ASSESSING AI CAPABILITIES: TOO IMPORTANT TO BE FOOLED

José Hernández-Orallo (jorallo@upv.es, josephorallo.webs.upv.es)
Valencian Research Institute for Artificial Intelligence (vrAIn) (vrain.upv.es)
Universitat Politècnica de València, València (www.upv.es)
Leverhulme Centre for the Future of Intelligence, Cambridge (lcfi.ac.uk)

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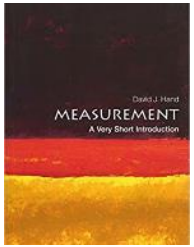
UNIVERSITAT POLITÈCNICA DE VALÈNCIA

CFI LEVERHULME CENTRE FOR THE FUTURE OF INTELLIGENCE

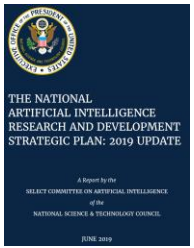
OECD International Conference on AI in Work, Innovation, Productivity and Skills (AI-WIPS): 1-5 February 2021
Panel on exploring assessments of AI capabilities: 4 February 2021

https://oecd-events.org/ai-wips/

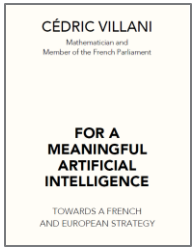
ASSESSING AI CAPABILITIES. IT IS VERY IMPORTANT!



"Greatest accuracy, at the frontiers of science, requires greatest effort, and probably the most expensive or complicated of measurement instruments"
David Hand, "Measurement: A Very Short Introduction", OUP, (2004)



"Measure and Evaluate AI Technologies through Standards and Benchmarks"
Strategy 6 in U.S. National
AI Research and Development Strategic Plan: (2019)



"Public authorities must act in order to develop and implement standards, tests and measurement methods [for] AI technology"
Villani report (French AI Strategy): (2018)

WHY IS IT REALLY SO IMPORTANT?

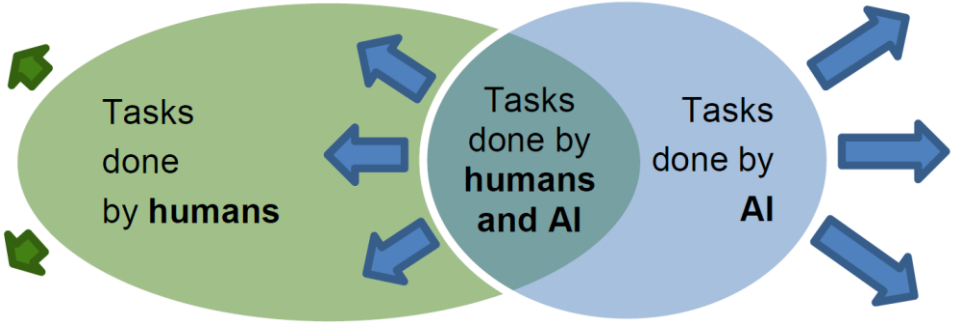
- AI is not just another emergent technology. It is about **intelligence**:
  - What has made us "understand" and attempt to "control" nature.
- It is going to **transform** every sphere of society radically:
  - From education to the workplace.
- But:

> The way and the extent the world is affected by AI depends on **what and how much AI can do!**

- Key question for policies, regulations, investments, opportunities, risks…
  - We need to evaluate what a system (AI or hybrid) **can** and **cannot** do.

WHAT IS AI EVALUATION?

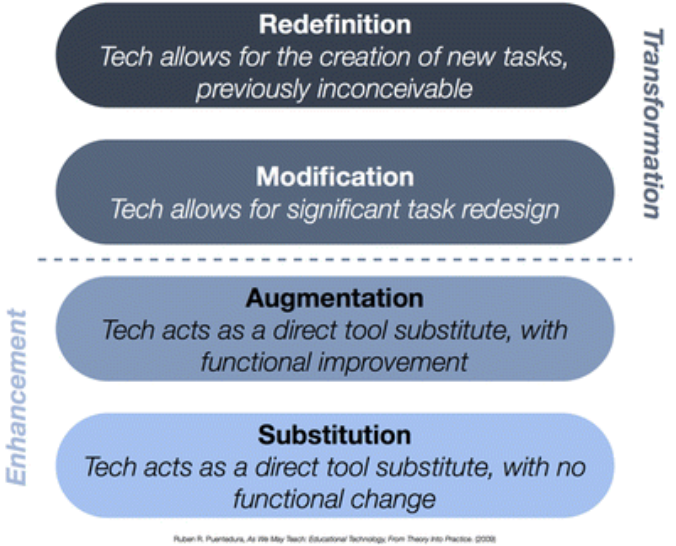
- Evaluating AI on tasks humans do today?
  - The "substitution narrative" is too narrow!



