Dr Wayne Holmes

Institute of Educational Technology, The Open University

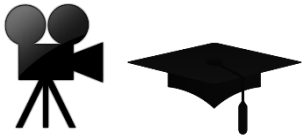
人工智能与未来学习：机遇和风险

Artificial Intelligence and the future of learning: the promise and the perils.

Gongyuan Primary School

Tongzhou District, Beijing, 26 May 2017

关于我
ABOUT ME



BA Film, MA Philosophy

~8 years teaching (film, photography and media studies)

~8 years making educational films

CatchUp®

~8 years as Head of Research for an international children's educational charity (developing and researching interventions)

UNIVERSITY OF OXFORD

MSc Education, PhD Education (Learning and Technology)
University of Oxford

关于我
ABOUT ME

Senior Teaching Associate (2014 – 2016)
Graduate School of Education, University of Bristol

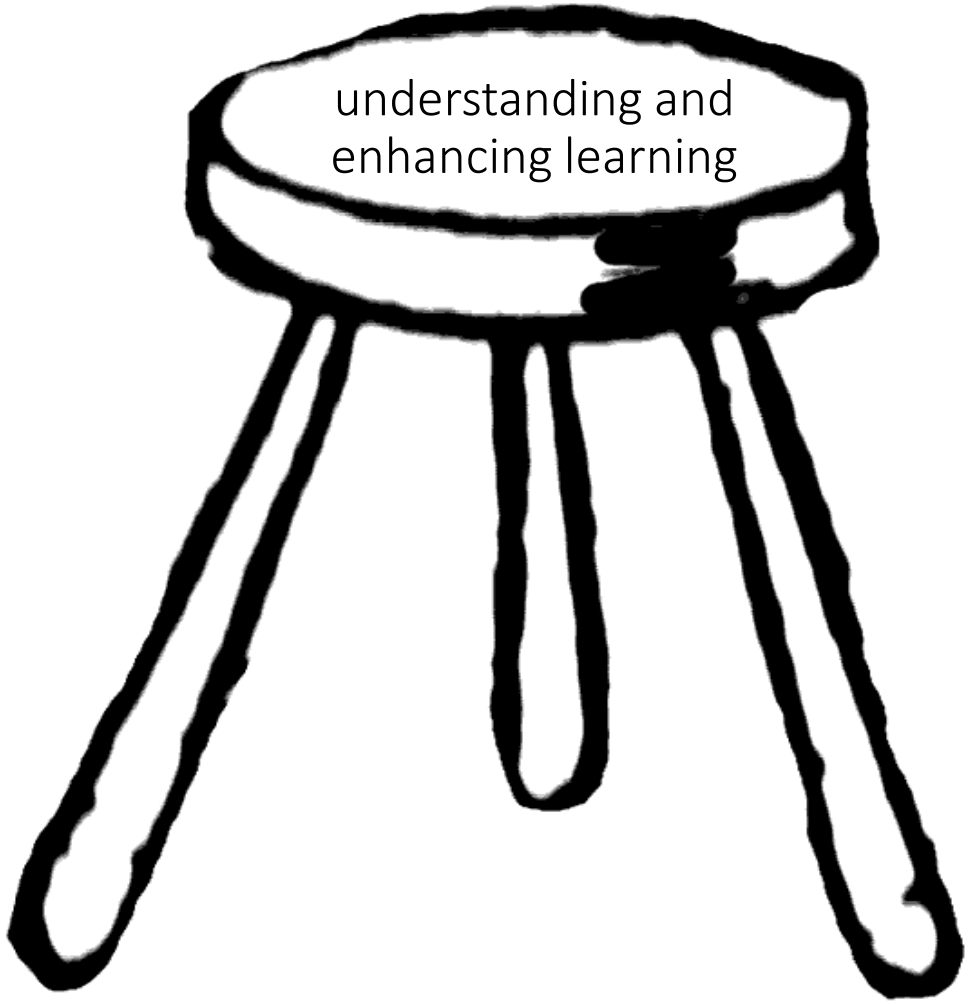
Researcher (2014 – 2016)
UCL Knowledge Lab, University College London

Lecturer (2016 to date)
Institute of Educational Technology, The Open University

Co-founder (edTech entrepreneurship)
zondle (games-based learning platform with 2m users)

