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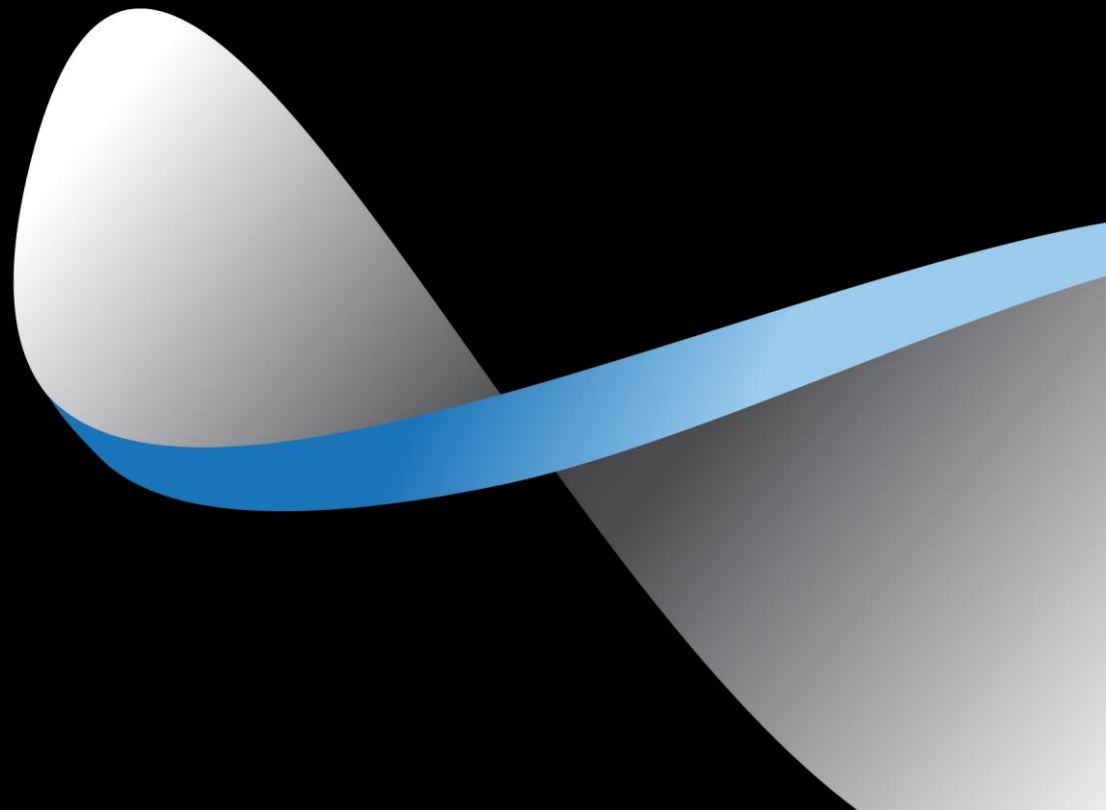
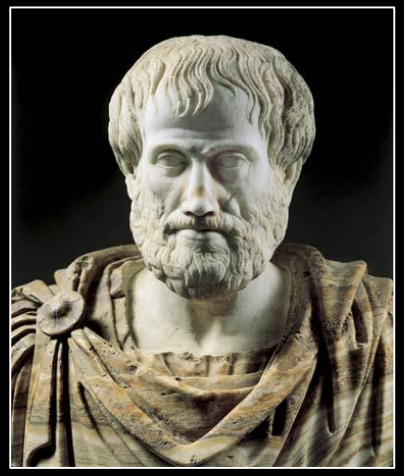
AI - Vision and Reality

Michael Rovatsos
The University of Edinburgh



AI through the ages

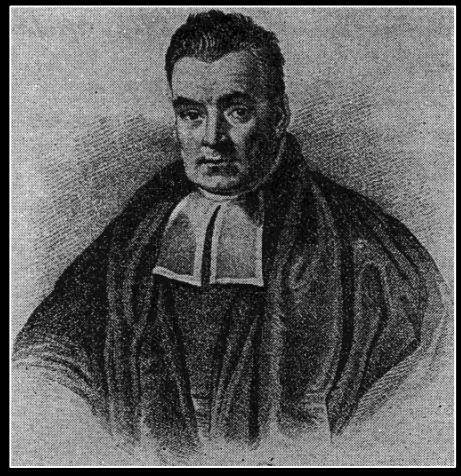


384BC – 322BC

“Given A, and A implies B, I can infer B”

1711-1776

We can only experience causality by observing “conjunction” of events



c.1701-1761

How likely is an event given my observations and assumptions?