  - It is not just what *tasks AI systems can do*, but *what skills AI systems can acquire by themselves*

"The right kind of AI"?

Specific vs. General AI Systems



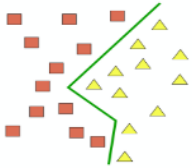
Puentedura, R. (2014b). Learning, technology, and the SAMR model: Goals, processes, and practice [Blog post]. http://www.hippasus.com/rpweblog/archives/2014/06/29/LearningTechnologySAMRModel.pdf. Hamilton, E.R., Rosenberg, J.M. & Akcaoglu, M. The Substitution Augmentation Modification Redefinition (SAMR) Model: a Critical Review and Suggestions for its Use. TechTrends 60, 433–441 (2016). https://doi.org/10.1007/s11528-016-0091-y

Acemoglu, D, and Restrepo, P. "The wrong kind of AI? Artificial intelligence and the future of labour demand." *Cambridge Journal of Regions, Economy and Society* 13.1 (2020): 25-35.

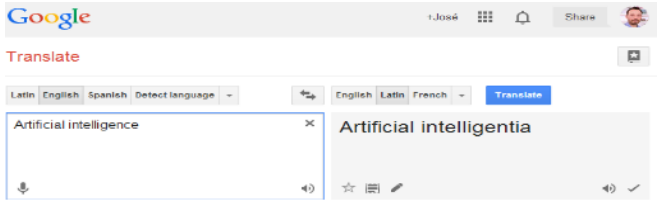
TASK-ORIENTED EVALUATION?

- Specific (task-oriented) AI systems

PR: computer vision, speech recognition, etc.