我热衷于: 学习什么是学习

MY PASSION: learning about learning



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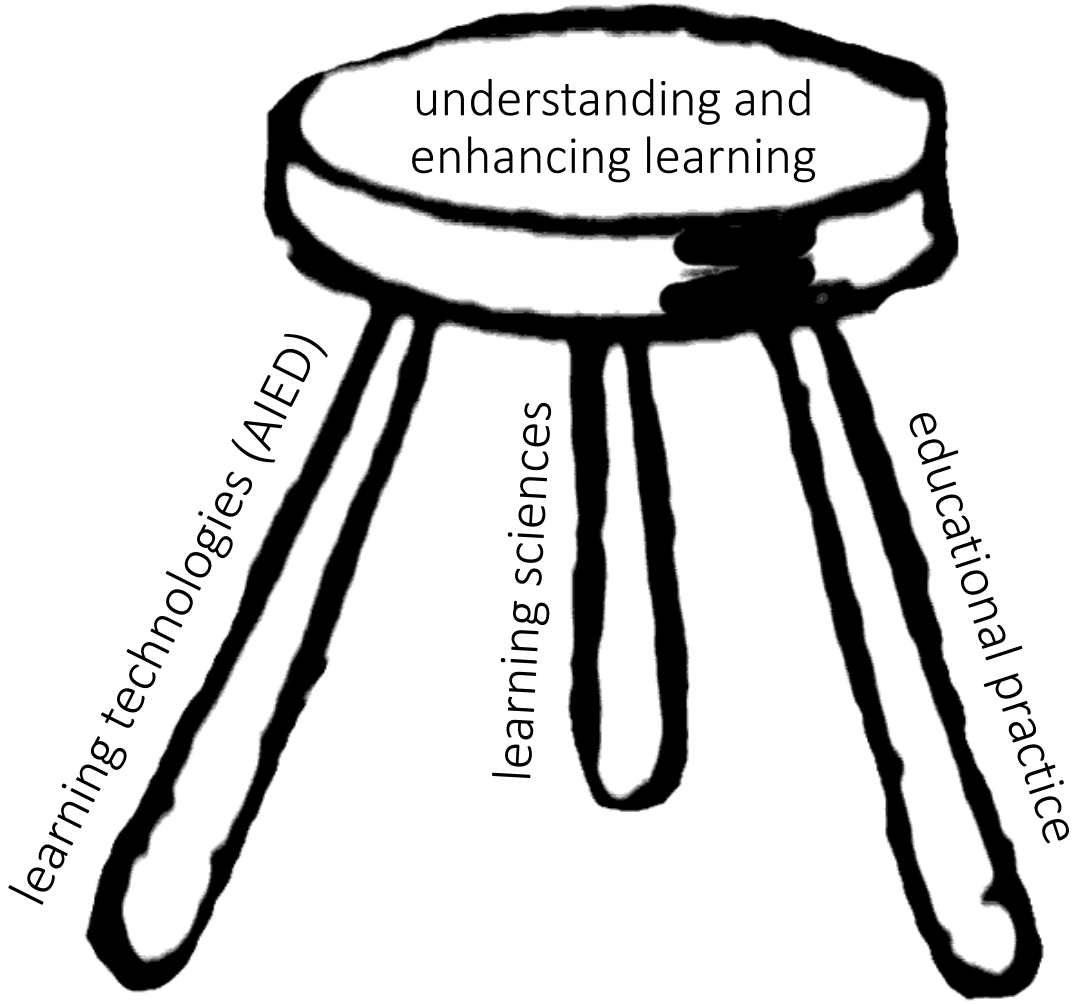
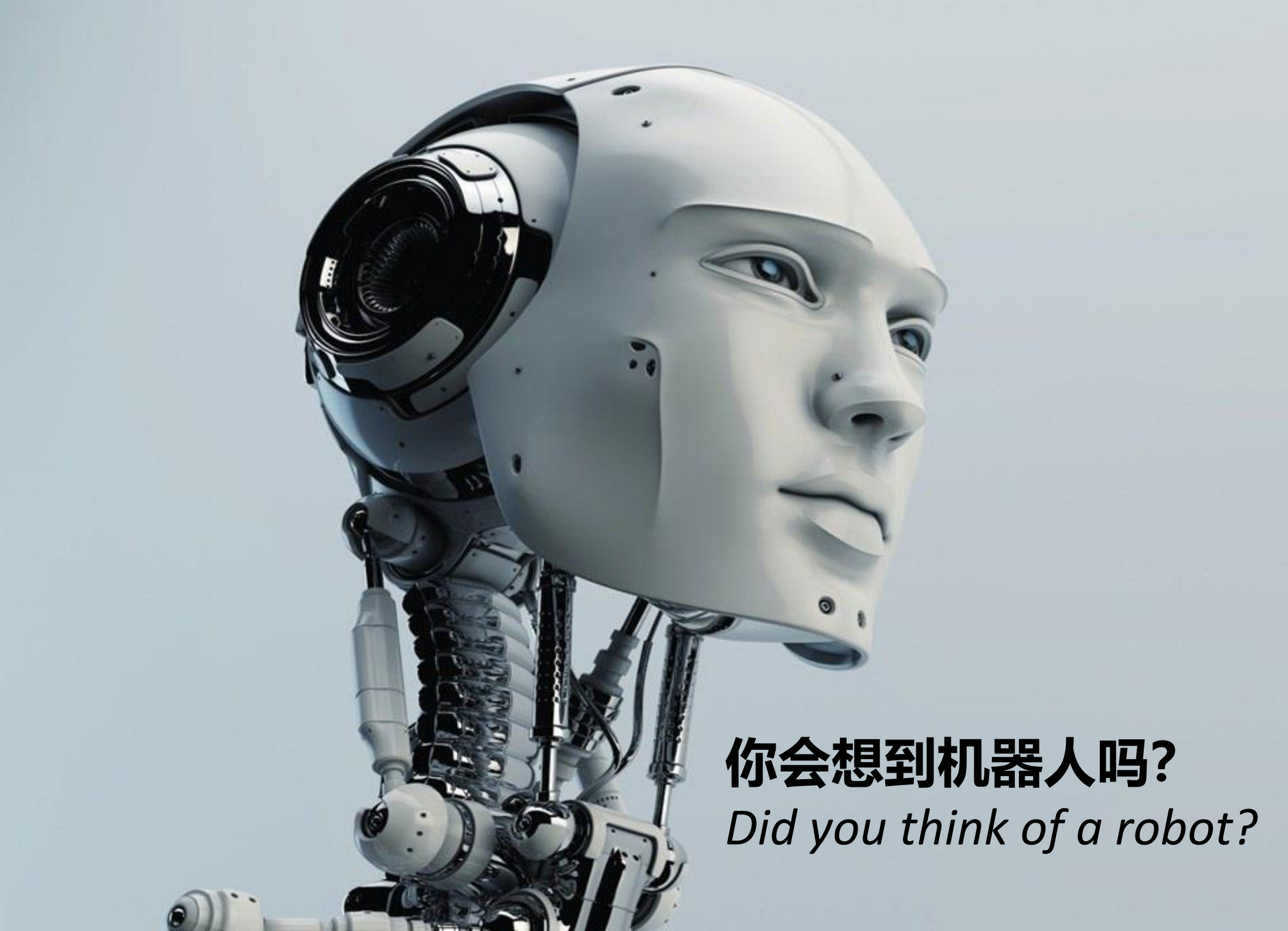


提问
A QUESTION FOR YOU

当你听说“人工智能”时，
你头脑中涌现出的第一件事是什么?

