Advanced Techniques in Artificial Intelligence

2021-2022

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Grado en Ingeniería en Informática

Content

- Goals
- Topics
- Bibliography
- Evaluation
- Project

- Motivation to ATAI

Goals

- Intelligent Agents
- Multi-agent Systems
- Planning
- To develop multi-agent systems
  - Labs & assignments:
    - JADE (Java Agent DEvelopment Framework)
    - JASON (Java version of AgentSpeak)
  - Final Assignment:
    - JGOMAS (Game Oriented Multiagent System based on JADE/JASON)
- Introduction to AI research

Topics

- Intelligent Agents
- Multiagent Systems
- Planning

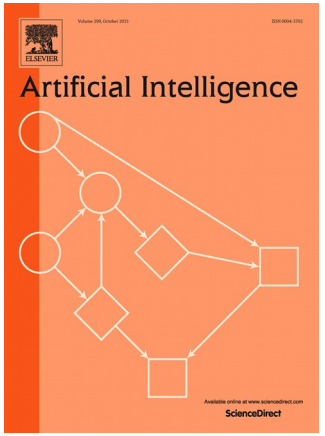
Research publications

- International Conference on Autonomous Agents and Multiagent Systems (AAMAS)
  http://www.aamas-conference.org

- Journal on Autonomous Agents and Multi-Agent Systems
  ISSN: 1387-2532

- Artificial Intelligence.
  ISSN: 0004-3702

- Research events on AI (IJCAI, AAAI, ECAI, ACL, ...)



Bibliography

- S. Russell, P. Norvig. Artificial Intelligence. 3rd. edition. Pearson, 2009.
- Elaine Rich and Kevin Knight. Artificial Intelligence. McGraw-Hill, Inc., 3rd. Edition, 2009

- G. Weiss, editor. Multiagent Systems. The MIT Press, 2nd edition. 2013.
- M. Wooldridge. An Introduction to Multiagent Systems. 2nd Edition, John Wiley, 2009.
- Y. Shoham and K. Leyton-Brown, Multiagent Systems: Algorithmic, Game-theoretic, and Logical Foundations. Cambridge University Press, 2008.

- Automated Planning: Theory and Practice. M. Ghallab, D. S. Nau & p. Traverso. Morgan Kaufmann Publisher, 2004.

- https://github.com/LantaoYu/MARL-Papers

Evaluation

- Homework 1 (Report/Presentation): 10%
- Homework 2 (JASON): 20%
- Homework 3 (JGOMAS Trial): 30%
- Final project (JGOMAS): 40%

The final project

- ~6 students
- 40% of the final grade.

- JASON (Java version of AgentSpeak)
- JGOMAS (Game Oriented Multiagent System based on Jade)
  - JGOMAS is an environment to develop and to run intelligent agents over simulated 3D worlds.

Motivation

- (Huhns & Singh 1994) ... “creating a system that interconnects separately developed colaborative agents, thus enabling the ensemble to function beyond the capabilities of any of its members”.

- value(Σ agent$_i$) > max(value(agent$_i$))

Motivation

- The RoboCub Soccer simulator
  - http://sourceforge.net/projects/sserver
- RoboCub
  - http://www.robocup.org
- Agents on Mars (Multi-agents contest)
  - http://multiagentcontest.org
- Angry Birds AI
  - http://aibirds.org/
- Robotarium
  - https://www.robotarium.gatech.edu
- OpenAI Gym
  - http://gym.openai.com/
  - https://openai.com/blog/safety-gym/
- NLPGym
  - https://github.com/rajcscw/nlp-gym
- JGOMAS
  - http://gti-ia.dsic.upv.es/sma/tools/jgomas/index.php

