Intelligent Interactive Systems: Introduction

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(slides adapted from Andrew Howes, IIS 2023)

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Intelligent, Interactive, Systems …

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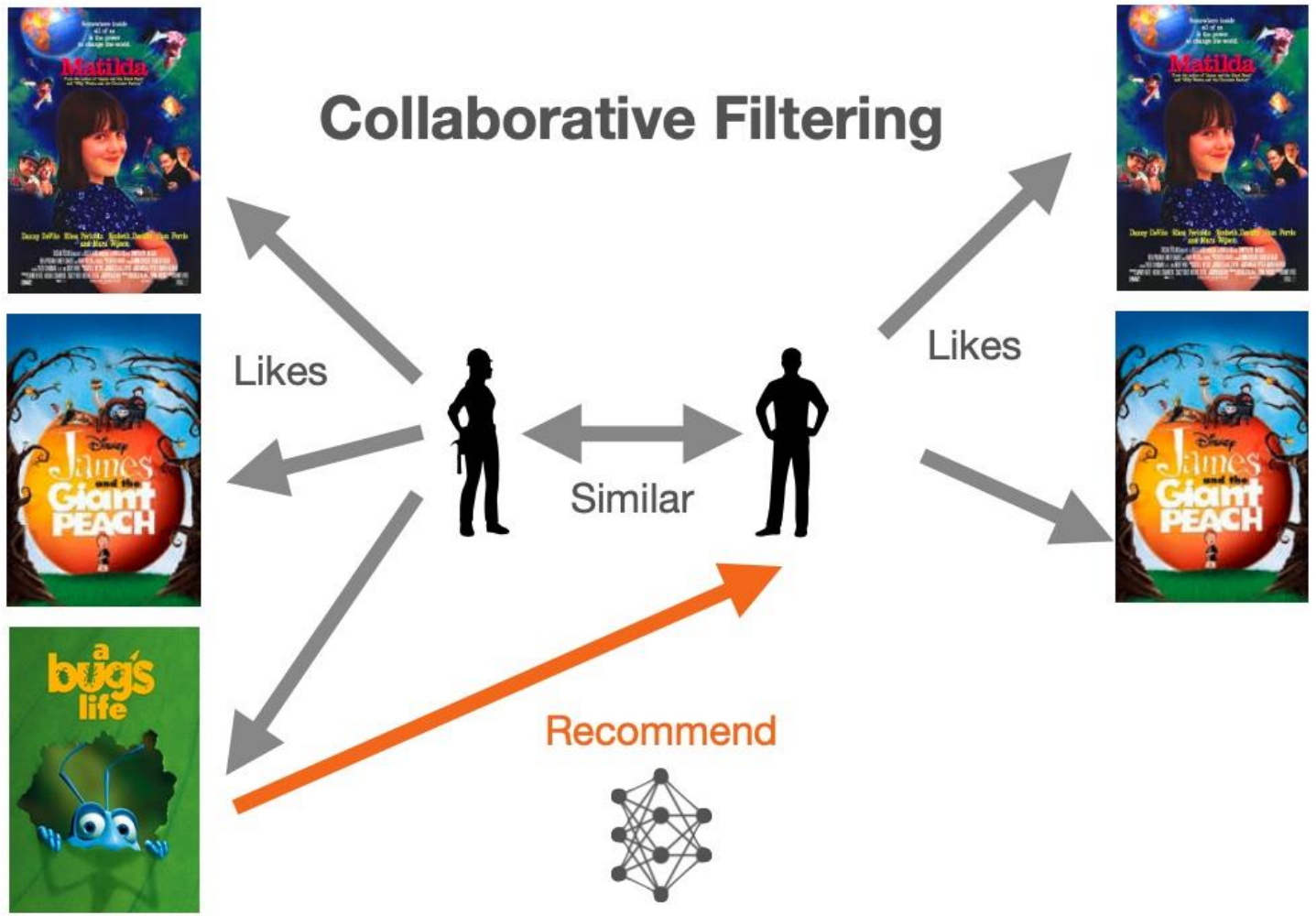
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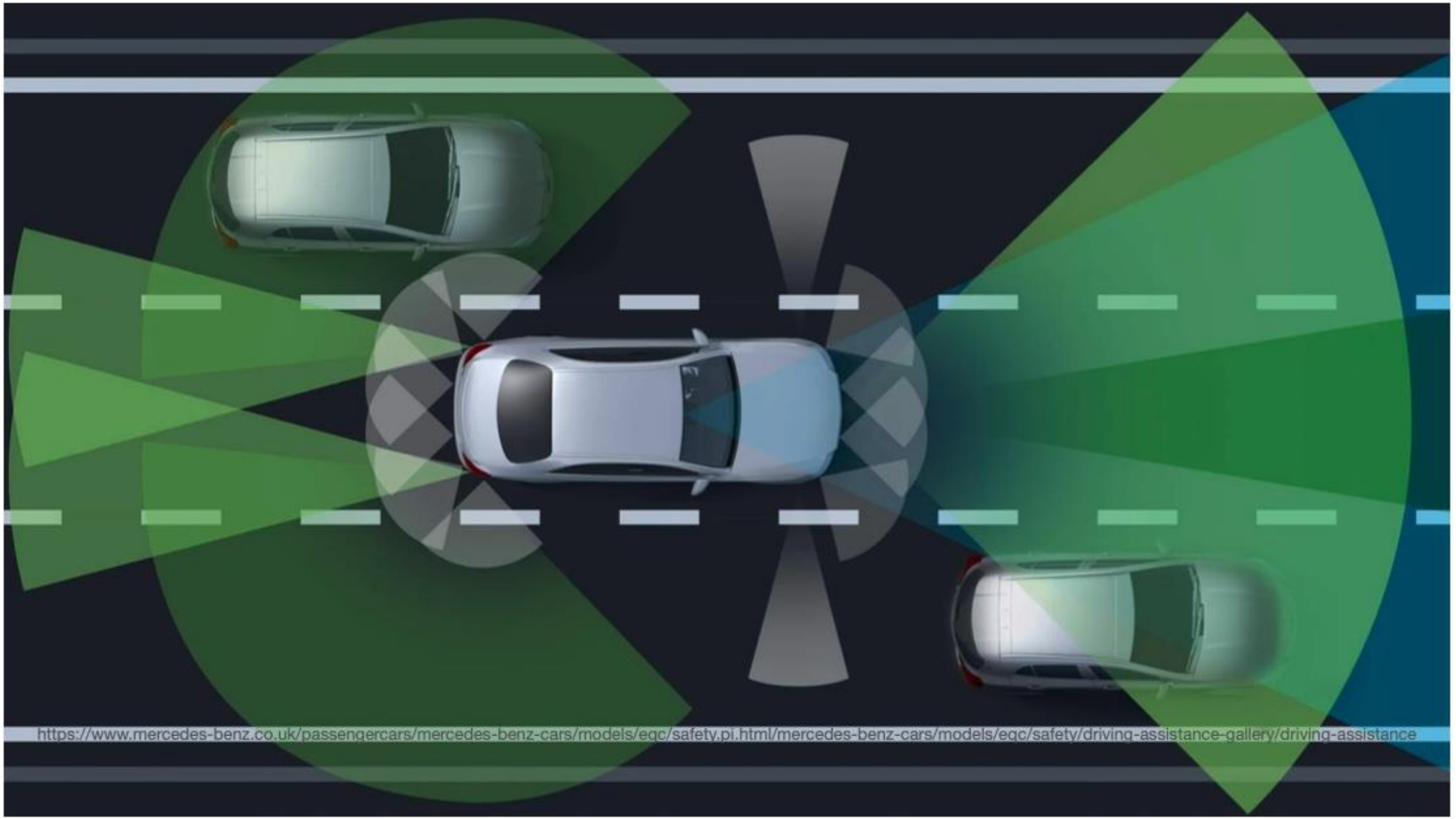
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https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2758472