Prediction and estimation

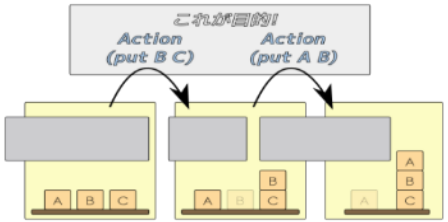


Machine translation, information retrieval, summarisation

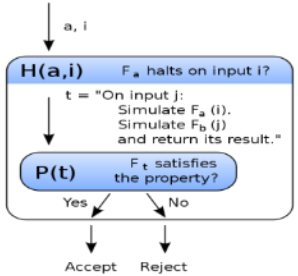
Robotic navigation

Knowledge-based assistants

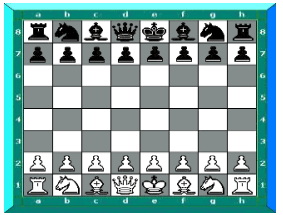
Driverless vehicles



Planning and scheduling



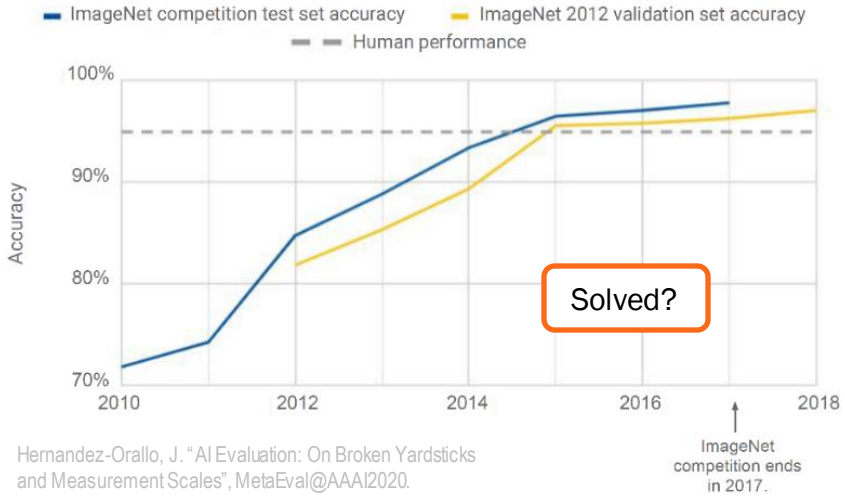
Automated deduction



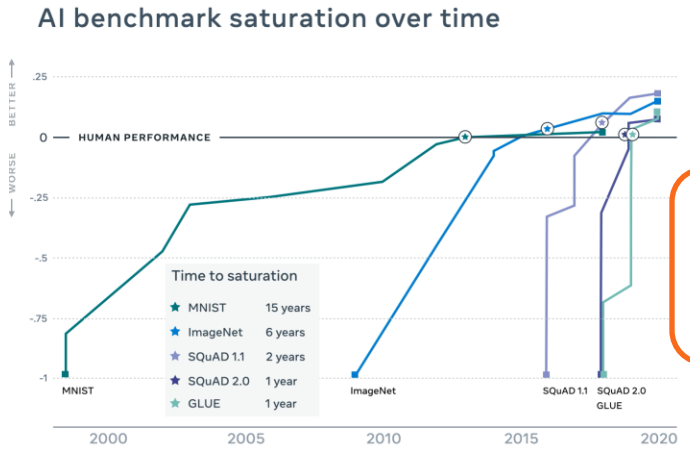
Game playing

All images from wikicommons

TASK-ORIENTED EVALUATION: TEACHING TO THE BENCHMARK!



Hernandez-Orallo, J. "AI Evaluation: On Broken Yardsticks and Measurement Scales", MetaEval@AAAI2020.



From: https://ai.facebook.com/blog/dynabench-rethinking-ai-benchmarking

Give me the data (distribution) and I will ace the test in a year!

MISLEADING!!!

Can we anticipate how these systems will behave for new problems or other distributions of the same problem?

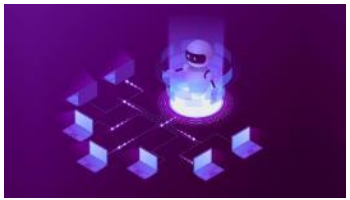
CAPABILITY-ORIENTED EVALUATION?

- How to evaluate general-purpose systems and cognitive components?

Cognitive robots

Agents, avatars, chatbots

Pets, animats and other artificial companions



Internet bots, Smartbots, Security bots…

Smart environments

Personal assistants

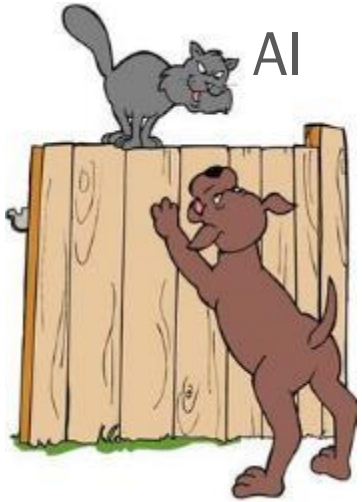
CAPABILITY-ORIENTED EVALUATION: MANY APPROACHES!

- "AI-completeness" benchmarks:
  - Science exams, commonsense reasoning
- The "Mythical" Turing Test:
  - And a myriad variants….
- New evaluation platforms:
  - Videogames, naïve physics, etc.
- Psychometric tests:
  - IQ tests, developmental tests, …
- Comparative cognition (animal) tests:
  - Morgan's canon?

TOO IMPORTANT TO BE FOOLED!

- A call for action: new AI evaluation initiatives!
  - More principled, more robust.
  - More interdisciplinary: AI, psychology, cognitive/social sciences, …
  - More independent and international (e.g., OECD, JRC@EC, academia)
  - More long-term and integrated…

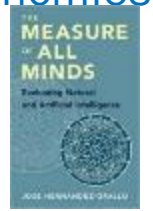
A challenge for the whole century!
We need to start now, as AI evaluation is lagging behind AI!



THANKS!

OTHER SOURCES AND INITIATIVES:

- Other Talks (http://josephorallo.webs.upv.es/)
  - Diversity Unites Intelligence: Measuring Generality
  - Measuring A(G)I Right: Some Theoretical and Practical Considerations
  - Natural and Artificial Intelligence: Measures, Maps and Taxonomies
- Book (http://allminds.org):
  - The Measure of All Minds: Evaluating Natural and Artificial Intelligence, Cambridge University Press 2017



- The AI Collaboratory: http://aicollaboratory.org/
  - Part of the European Commission's AI watch:
    - https://ec.europa.eu/knowledge4policy/ai-watch_en

[A]I collaboratory

- Other Events:
  - epAI (Evaluating progress in AI, at ECAI, September 2020)
    - http://dmip.webs.upv.es/EPAI2020/