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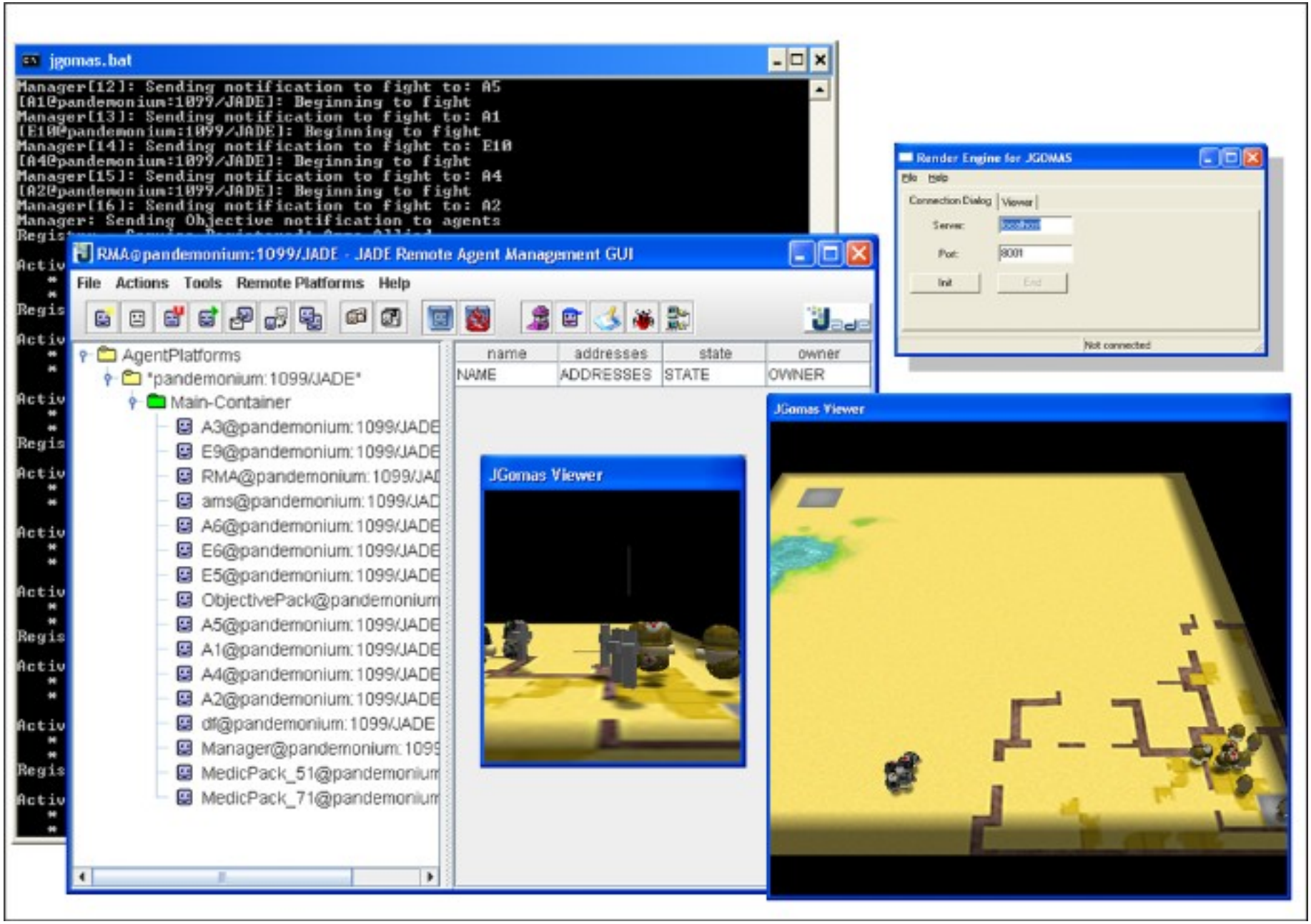


Motivation

- AI among the **top** 10 strategic technology trends for 2021 according to Gartner
- All countries are ready for **AI**.
- AI strategy @ EU
- AI strategy @ ES (ENIA)
- AI strategy @ EUS (Ikur)