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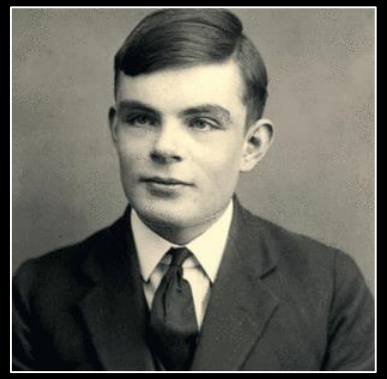
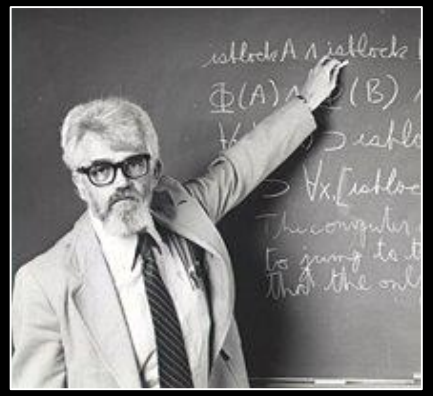
AI through the ages





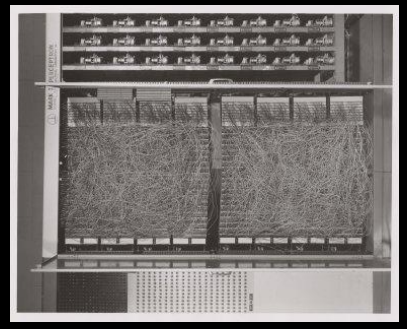
I.—COMPUTING MACHINERY AND INTELLIGENCE

By A. M. Turing

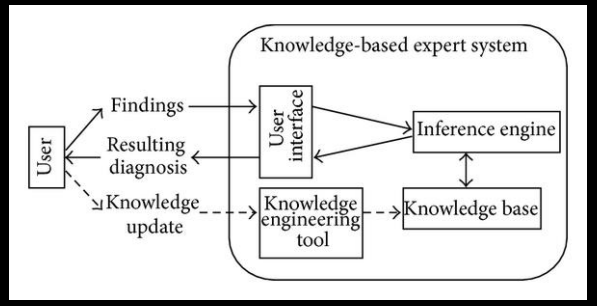
1. *The Imitation Game.*

I propose to consider the question, 'Can machines think?' This should begin with definitions of the meaning of the terms 'machine' and 'think'. The definitions might be framed so as to reflect so far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words 'machine' and 'think' are to be found by examining how they are commonly used it is difficult to escape the conclusion that the meaning and the answer to the question, 'Can machines think?' is to be

1950



1957



1963

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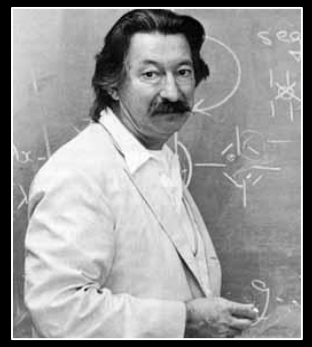
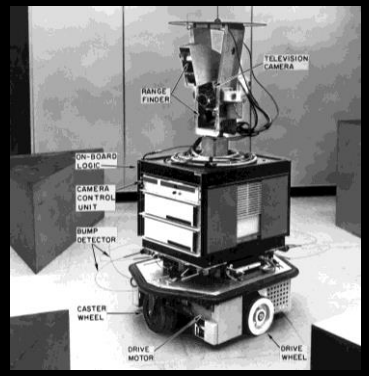
AI through the ages

