Artificial Intelligence

Janyl Jumadinova

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What is AI?

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"**a branch of computer science that studies the properties of intelligence by synthesizing intelligence**"

What is AI?

Our 2019 Prediction	Grade
New natural language processing companies raise $100M in 12 months.	**Yes**
No autonomous driving company drives >15M miles in 2019.	**Yes**
Privacy-preserving ML adopted by a F2000 company other than GAFAM (Google, Apple, Facebook, Amazon, Microsoft).	**Yes**
Unis build *de novo* undergrad AI degrees.	**Yes**
Google has major quantum breakthrough and 5 new startups focused on quantum ML are formed.	**Sort of**
Governance of AI becomes key issue and one major AI company makes substantial governance model change.	**No**
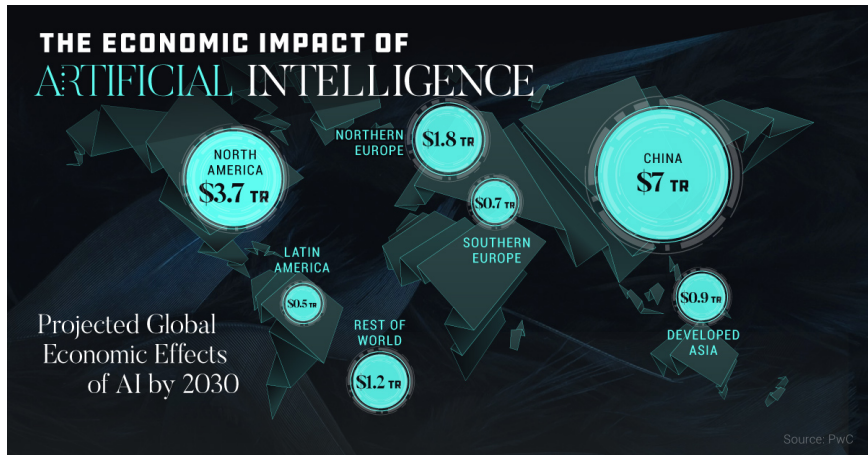
https://www.stateof.ai/

EXECUTIVE ORDERS

Executive Order on Maintaining American Leadership in Artificial Intelligence

— **INFRASTRUCTURE & TECHNOLOGY** | Issued on: **February 11, 2019**

★ ★ ★

Why AI?

Executive Order on Maintaining American Leadership in Artificial Intelligence

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Tech-driven change a key priority for new EC president

Why AI?

Figure 2. Identifying Societal Drivers

Side Effects of AI

Google's AI for mammograms doesn't account for racial differences

By Amrita Khalid · January 9, 2020

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Are robots sexist? UN report shows gender bias in talking digital tech

DEAN MOUHTAROPOULOS | GETTY. EDITED BY MIT TECHNOLOGY REVIEW

Artificial Intelligence / Machine Learning

Training a single AI model can emit as much carbon as five cars in their lifetimes

Deep learning has a terrible carbon footprint.

Robots as Moral Agents

Is it possible to construct some kind of 'artificial moral agents'? (implicit vs. explicit)

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If so,
Which moral code should they be programmed with?

Moral Machine

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- making computers that think?
- the automation of activities we associate with human thinking, like decision making, learning, ...?
- the art of creating machines that perform functions that require intelligence when performed by people?
- the study of mental faculties through the use of computational models?

What is AI?

- the study of computations that make it possible to perceive, reason and act?
- a field of study that seeks to explain and emulate intelligent behaviour in terms of computational processes?
- a branch of computer science that is concerned with the automation of intelligent behaviour?
- anything in Computing Science that we don't yet know how to do properly? (!)

Weak AI vs. Strong AI

- **Strong (General) AI:** Computer software + hardware alone can emulate a human mind. There is no fundamental difference between man and machine.

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- **Strong (General) AI:** Computer software + hardware alone can emulate a human mind. There is no fundamental difference between man and machine.
- **Weak (Narrow) AI:** Computer software + hardware alone can simulate every aspect of a human mind. Only people can think, machines cannot.

What is AI?

THOUGHT	**Systems that think like humans**	**Systems that think rationally**
BEHAVIOUR	**Systems that act like humans**	**Systems that act rationally**
	HUMAN	RATIONAL

Acting humanly: The Turing test

Turing (1950) "Computing machinery and intelligence":

- "*Can machines think?*" $\longrightarrow$ "*Can machines behave intelligently?*"
- Operational test for intelligent behavior: the *Imitation Game*

Thinking humanly: Cognitive Science

Requires scientific theories of internal activities of the brain

- What level of abstraction? "*Knowledge*" or "*circuits*"?
- How to validate? Requires
  1. Predicting and testing behavior of human subjects (top-down) or
  2. Direct identification from neurological data (bottom-up)

Both approaches (roughly, *Cognitive Science* and *Cognitive Neuroscience*) are now distinct from AI

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- Direct line through mathematics and philosophy to modern AI

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- *Normative* (or *prescriptive*) rather than *descriptive*
- Direct line through mathematics and philosophy to modern AI
- Rational behavior: **doing the right thing**
- The right thing: that which is expected to maximize goal achievement, given the available information