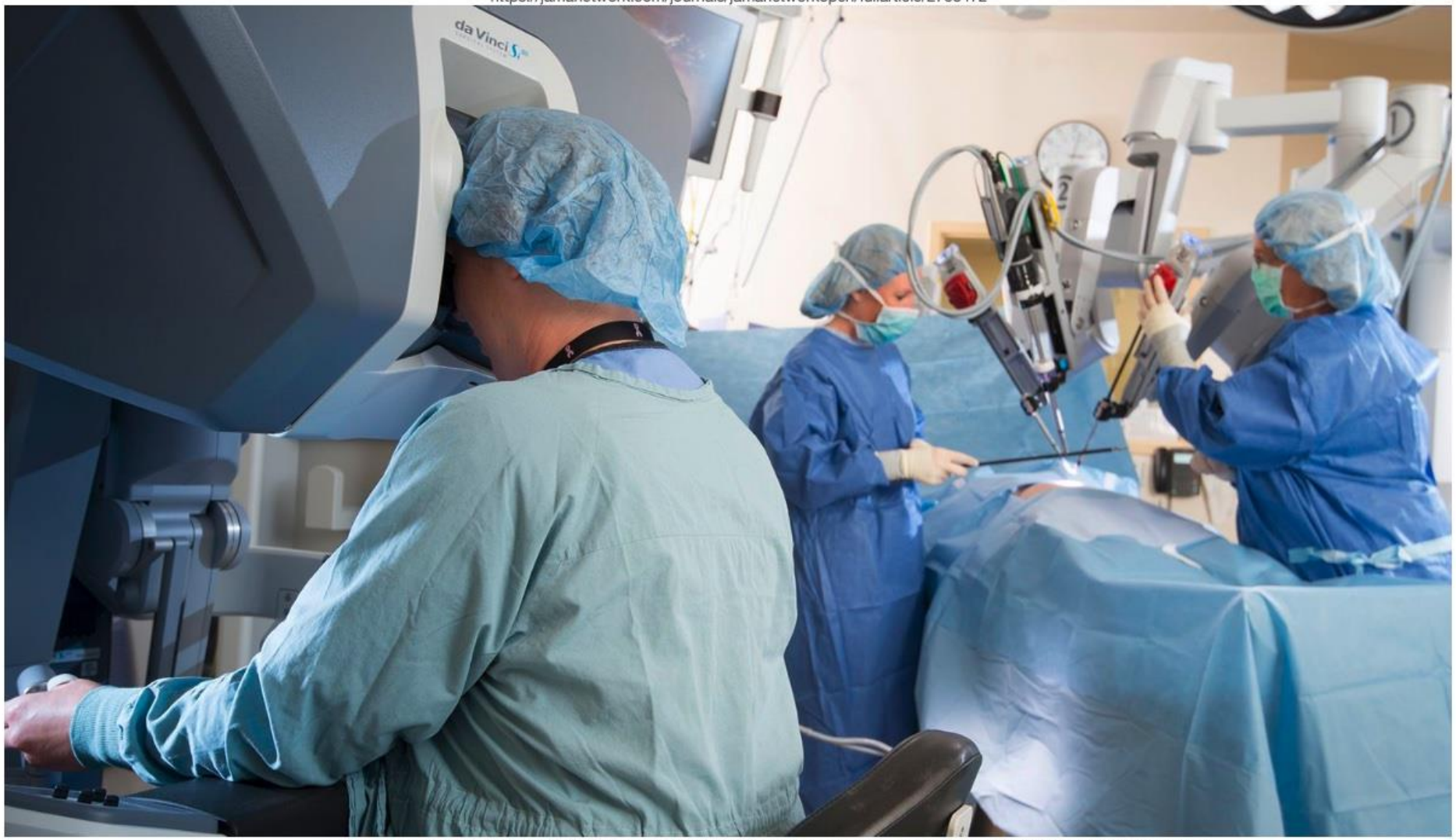

image: https://www.medtechdive.com/news/robotic-surgeries-surge-to-15-of-all-procedures-despite-limited-evidence/570370/

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image: https://developers.google.com/ml-kit/language/translation