When you hear “Artificial Intelligence”,
what is the first thing that comes into your head?


你会想到机器人吗?
Did you think of a robot?

B8909

KBA
Korea Baduk Association
Google DeepMind
Challenge Match
8 - 15 March 2016
ALPHAGO
01:58:37

梦幻西游

中国移动
18:19
72%
你可以这样问我：
FaceTime小凤
接下来要在哪里转弯？
把邓丽君的但愿人长久添加到我的精选集
播放更多类似歌曲
打电话回家

成交量
最新
成交量
最新
976
840901
15875
15377
637676
131375
247759
190135
611167
89350
19730
521545
7.53
8.65
16.85
6.04
12.49
6.90
6.77
16.10
4.16
20.52
7.24
14.21
5.35
25.67
5.64
11.90
12.32
10.98
12.26
6.92
8.85
2.03
9.99
0.87
10.04
9.97
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9.96
10.00
9.16
10.01
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200001
176611
4237400
536209
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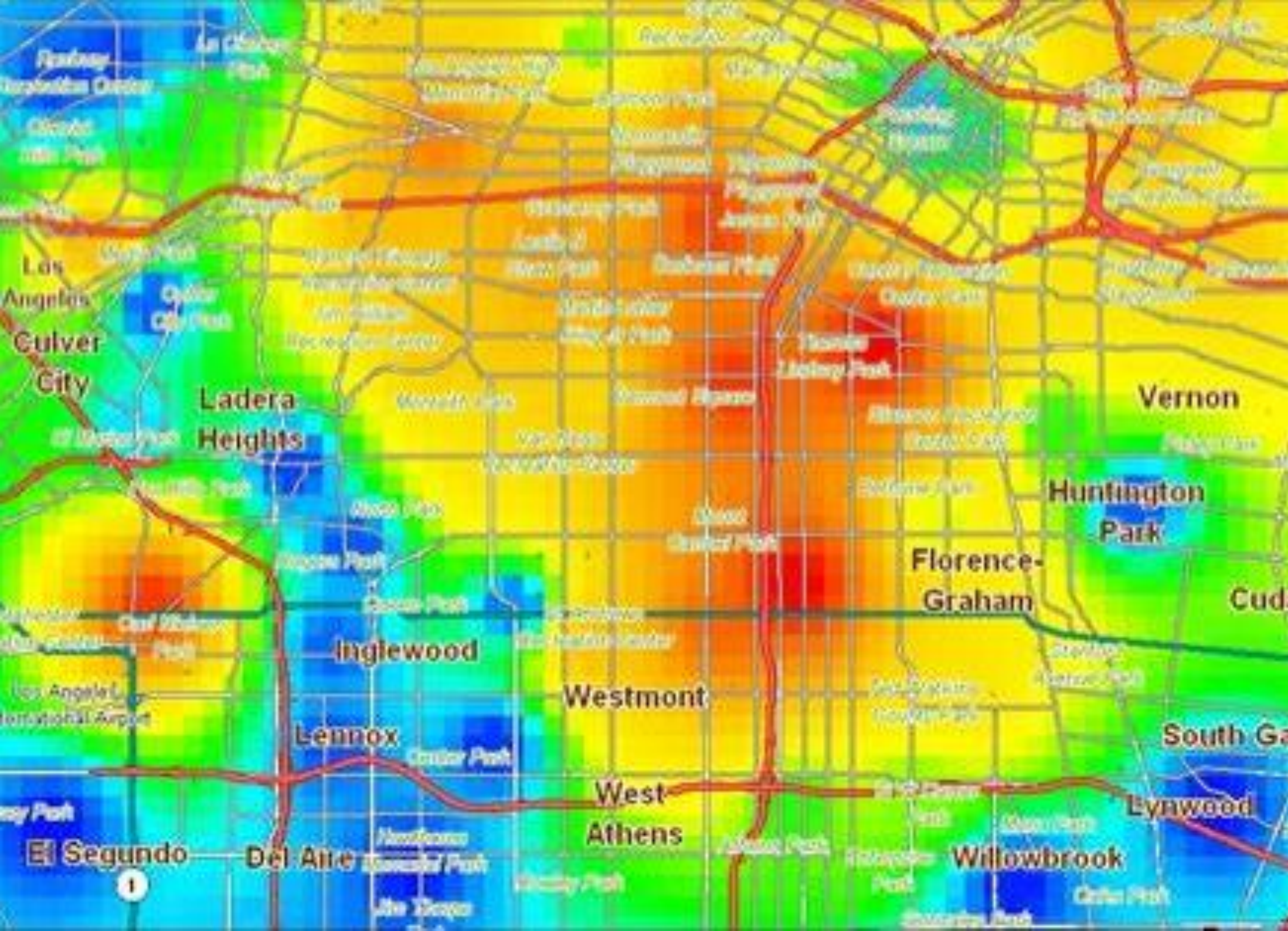
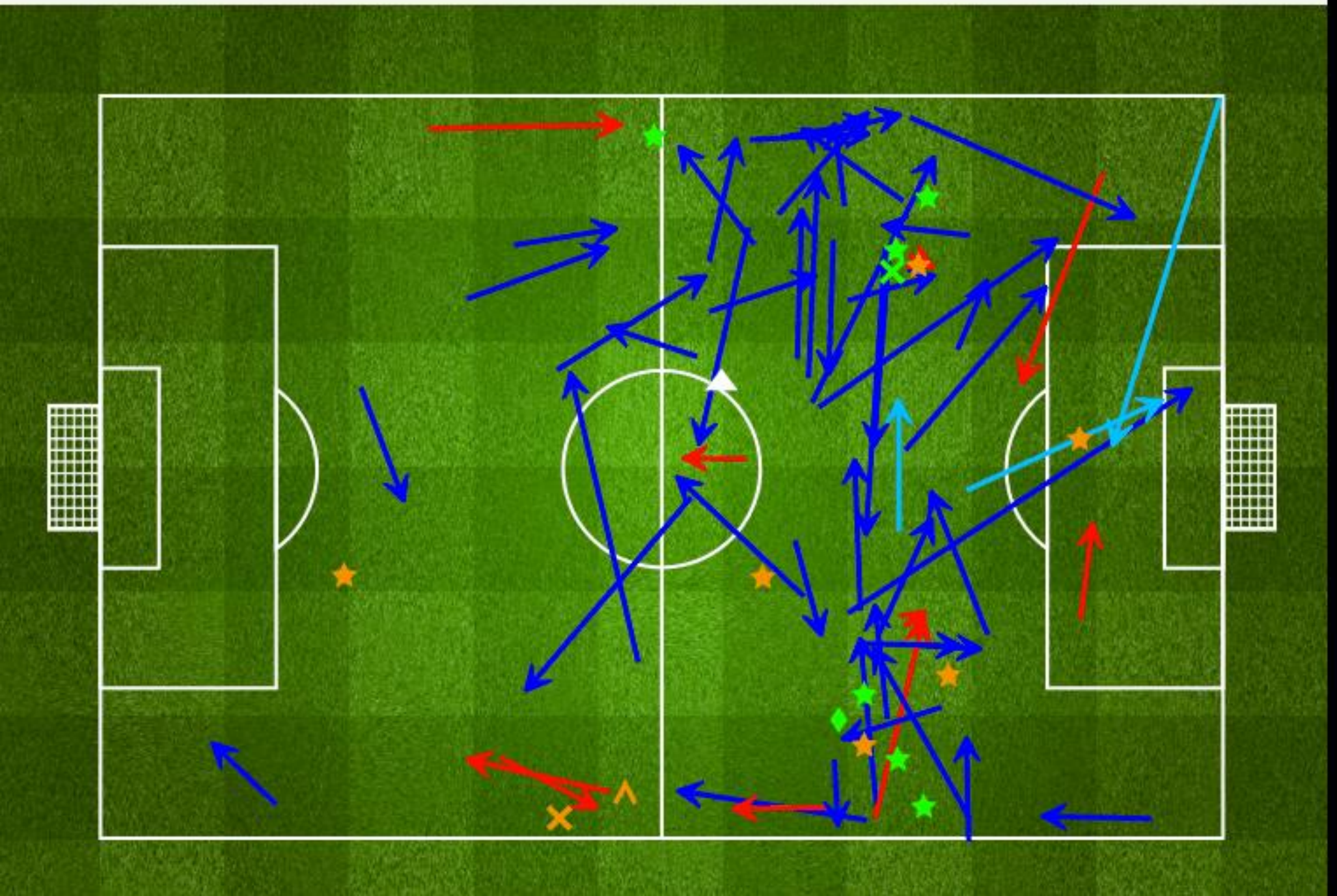