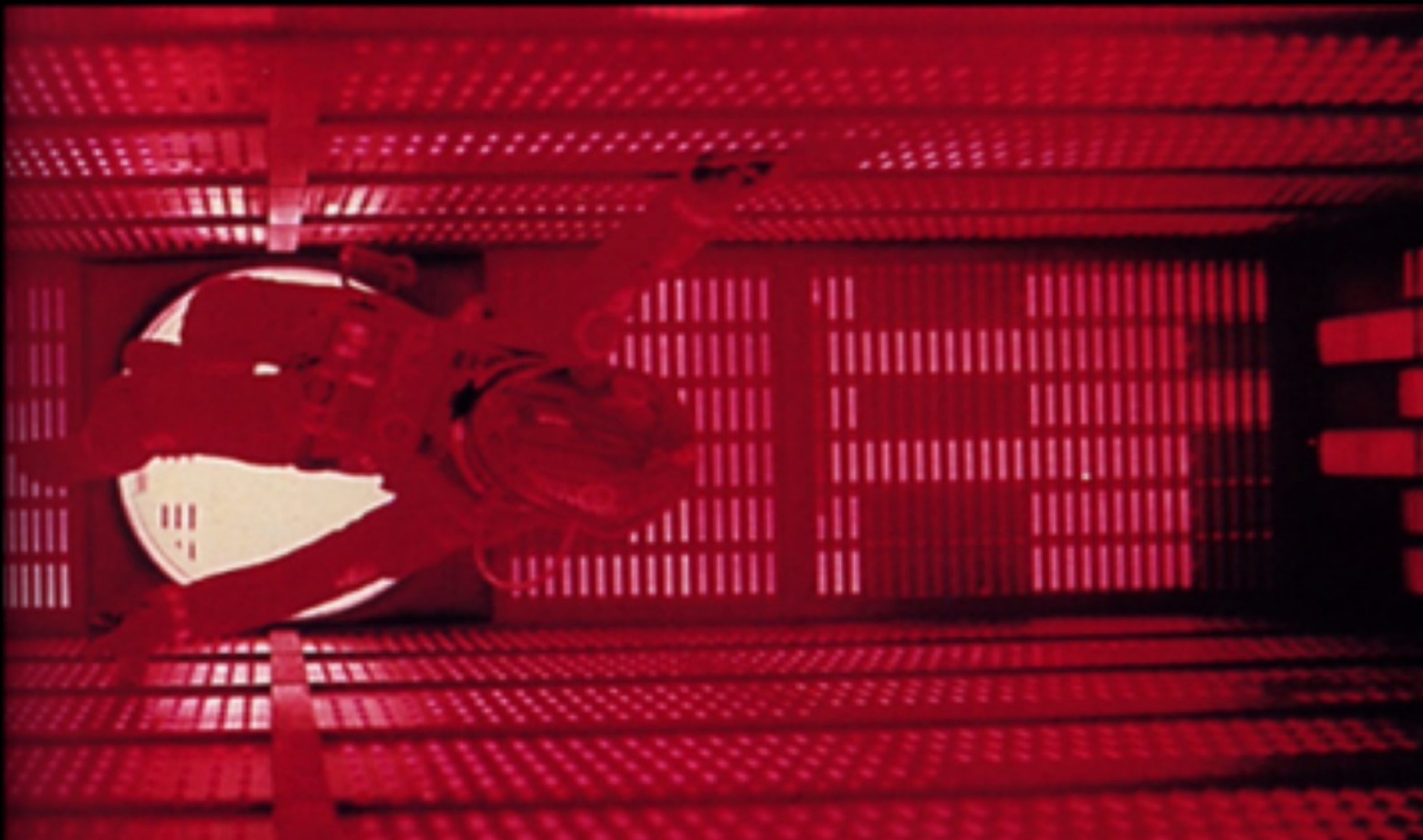
e.g. IBM Watson ...

but also Google, Facebook, Amazon, Microsoft, ...