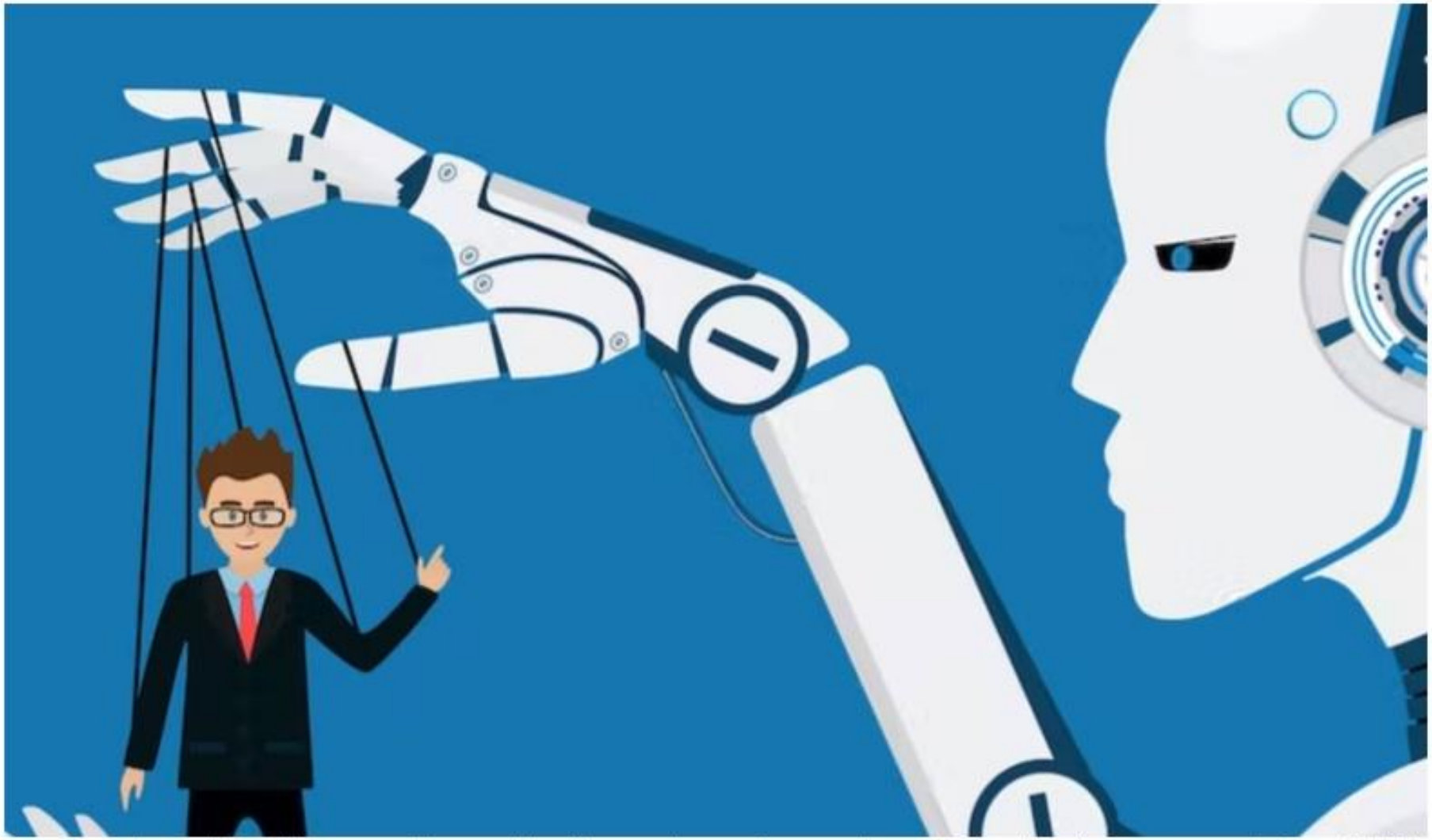
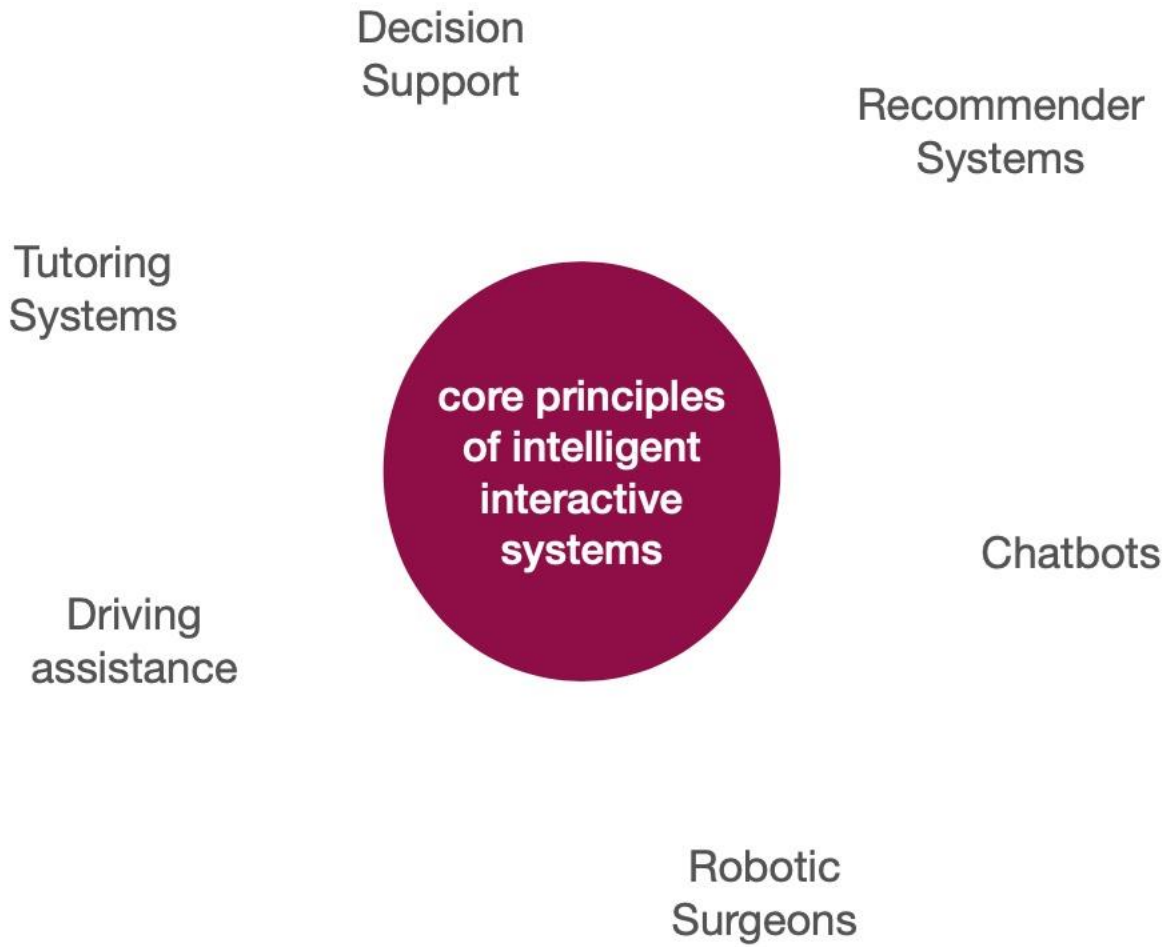