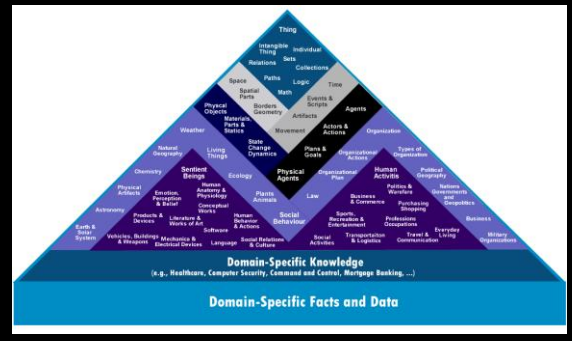


```
> Hello, I am Eliza.
* I am afraid.
> How long have you been afraid?
* Since midterms.
> Tell me more...
* I am afraid that I will fail
my course.
> Do you enjoy being afraid that
you will fail your course?
```

1965



1972



1984

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Where are we today?

- Great advances in image and language processing, game-playing, robotics
- Off-the shelf “AI” only available in a small set of narrow specialist areas
- Hardly any real-world applications that involve complex reasoning
- But small-letter “ai” (=advanced analytics) is becoming ubiquitous

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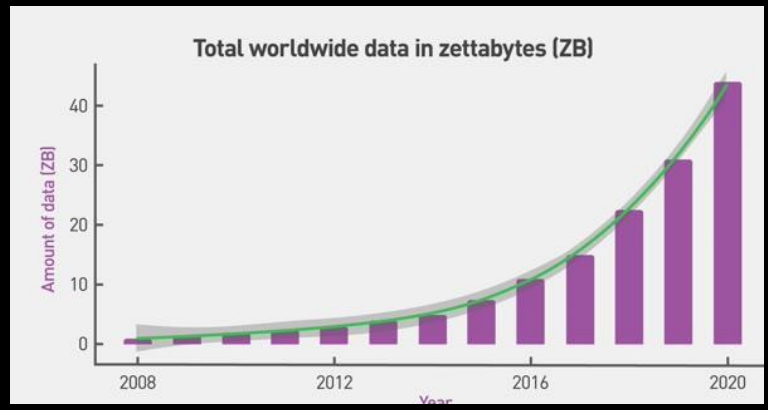
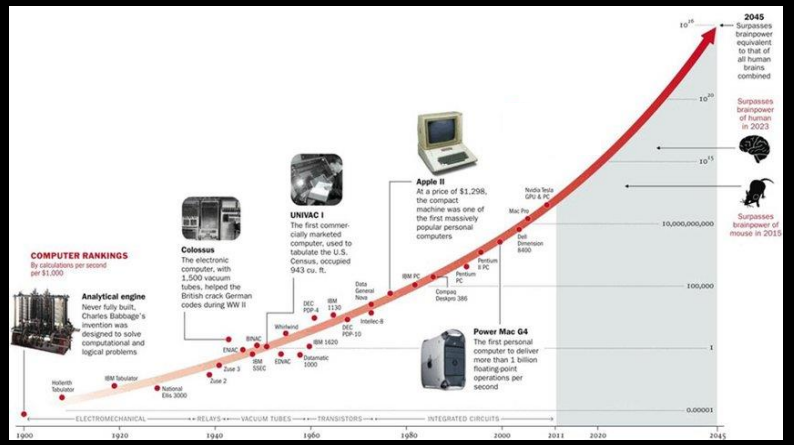
What has changed?

New opportunities

- Exponential growth in data, compute, and connectivity
- Great advances in machine learning, vision, robotics, NLP
- Availability of commodity software and hardware





