finding	Date	Calcification Fine/Linear	...	Mass Size	Location	Benign/ Malignant
P1	1	5/02	No	...	0.03	RU4	B
P1	2	5/04	Yes	...	0.05	RU4	M
P1	3	5/04	No	...	0.04	LL3	B
P2	4	6/00	No	...	0.02	RL2	B
...	...	...	...	...	...	...	...

ABOUT LOGIC

Patient	Finding	Date	Calcification Fine/Linear	...	Mass Size	Location	Benign/ Malignant
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ABOUT LOGIC

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P2	4	6/00	No	...	0.02	RL2	B
...	...	...	...	...	...	...	.

ABOUT LOGIC

$$
\begin{aligned}
same\_finding(F_1, F_2) \longleftarrow\ & MLOView(F_1) \wedge CCView(F_2) \wedge \\
& nipple\_distance(F_1, D_1) \wedge nipple\_distance(F_2, D_2) \wedge \\
& \big(abs(D_1 - D_2) < \epsilon\big) \wedge \\
& side(F_1, left) \wedge side(F_2, left) \wedge \\
& quadrant(F_1, upper\_outer) \wedge quadrant(F_2, upper\_outer) \wedge \\
& massShape(F_1, oval) \wedge massShape(F_2, oval).
\end{aligned}
$$

Kinds of representation:
time, location, space, hierarchies, concept aggregation

USEFUL TO CORRELATE INSTANCES

KNOWLEDGE DISCOVERY

- Buzz expression: big data
- Consensus today: **small data**!

- Machine learning:
  - Inductive logic programming
  - Probabilistic models
  - Active learning
  - Deep learning
  - Transfer learning