image: https://theconversation.com/algorithms-workers-cant-see-are-increasingly-pulling-the-management-strings-144724

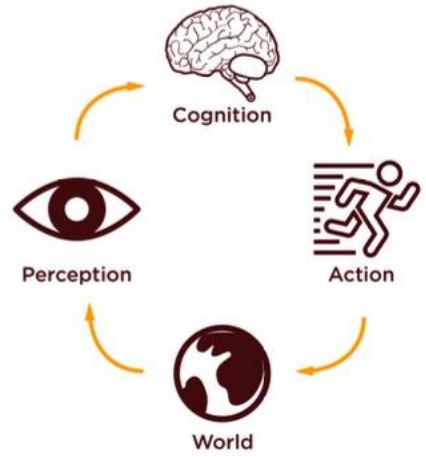

Decision Support
Recommender Systems
Tutoring Systems
core principles of intelligent interactive systems
Chatbots
Driving assistance
Robotic Surgeons

What do we mean by interactive?

Actions: move eyes, hands, arms, etc.

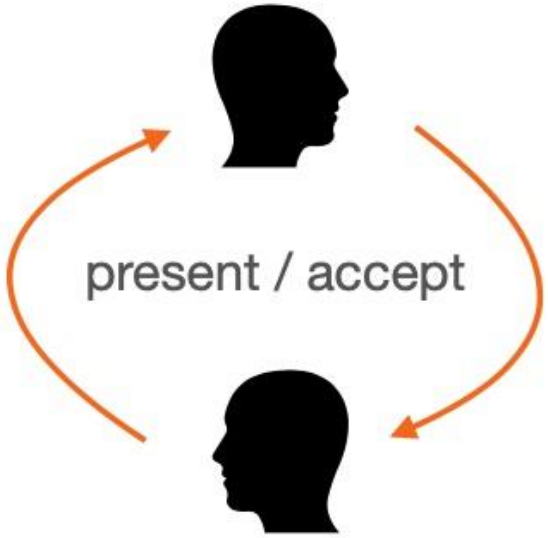
Perception: vision, touch, hear, smell etc.?

Cognition: automatic, consciously controlled.



The perception-action loop
@ hundreds of milliseconds

What do we mean by “interactive”?



O. Name of the people please?
C. Mrs Lane
O. Sorry, would you say that again please?
C. Lane
O. (spelling) M A I?
C. (spelling) L A N E
O. N for Nellie A N E
C. No, L for London
O. Oh! sorry, Lane, L for Leonard
C. Yes,

conversation @ time scale of seconds

Clark, H.H., & Schaefer, E.F. (1989). Contributing to discourse, Cognitive Science 13(2), 259-294

What do we mean by “interactive”?

decisions @ time scale of minutes/hours/days

Objective: Where should I do a masters degree?
Observe ratings: Leeds is good.
Observe ratings: Birmingham is better!
Decide: Birmingham.

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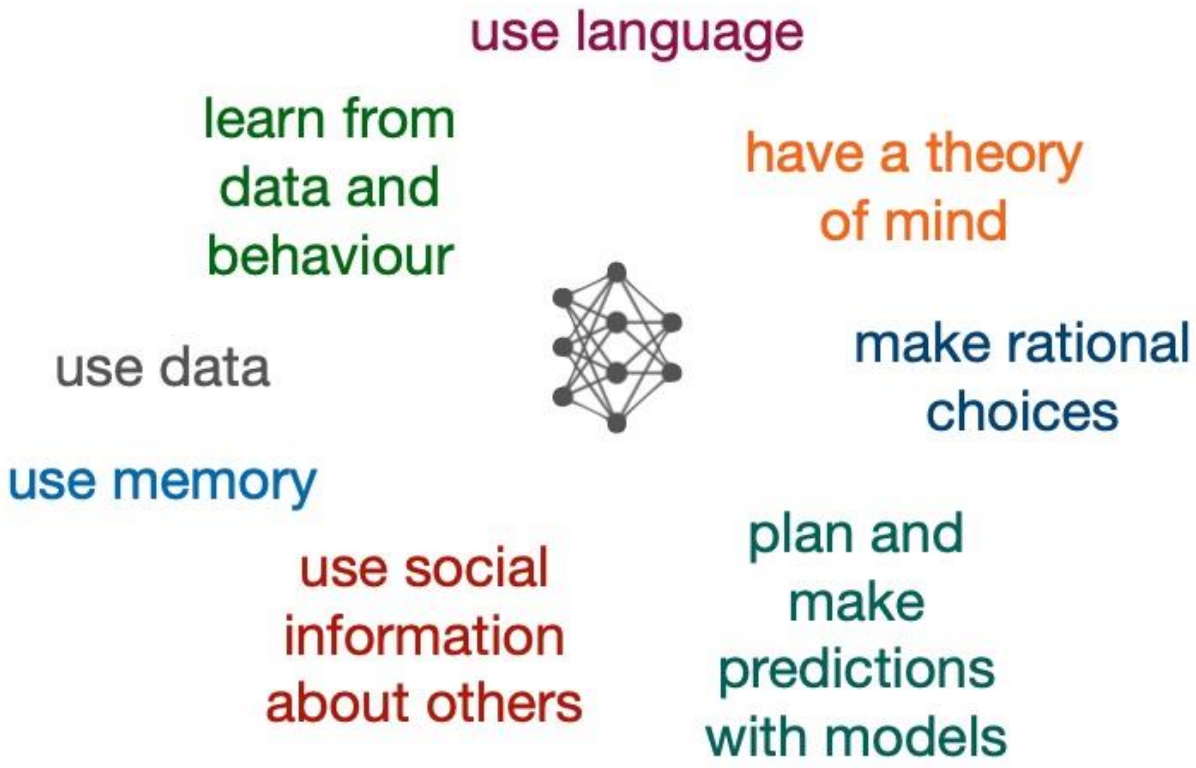
Payne, J.W., Bettman, J.R., & Johnson, E.J. (1993) The adaptive decision maker. Cambridge University Press