Los Angeles
Culver City
Ladera Heights
Vernon
Huntington Park
Florence-Graham
Inglewood
Westmont
Lennox
West Athens
El Segundo
Del Aire
Willowbrook
Lynwood

MESUT ÖZIL

Arsenal

Overall - Player Dashboard



Quick Pay	Transfer	Mobile Top Up
Wealth	Utilities	Order Taxi

31
32

ARTIFICIAL INTELLIGENCE (AI)

AI is already here.

AI affects our daily lives in many different ways.

We usually don't recognise it as AI
(but as computer games, or Siri, or WeChat, or…)

ARTIFICIAL INTELLIGENCE (AI)

AI is also already in education.

AI is being used to help us understand learning.

AI is being used to help us enhance learning.

AI can adapt the learning experience to the needs and skills of the individual student.

AI can inform and support teachers.

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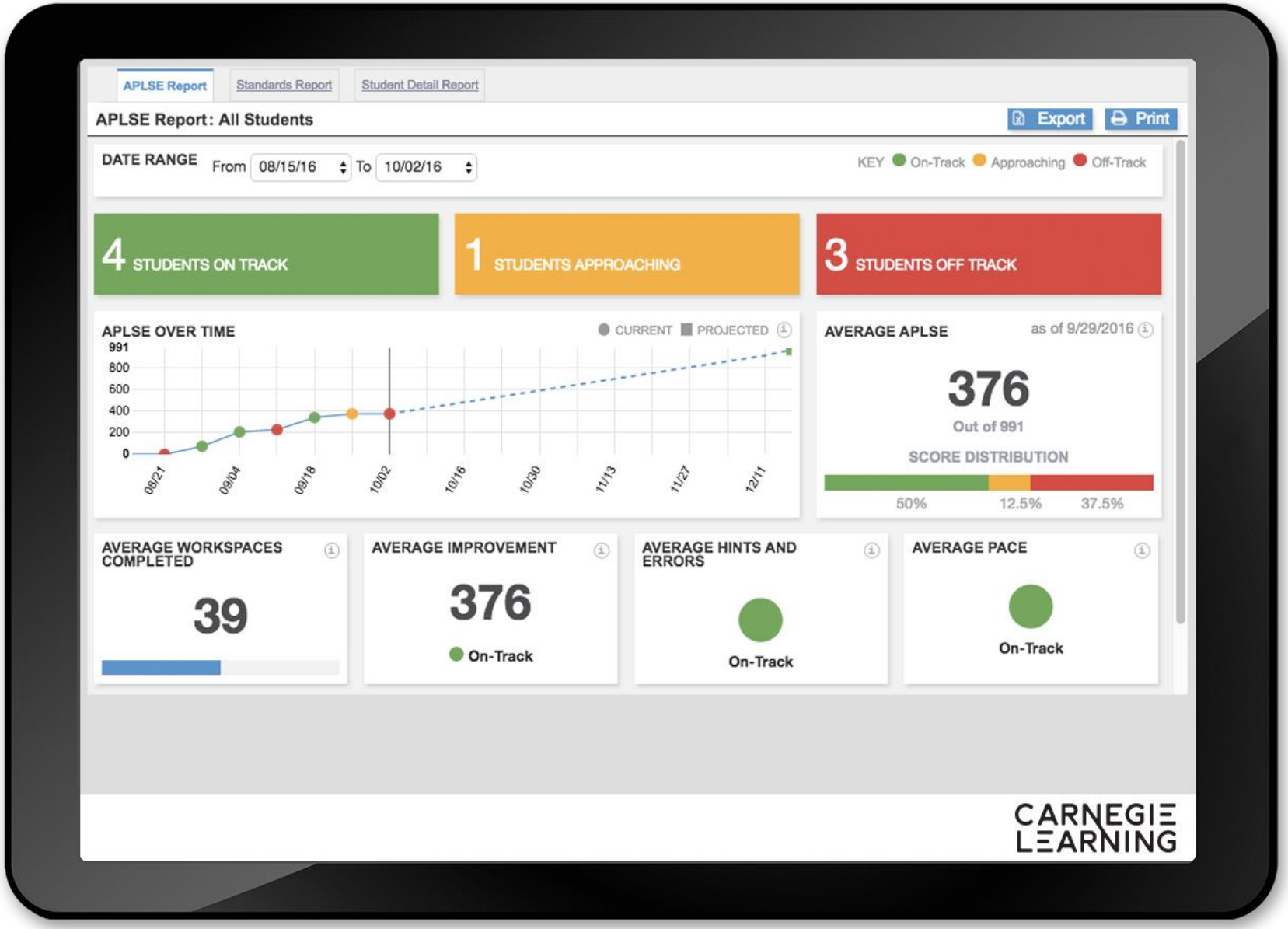
Some examples of *Artificial Intelligence in education*

SMART LEARNING PARTNER

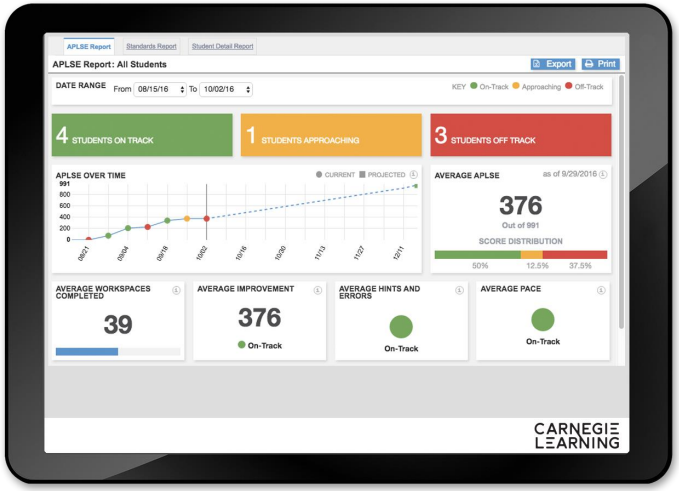
CARNEGIE LEARNING



INTRODUCING COGNITIVE TUTOR

CARNEGIE LEARNING

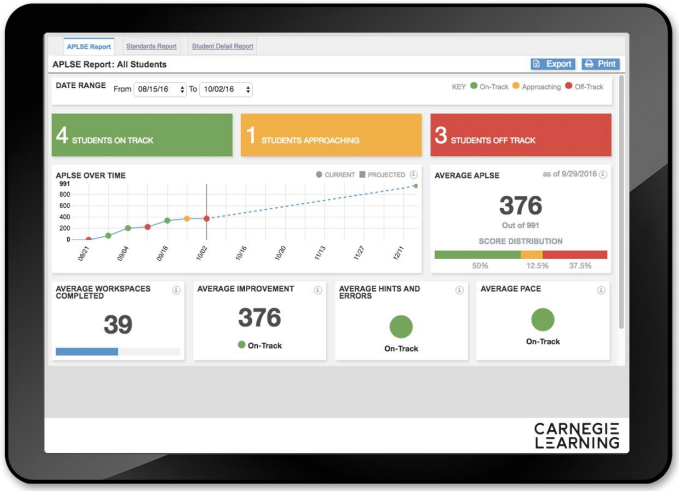
- Artificial Intelligence-driven software for the learning of mathematics.
- It aims to mirror a human tutor.
- In an independent study (U.S. Department of Education and the RAND Corporation), students using Cognitive Tutor achieved almost twice the progress (on standardized tests) compared to typical students.