ORIGINAL MOTION PICTURE SOUNDTRACK

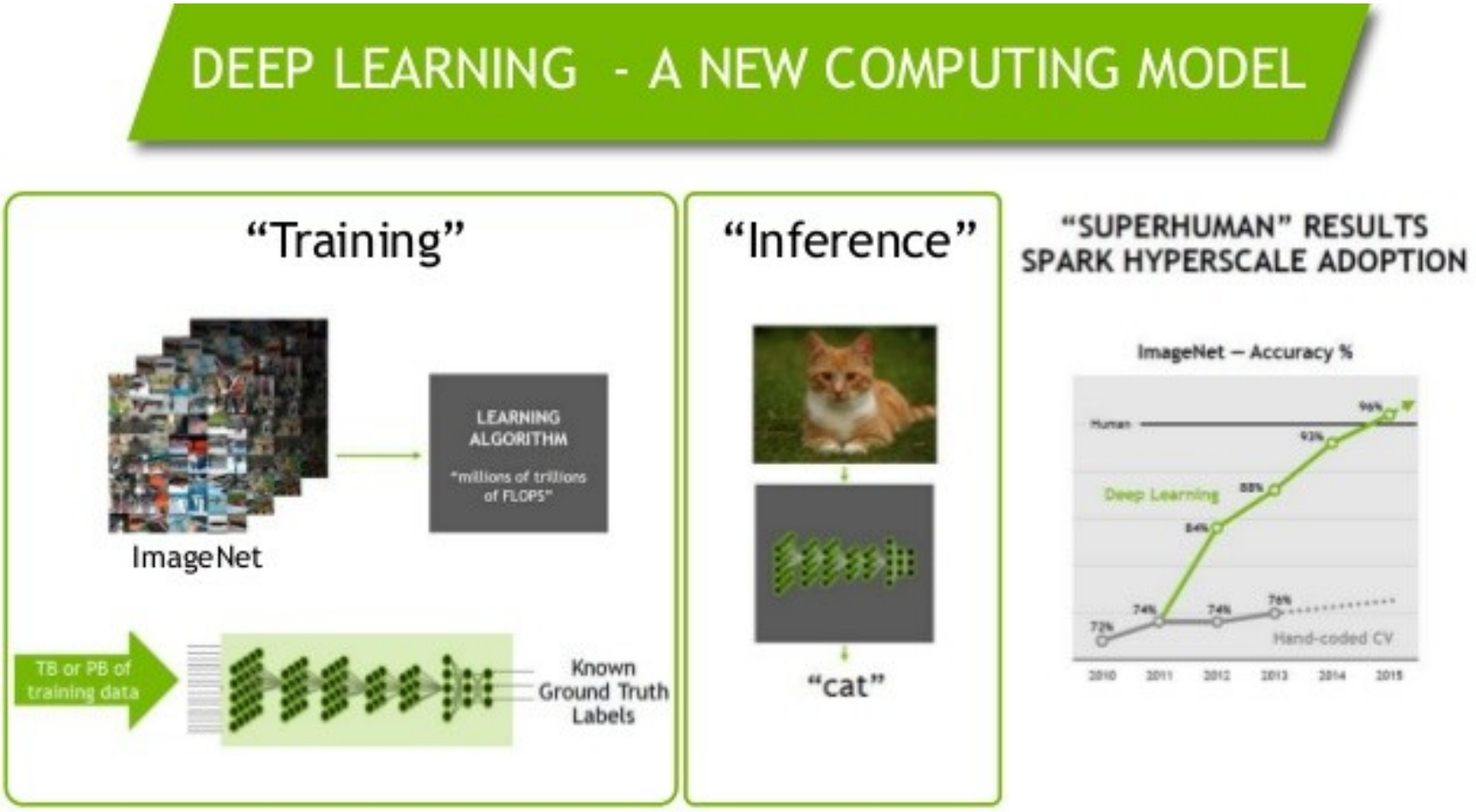
M-G-M PRESENTS A STANLEY KUBRICK PRODUCTION

2001: a space odyssey



2001: A SPACE ODYSSEY

AI & Deep Learning



From Andy Steinbach (NVIDIA)

Superhuman results

Figure 5. Example alignments predicted by our model. For every test image above, we retrieve the most compatible test sentence and visualize the highest-scoring region for each word (before MRF smoothing described in Section 3.1.4) and the associated scores ($v_i^T s_t$). We hide the alignments of low-scoring words to reduce clutter. We assign each region an arbitrary color.

Deep visual-semantic alignments for generating image descriptions (2014)

A Karpathy, L Fei-Fei

Superhuman results

Figure 1. Photo-realistic images generated by our StackGAN from unseen text descriptions. Descriptions for birds and flowers are from CUB [32] and Oxford-102 [18] datasets, respectively. (a) Given text descriptions, Stage-I of StackGAN sketches rough shapes and basic colors of objects, yielding low resolution images. (b) Stage-II of StackGAN takes Stage-I results and text descriptions as inputs, and generates high resolution images with photo-realistic details.

StackGAN: Text to Photo-realistic Image Synthesis with Stacked Generative Adversarial Networks (2016)
Han Zhang, Tao Xu, Hongsheng Li, Shaoting Zhang, Xiaolei Huang, Xiaogang Wang, Dimitris Metaxas

Superhuman results

Figure 2. Uncurated set of images produced by our style-based generator (config F) with the FFHQ dataset. Here we used a variation of the truncation trick [40, 5, 32] with $\psi = 0.7$ for resolutions $4^2 - 32^2$. Please see the accompanying video for more results.

A Style-Based Generator Architecture for Generative Adversarial Networks (2018)

Tero Karras, Samuli Laine, Timo Aila

https://thispersondoesnotexist.com

Superhuman results

LipNet: Sentence Level Lipreading (2016)
Yannis M. Assael, Brendan Shillingford, Shimon Whiteson, Nando de Freitas

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