What do we mean by “intelligent”?



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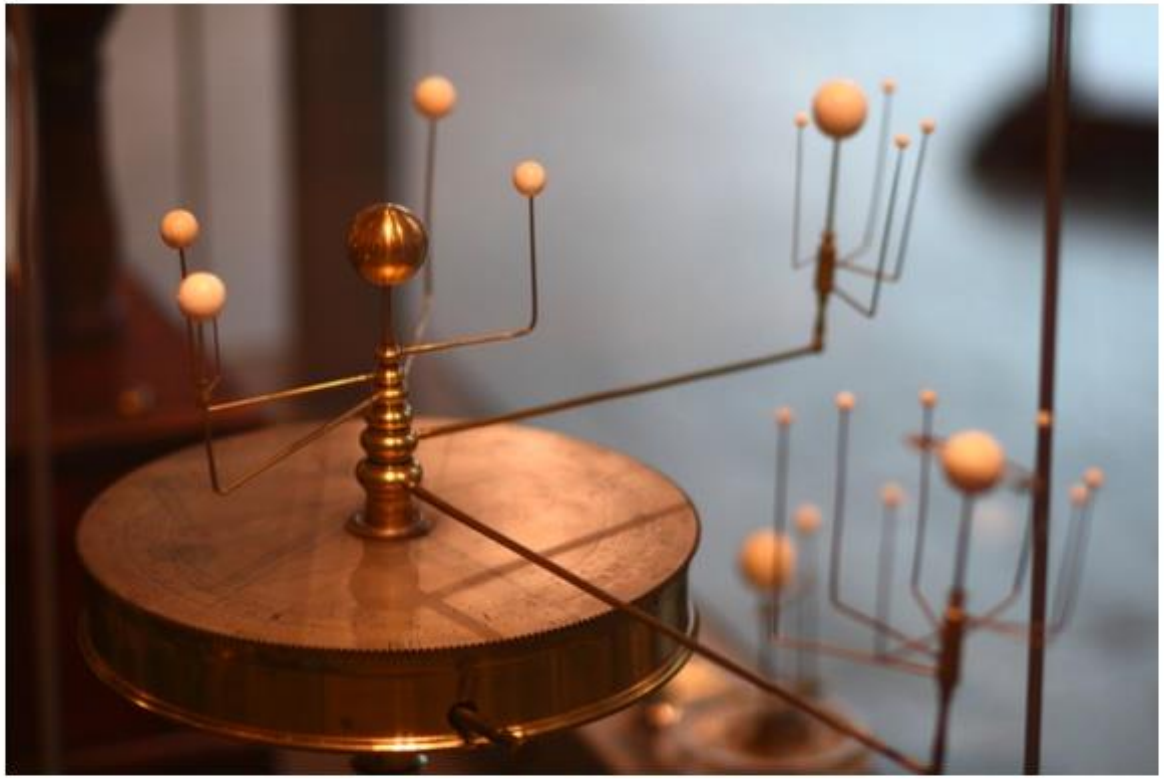
In short: to make rational choices given the available data and some objective.

What do we mean by “intelligent”?

The ability to use ‘mental’ models is one aspect of intelligence.