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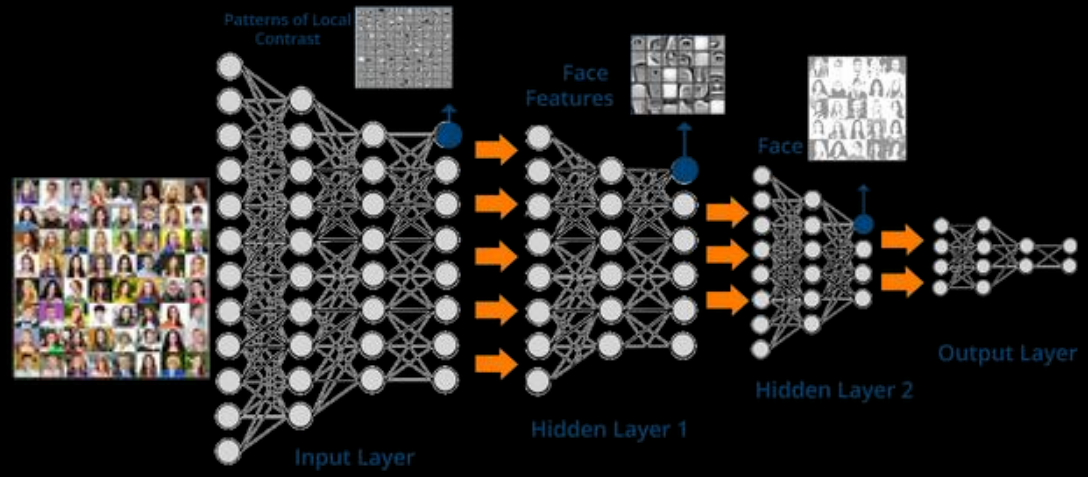
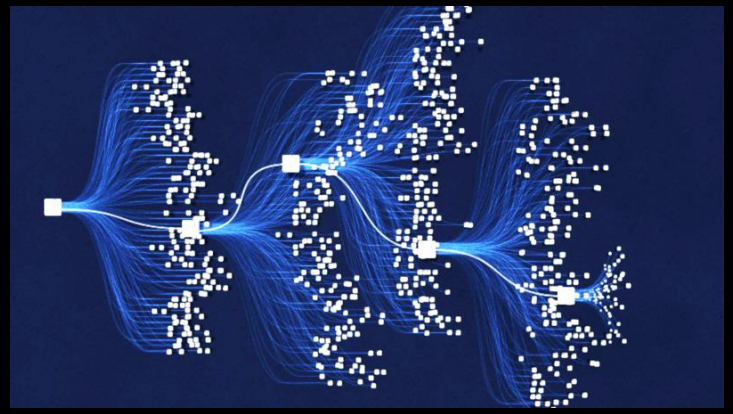
What has changed?

New challenges

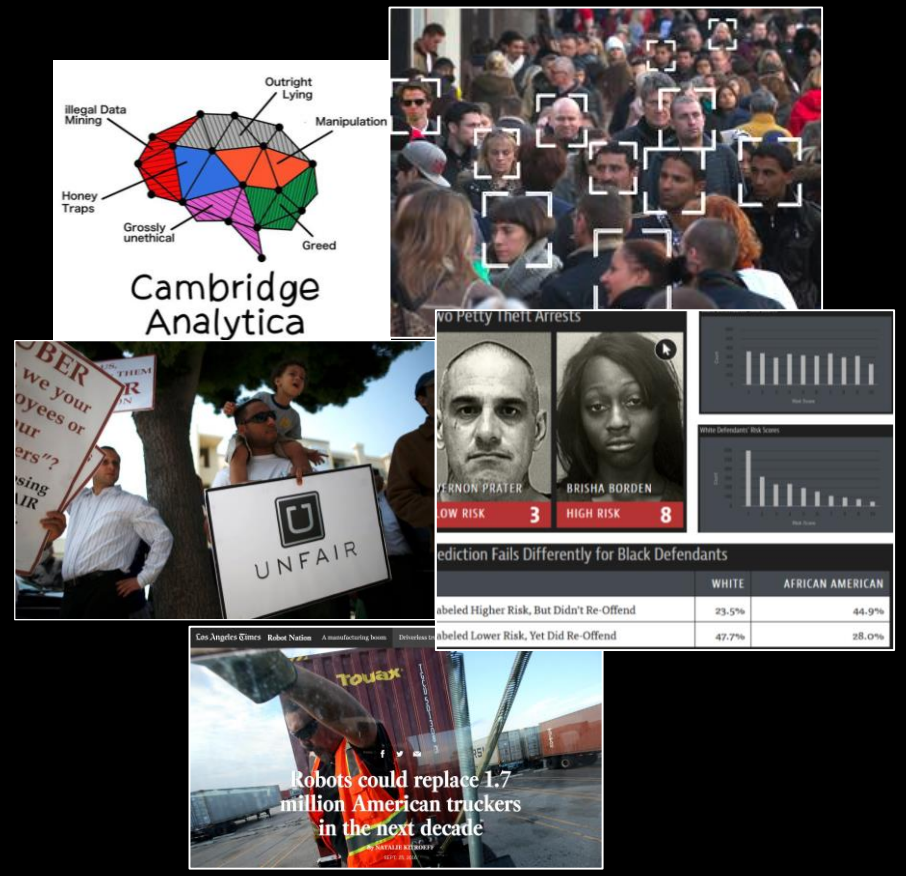
- Focus on narrow, single-shot, perceptual cognitive tasks
- Offline training of “big” AI systems - unsustainable
- Robustness and accuracy increase, but so does opacity