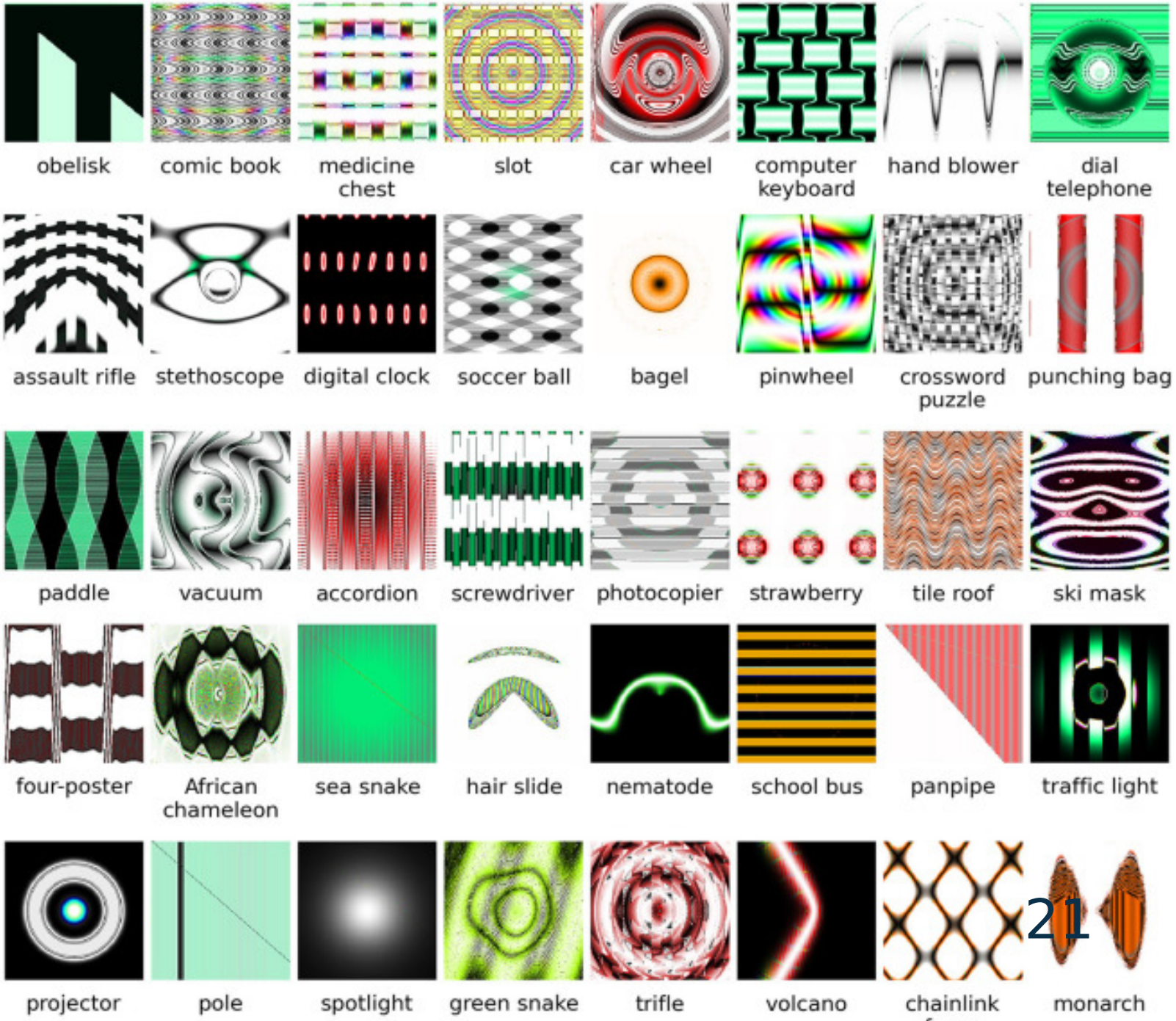
PLANNING AND SCHEDULING

- Graphplan
- Annual competition: International Workshop on the International Planning Competition (WIPC)
- PDDL or similar still being used

NATURAL LANGUAGE PROCESSING

- Advances with Google translator
- Interesting projects such as Floresta Sintatica
- Visual Interactive Syntax Learning (VISL)

PATTERN RECOGNITION



http://www.wired.com/2015/01/simple-pictures-state-art-ai-still-cant-recognize

Number of hits	Percentage of hits	Number of wrong	Percentage of wrong
63	73,26%	23	26,74%

- Relatorio: A pele e o tecido celular subcutâneo apresentam aspectos mamográficos normais.
- WS API: a pele e o tecido celular subcutâneo apresentam aspectos demográficos normais
- Voice Note: a pele e do tecido celular subcutâneo apresento aspectos demográficos normais.

SPEECH RECOGNITION

KEY

- Combination of various techniques
- For example, planning uses:
  - search +
  - machine learning +
  - pattern recognition +
  - knowledge representation (logic) and engineering
- Mathematical modeling and optimization
- Wearables (e.g., sneakers that detect humour or wearable for diabetic people) and smart applications

AI IN PORTUGAL

- Several groups:
  - Machine learning
    - Strong group at UP
  - Robotics
    - RoboCup → lots of research and championships
  - Knowledge representation
    - First order logic → YAP system totally developed in Portugal
- EPIA

CAN WE DO MORE?

- Maybe not compete with MIT…
- …but we have the competence to excel and be internationally recognized:
  - Intelligent wearables and smart apps
  - Knowledge representation and implementations
  - robotics

OTHER RELATED AREAS

- Paralellism
  - Can mitigate some of the combinatorial explosion of AI algorithms
- Neuroscience and Cognitive science
  - Helping to better understand mental processes and reasoning

- Let the discussion start…

TECH ARTIFICIAL INTELLIGENCE

Interview with Eugene Goostman, the Fake Kid Who Passed the Turing Test

Doug Aamoth | June 9, 2014

Chatbot Eugene Goostman supposedly passed the legendary Turing Test on Sunday, tricking 33% of a panel of judges into believing he was a real boy during the course of a five-minute chat conversation.

The milestone conveniently occurred 60 years to the day after Alan Turing passed away; Turing bet that by the year 2000, computers would be intelligent enough to trick humans into thinking they were real 30% of the time.

As you may or may not notice below, passing the Turing Test is less about building machines intelligent enough to convince humans they're real and more about building programs that can anticipate certain questions from humans in order to pre-form and return semi-intelligible answers.

Software may not be intelligent, but it can pass a major test

SEATTLE

BY JOHN MARKOFF

An artificial intelligence software program capable of seeing and reading has for the first time answered geometry questions from the SAT at the level of an average 11th grader.

The achievement, in which the program answered math questions it had not previously seen, was reported in a paper presented by computer scientists from the Allen Institute for Artificial Intelligence and the University of Washington at a scientific conference in Lisbon on Sunday.

The software had to combine machine vision to understand diagrams with the ability to read and understand complete sentences; its success represents a breakthrough in artificial intelligence.

Despite the advance, however, the researchers acknowledge that the program's abilities underscore how far scientists have to go to create software capable of mimicking human intelligence.

For example, Ali Farhadi, a University of Washington artificial intelligence researcher and a designer of the test-taking program, noted that even a simple task for children, like understanding the meaning of an arrow in the

such as abstract and common-sense reasoning.

The Allen Institute's program, which is known as GeoSolver, or GeoS, was described at the Conference on Empirical Methods on Natural Language Processing in Lisbon this weekend. It operates by separately generating a series of logical equations, which serve as components of possible answers, from the text and the diagram in the question. It then weighs the accuracy of the equations and tries to discern whether its interpretation of the diagram and text is strong enough to select one of the multiple-choice answers.

The Allen Institute approach has more in common with an earlier generation of artificial intelligence research that relied on logic and reasoning.

Moreover, the Allen Institute researchers said, machine-learning techniques have continued to fall short in areas where humans excel, such as problem solving.

"This is not pattern matching," said Oren Etzioni, a computer scientist and the chief executive of the Allen Institute.

While neural networks have made progress based on the availability of huge amounts of data available online, the Allen Institute approach works with relatively sparse data (even all the standardized-test questions do not make