1766 Benjamin Martin Orrery

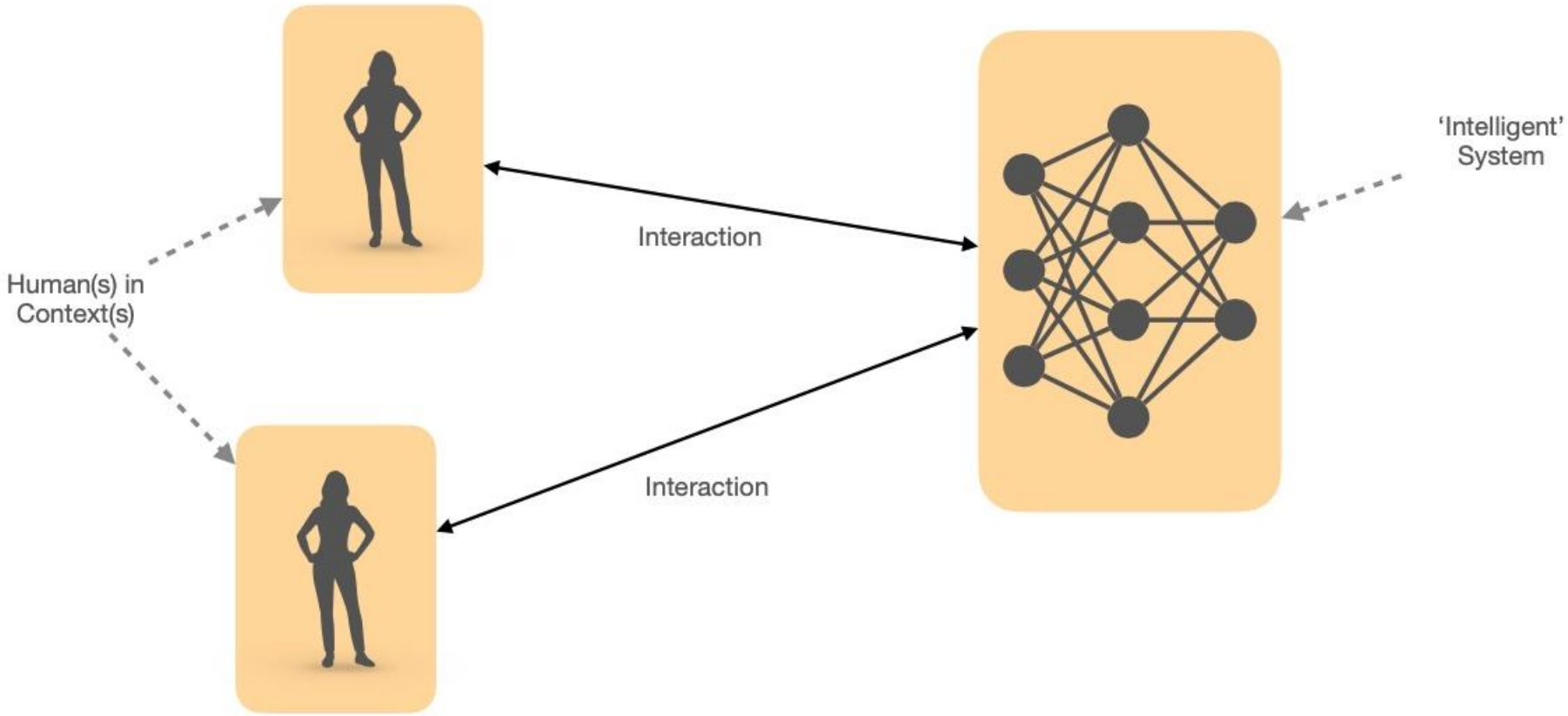
Models of Human Psychology

When designing intelligent interactive systems we need models of human psychology that have:

- Explainatory power
- Predictive power
- Consistency across context
- Consistency with other scientific models

We'll look at a number of these models of human psychology and evaluate them against these criteria.

A traditional view of interactive Systems



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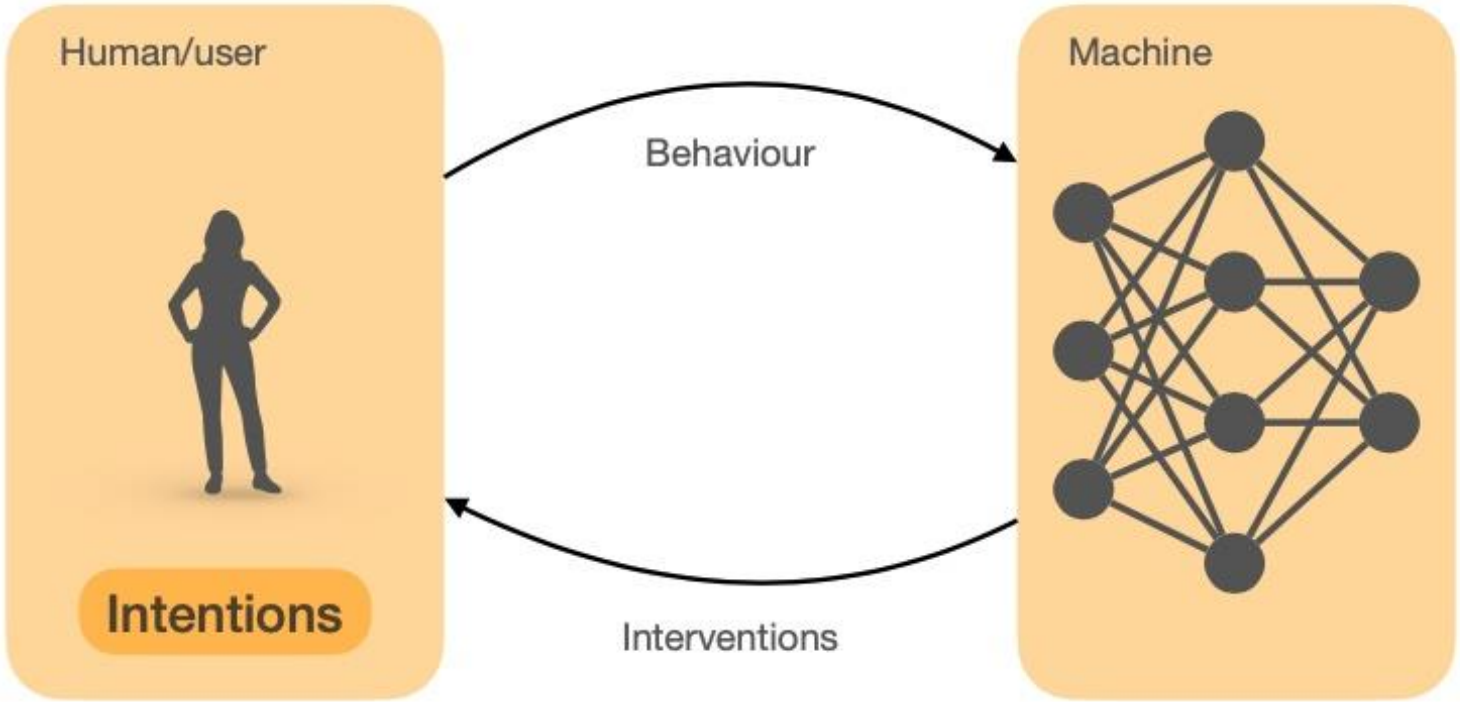
Intelligent Interactive Systems



Intentions

- A car is being tracked by an AI between Wychall Lane, south to Hopwood.
- What is the intention of the user?
- What is the probability that the destination is to the south?