HOW COGNITIVE TUTOR WORKS

CARNEGIE LEARNING

- Cognitive Tutor uses a model of math skills.
- Captures billions of student interactions, as students work through problems, and uses that data to learn, adapt, and improve.
- Like a human tutor, it re-phrases questions, re-directs the student, and focuses on the parts of the problem that are proving difficult.
- It provides customised just-in-time feedback.
- It doesn't just tell students what they got wrong, it tells them why they got it wrong, and how to get it right... and then it adapts.



UNLOCKE

Let's play!
Which of these calculations have the same answer as 8-5?
2+1
8+5
5-8
5+8
1+2
Same
Different
Here's the next task, remember to stop and think

UNLOCKE

- There are two distinct ways of reasoning, which co-exist and compete:

  System 1 H**euristic-based system** that is evolutionarily old, fast, automatic and parallel, and enables us to make decisions intuitively and very quickly in situations that are familiar.

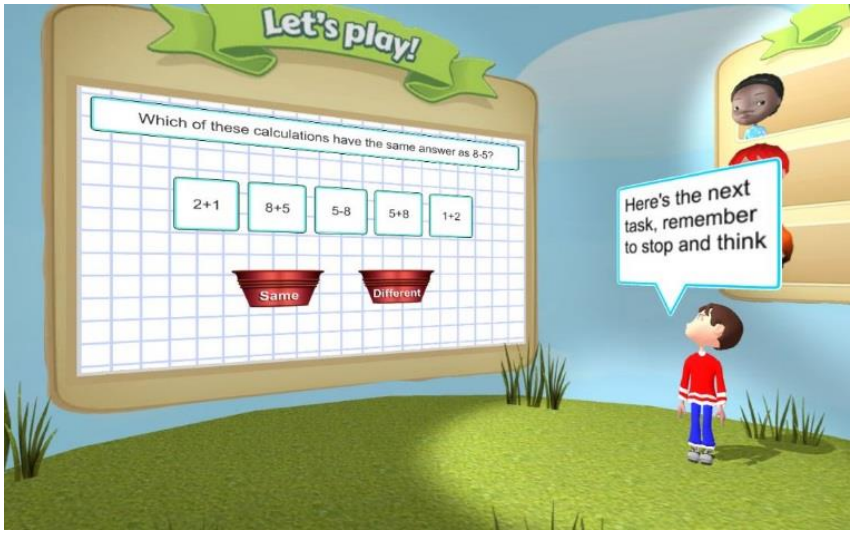
  System 2 A**nalytic system** that operates more slowly, is sequential, based on rules, and enables us to engage in abstract logical reasoning and hypothetical thinking.

- **The analytic system inhibits and overrides the heuristic system** when needed, so that we can think things through and carry out logical tasks, instead of giving an automatic but often incorrect response.

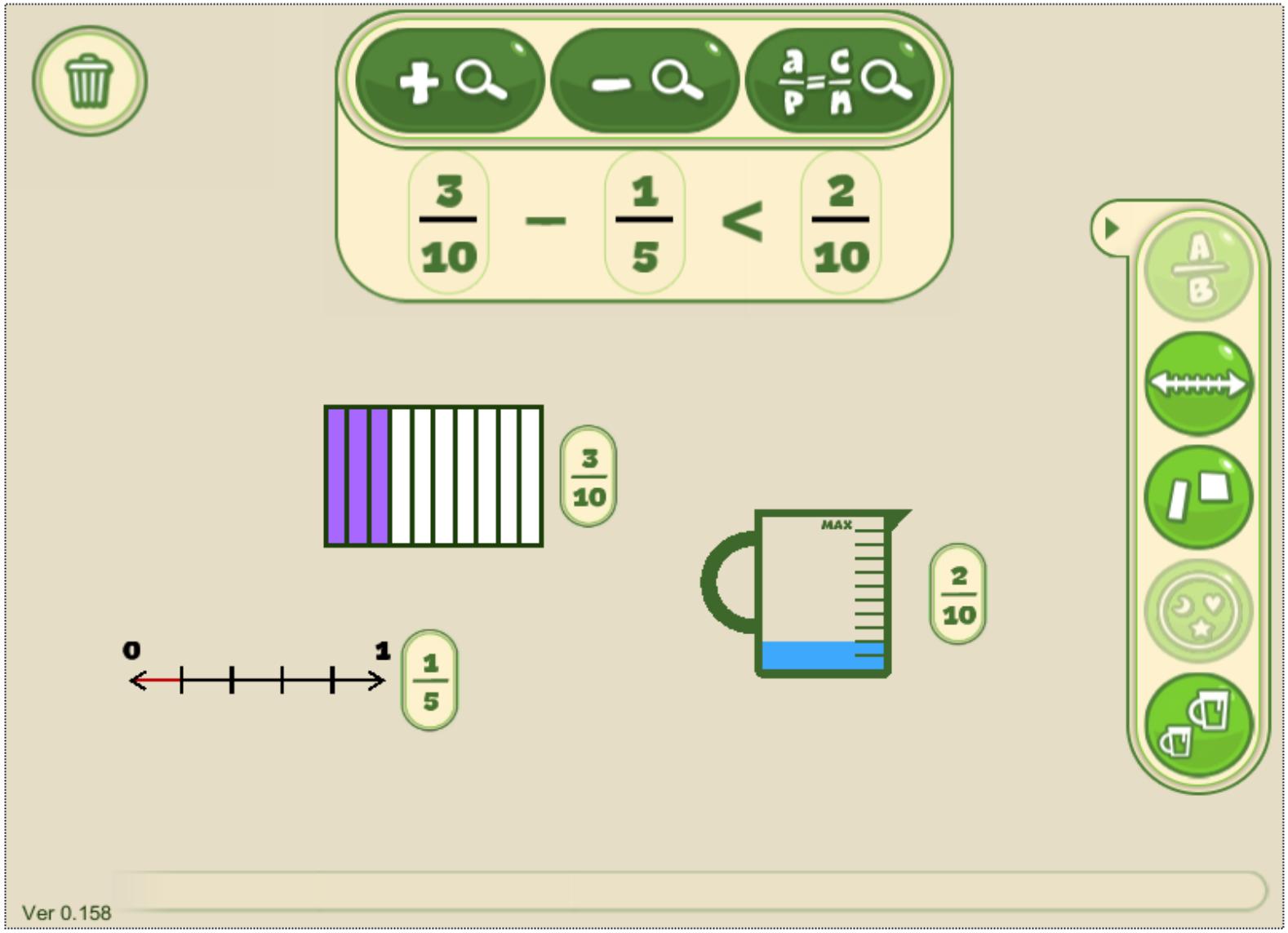
Evans, J. S. B. T. (2003). In two minds: dual-process accounts of reasoning. *Trends in Cognitive Science, 7,* 454-459
Kahneman, D. (2011). *Thinking, Fast and Slow.* Farrar, Straus and Giroux, New York.