Where are we headed?

- Many are concerned about the risks of AI – rightfully so
- Loss of public trust may mean we lose the potential benefits of AI
- Public debate focuses on blaming AI, rather than those responsible



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Three predictions for the future

1. Machine learning will become a standard programming method
2. The next wave of AI will focus on integration of different approaches
3. Safety engineering will become indispensable for AI

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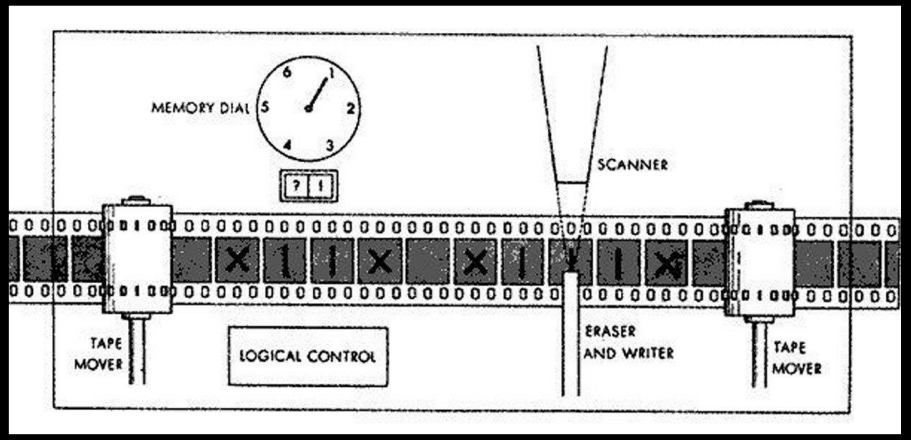
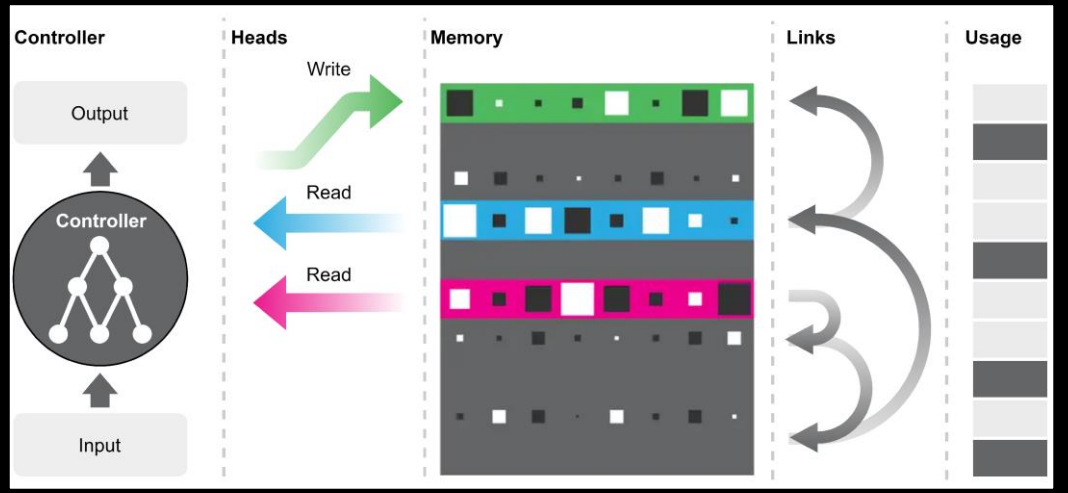
Machine learning as new programming paradigm






```
class Customer {
    private String _name;
    private Vector<Rental> _rentals = new Vector<Rental>();

    public Customer(String name) {
        _name = name;
    }
    public String getMovie(Movie movie) {
        Rental rental = new Rental(new Movie("", Movie.NEW_RELEASE), 10);
        Movie m = rental._movie;
        return movie.getTitle();
    }
    public void addRental(Rental arg) {
        _rentals.addElement(arg);
    }
    public String getName() {
        return _name;
    }
```