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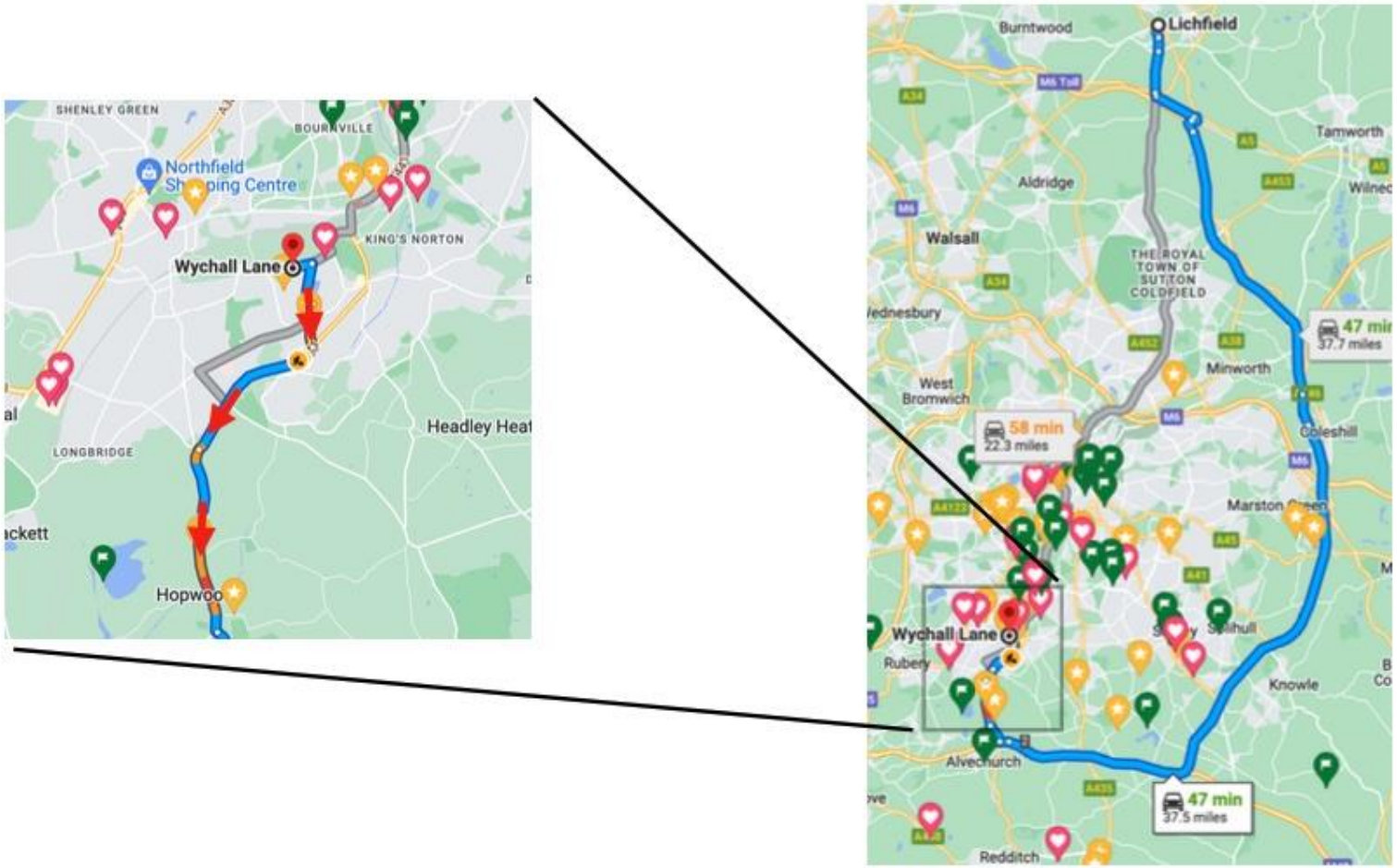

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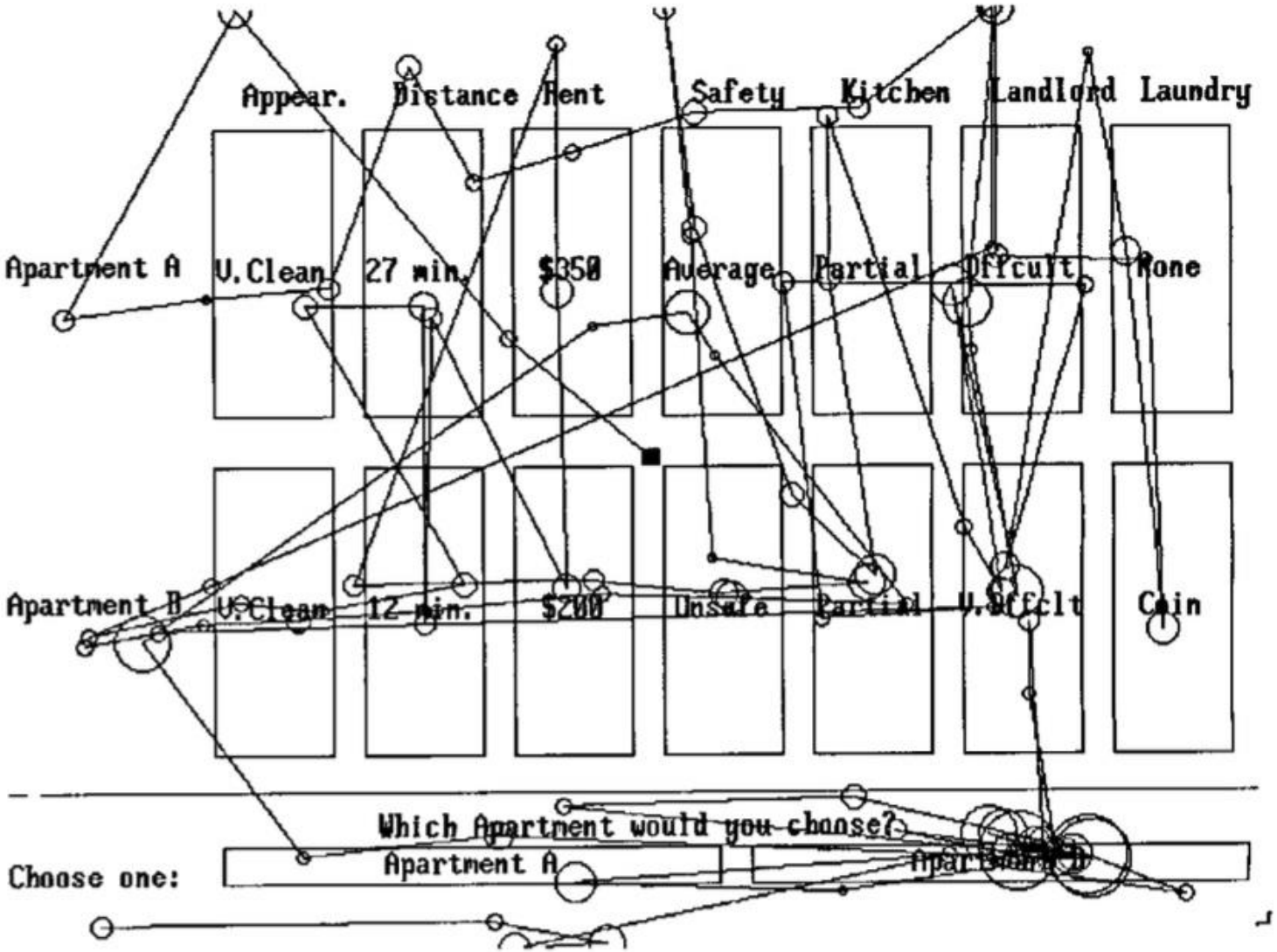