UNLOCKE

- The UnLocke intervention aims to **train children to engage their analytic system 2 and inhibit their automatic system 1**, using an approach embedded within the maths and science curricula (to aid transfer).
- The children 'play' a gameshow-like intervention called '***Stop and Think***'.
- The system uses AI to adapt to the progress of the individual student.



FRACTIONS LAB

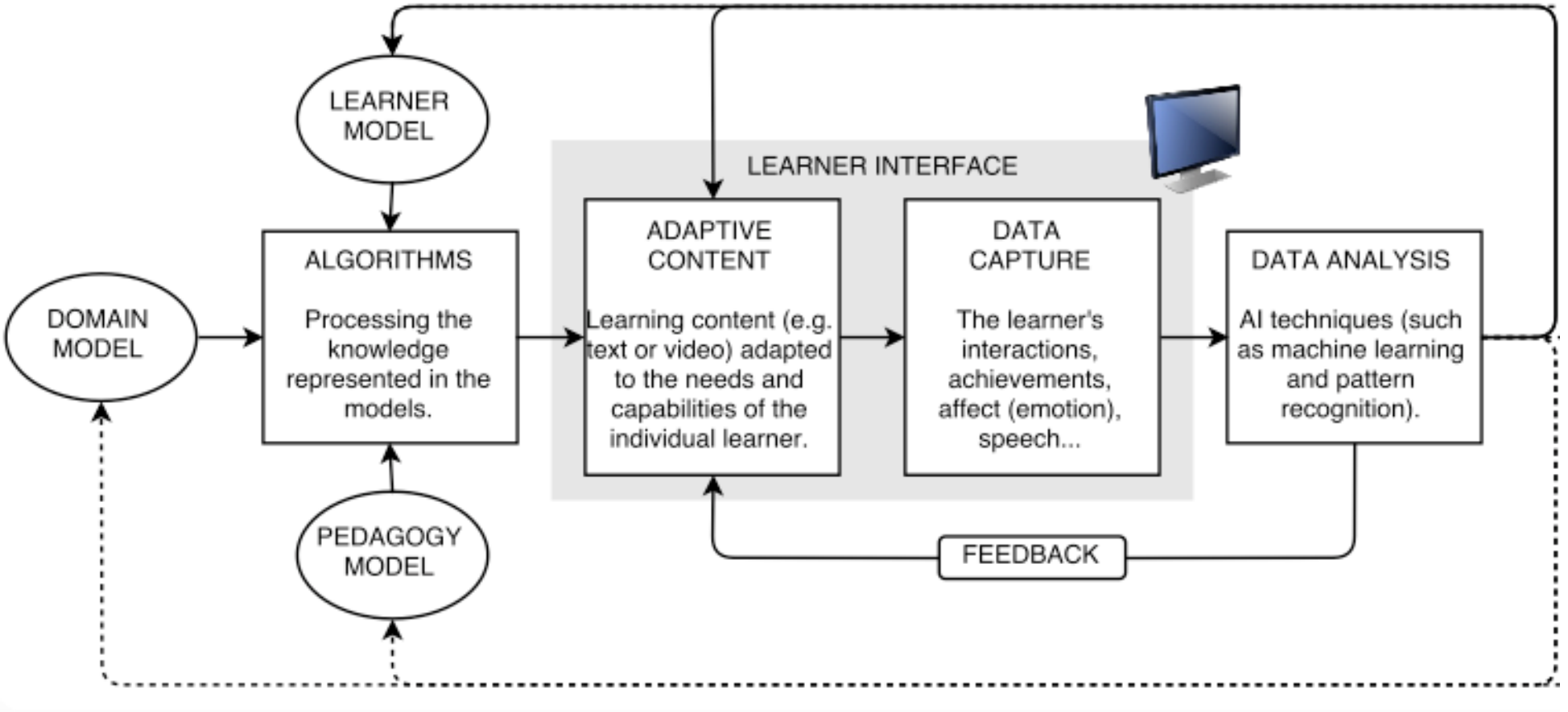


FRACTIONS LAB

- **Exploratory learning environment** designed to help students discover and construct ideas about fractions (helps with conceptual understanding).
- Students are given a task and use the fractions representations (rectangle, jug, number line…) to work out a solution.
- The system includes tools to help compare, add and subtract fractions.
- Each student follows their own **individual path towards a solution**.
- While they work, the system provides **targeted feedback**.
- The choice of next task is **adapted** by the system to needs of the individual student.