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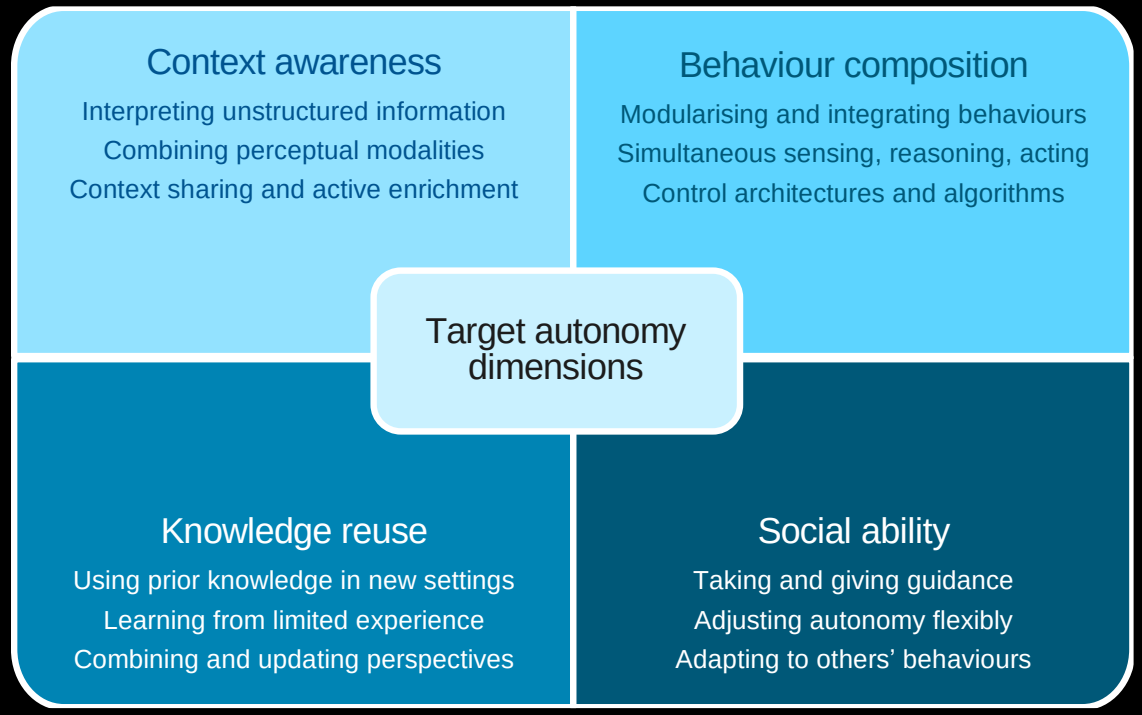
Integration of different AI approaches

- Advanced autonomy requires flexible, on-the-fly combination of different capabilities
- Needs to bring together sensing, reasoning, communication and physical control methods
- Focus needs to be on “plug and play” AI capabilities, building one existing component technologies



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AI Safety Engineering

- Regulation and policy will not solve the problem of managing AI risk
- Need for solid safety engineering, and embedding it in AI tech culture
- Huge challenge for design, validation and testing, impact assessment

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The future is bright

- AI can help address many of the great challenges of our times
- We have just reached the point where it is becoming a reality
- Much work lies ahead – including on how we make AI work for everybody

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Thank you!

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