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Lohse, G.L., & Johnson, E.J. (1996). A comparison of two process tracing methods for choice tasks. Organizational Behavior and Human Decision Processes, 68(1), 28-43.

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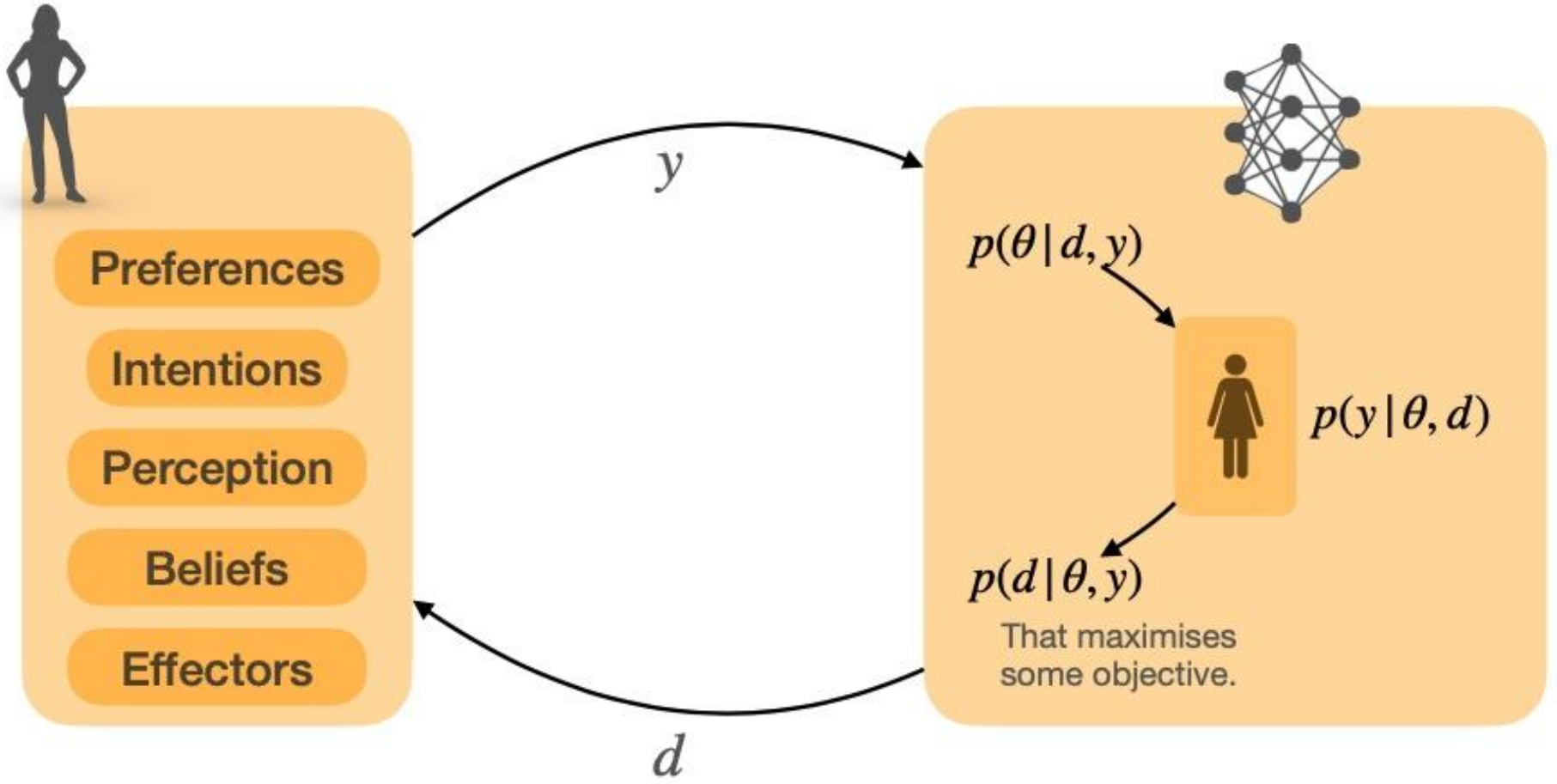
A goalie adapts to a penalty taker's **intentions**

But the striker knows that the goalie will try and guess their **intentions** so they try to fool them

In general the problem of estimating the intentions of another is a problem in a **co-adaptive** setting

Intelligent Interactive Systems



Building Intelligent Interactive Systems is not :

- Artificial General AI
- Cognitive Science

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Learning Outcomes

By the end of the course, you will be able to:

- Demonstrate an understanding of the conceptual structure of a broad range of Intelligent Interactive Systems.
- Demonstrate knowledge of how human psychology shapes interactive systems design.
- Understand how to build software models of human-computer cooperation.
- Analyse new intelligent interactive design problems and program solutions.

Summary

- That must cooperate (or collaborate) with humans.
- That cooperation requires **interaction and intelligence**.
- That **interaction** can occur on multiple times scales (perception- action, conversational, decision).
- That **intelligence** is about the ability to learn and make rational choices using the available data.
- That **intelligence** requires the use of models that are predictive, explanatory and consistent across contexts.
- And, that it requires **inferring** preferences and intentions from behaviour.

Thank you.

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