One approach to *Artificial Intelligence in education*

ONE APPROACH TO AI IN EDUCATION



Some future possibilities for *Artificial Intelligence in education*

AI AND COLLABORATIVE LEARNING

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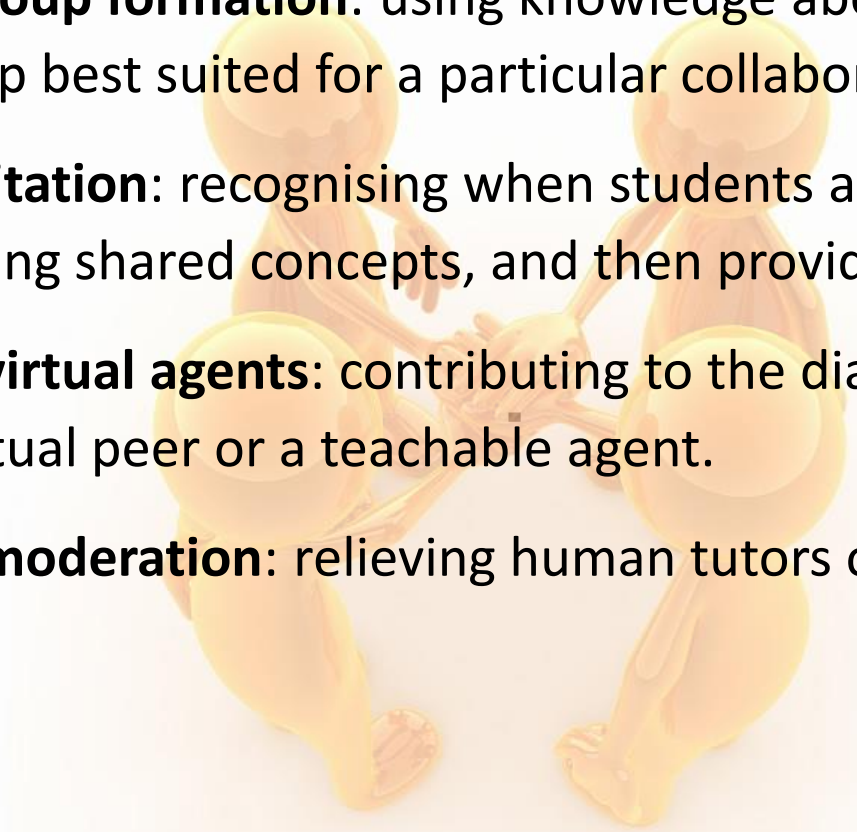
- Collaborative learning is well known to lead to better learning outcomes, but effective collaboration between learners can be difficult to achieve.
- AIED offers various possibilities:
  - **Adaptive group formation**: using knowledge about the participants to form a group best suited for a particular collaborative task.
  - **Expert facilitation**: recognising when students are having trouble understanding shared concepts, and then providing targeted support.
  - **Intelligent virtual agents**: contributing to the dialogues by acting as a coach, a virtual peer or a teachable agent.
  - **Intelligent moderation**: relieving human tutors of some moderation tasks.



AI LEARNING COMPANIONS

- Could accompany and support individual learners **throughout their studies**, perhaps through their mobile phone (**a Siri for learning**).
- Could help the learner to work out **what** to learn.
- Could suggest the **order and content** of topics to be learned.
- Could offer individualised examples, **feedback** and guidance.
- Could help learners to develop **21st century skills**.
- Could be suitable for **struggling and high-achieving learners** alike.

INTELLIGENT TEACHING ASSISTANTS

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- Could enable teachers to monitor student performance **while they learn**.
- Could **track students' progress** in detail.
- Could build and maintain **learner models for each child**, using interactions, voice recognition and eye tracking.
- Could **suggest teams** for collaborative activities.
- Could make our primitive 'stop and test' **assessments a thing of the past**.

To finish with… some concerns about *Artificial Intelligence in education*

SOME CONCERNS ABOUT AIED

Some AIED developers appear to believe:

- that they know enough about learning (because they went to school?);
- that it's OK to ignore 100+ years of research in the learning sciences;
- that it's OK to accept uncritically learning myths and buzz words;
- that it's OK to make big assumptions and use weak proxies;
- that it's OK to promise more than they can deliver; and
- that there will be 'no need' for teachers.

最后的一点想法

A final thought…

最后的一点想法
A FINAL THOUGHT

无论我们喜欢还是不喜欢，人工智能将对教育产生重大影响。

Whether we like it or not, AI is going to have a major impact in education.

最后的一点想法
A FINAL THOUGHT

因此，现在很重要的是教育工作者和学习科学家们要参与进来，以确保教育中的人工智能符合学生和教师的实际需要。

So it is important that educators and learning scientists engage now, to ensure that AI in education meets the real needs of students and teachers.

谢谢大家的聆听，欢迎大家提问。

Thank you for listening. I welcome your questions.

Dr Wayne Holmes
BA, MA, MSc (Oxon), PhD (Oxon), FHEA

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