

CSC-411

Artificial

Intelligence

Introduction to Artificial Intelligence



Course Learning Outcomes (CLOs)

- **CLO-1: Knowledge** of what constitutes Artificial Intelligence and how to identify systems and agents with Artificial Intelligence. (C1)
- **CLO-2: Comprehend** how Artificial Intelligence enables capabilities that are beyond conventional technology, for example, chess-playing computers, self-driving cars, robotic vacuum cleaners. (C2)
- **CLO-3: Apply** classical Artificial Intelligence techniques for problem solving. (C3)

WHAT is Artificial Intelligence?

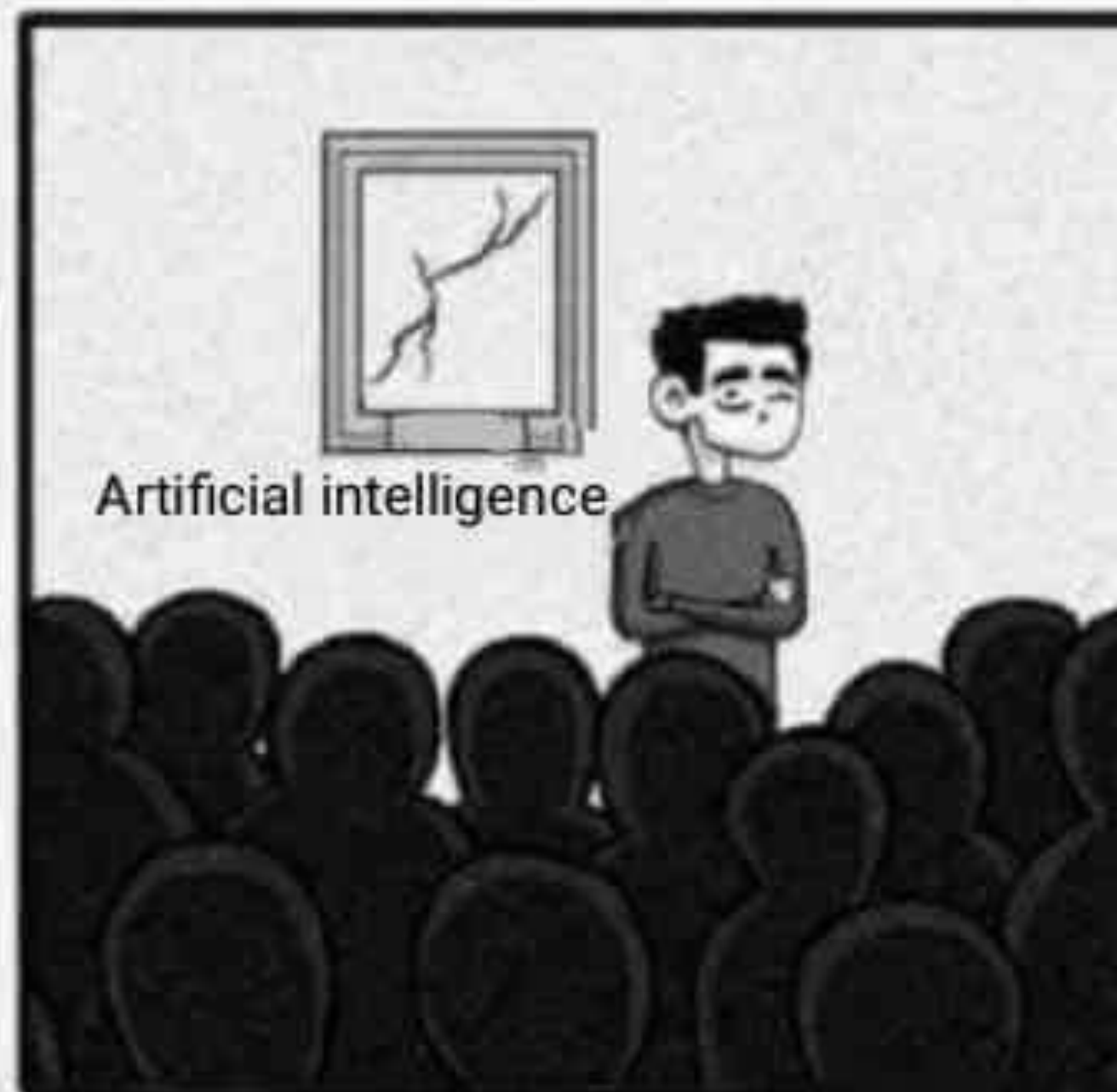
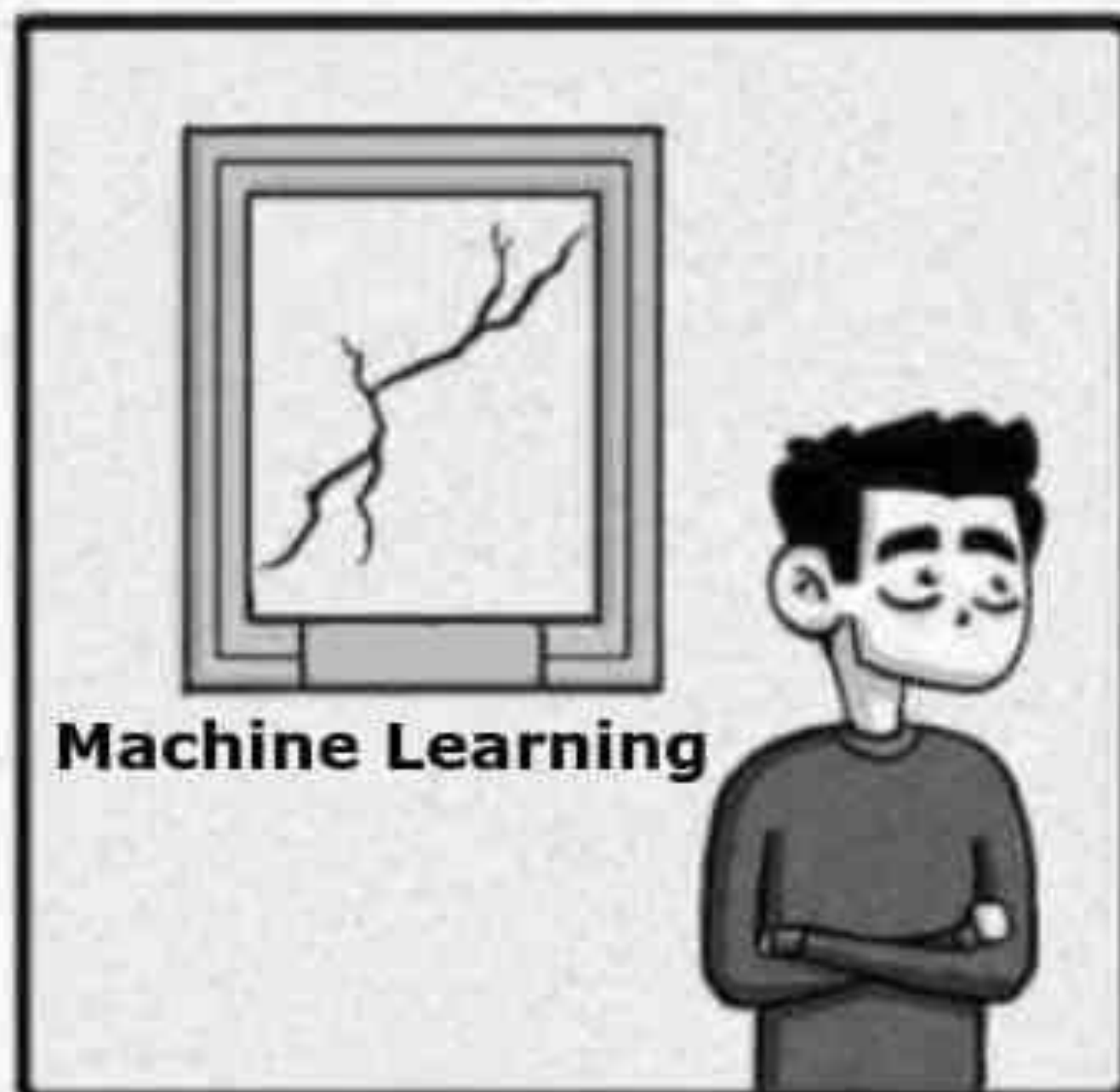
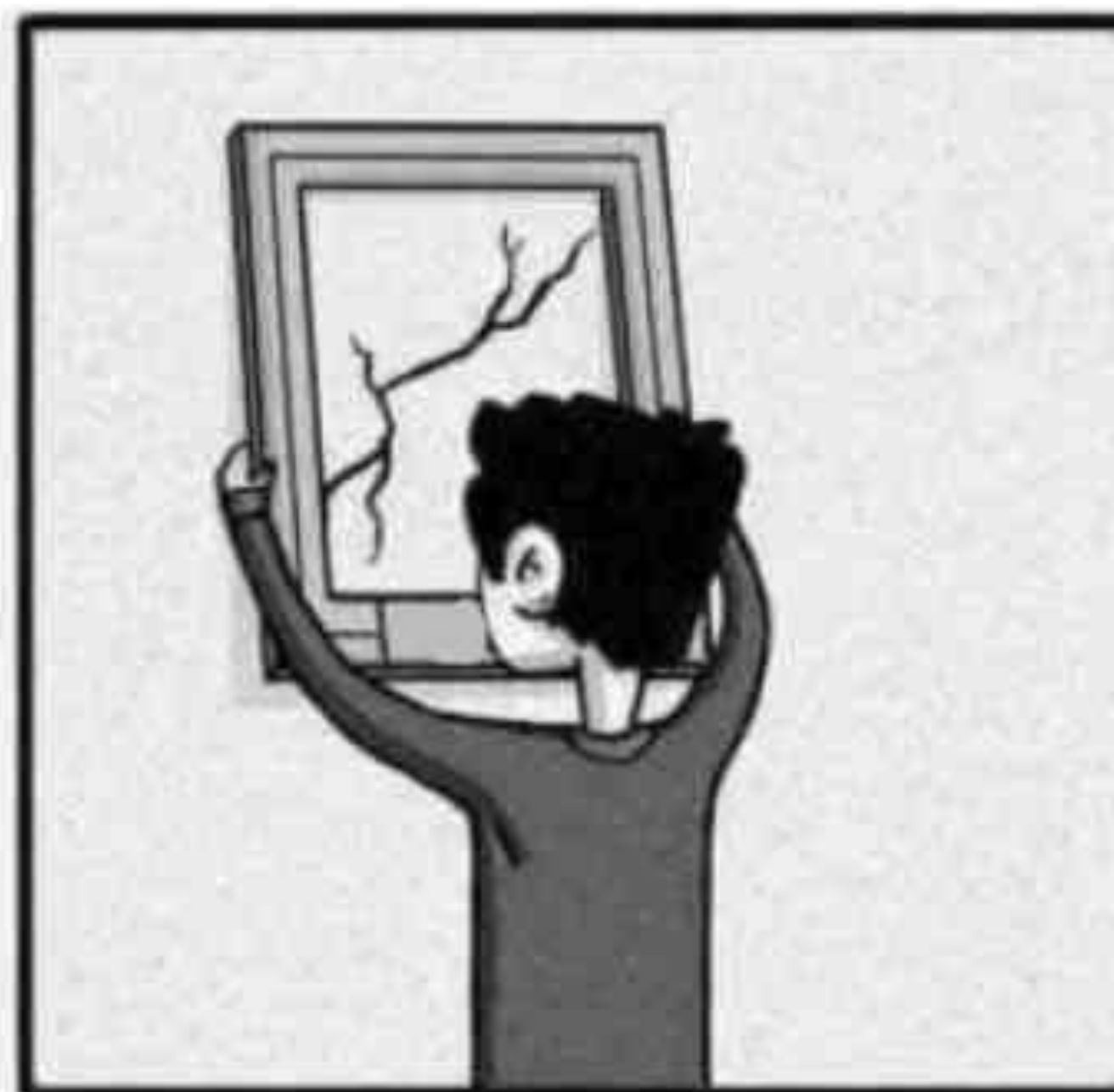
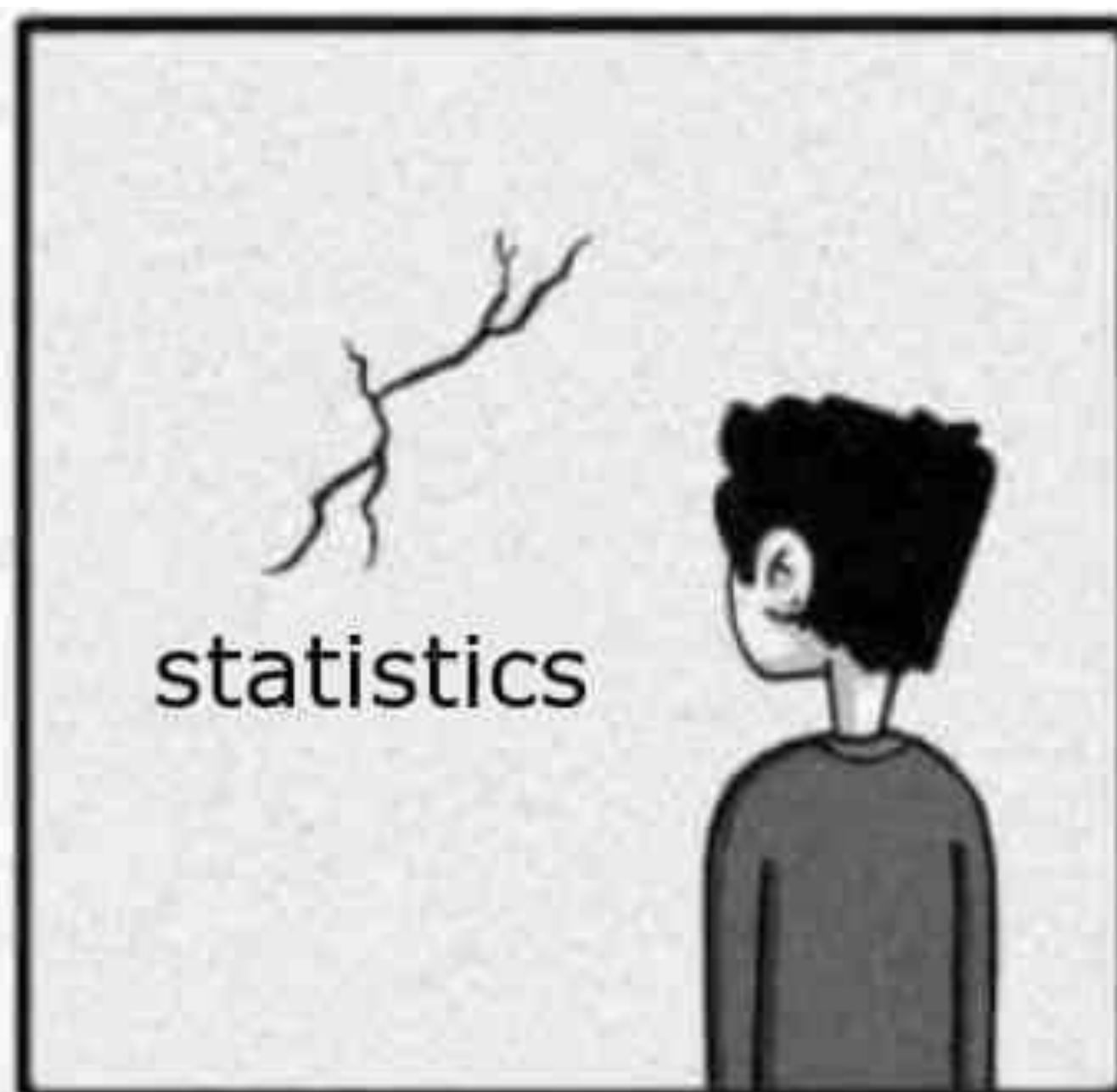


Definitions of AI

- **Artificial:** made by human skill; produced by humans (opposed to natural)
- **Intelligence:** “The ability to learn and solve problems” (Webster’s Dictionary)
- **Artificial Intelligence(AI):**

“The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.” (Oxford Languages)

“The study and design of intelligent agents, where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success.” (Russel & Norvig)



WHY Artificial Intelligence?

“Just as the Industrial Revolution freed up a lot of humanity from physical drudgery, I think AI has the potential to free up humanity from a lot of the mental drudgery.”

(Andrew Ng.)

AI Perspectives

Four schools of thoughts(Russel & Norvig)

Thinking Humanly	Thinking Rationally
“The exciting new effort to make computers think...machines with minds, in the full and literal sense.” (Haugeland,1985)	“The study of mental faculties through the use of computational models.” (Charniak and McDermott, 1985)
Acting Humanly	Acting Rationally
“The study of how to make computers do things which, at the moment, people are better.” (Richard Knight,1991)	“Computational Intelligence is the study of the design of intelligent agents.” (Poole et al. 1998)

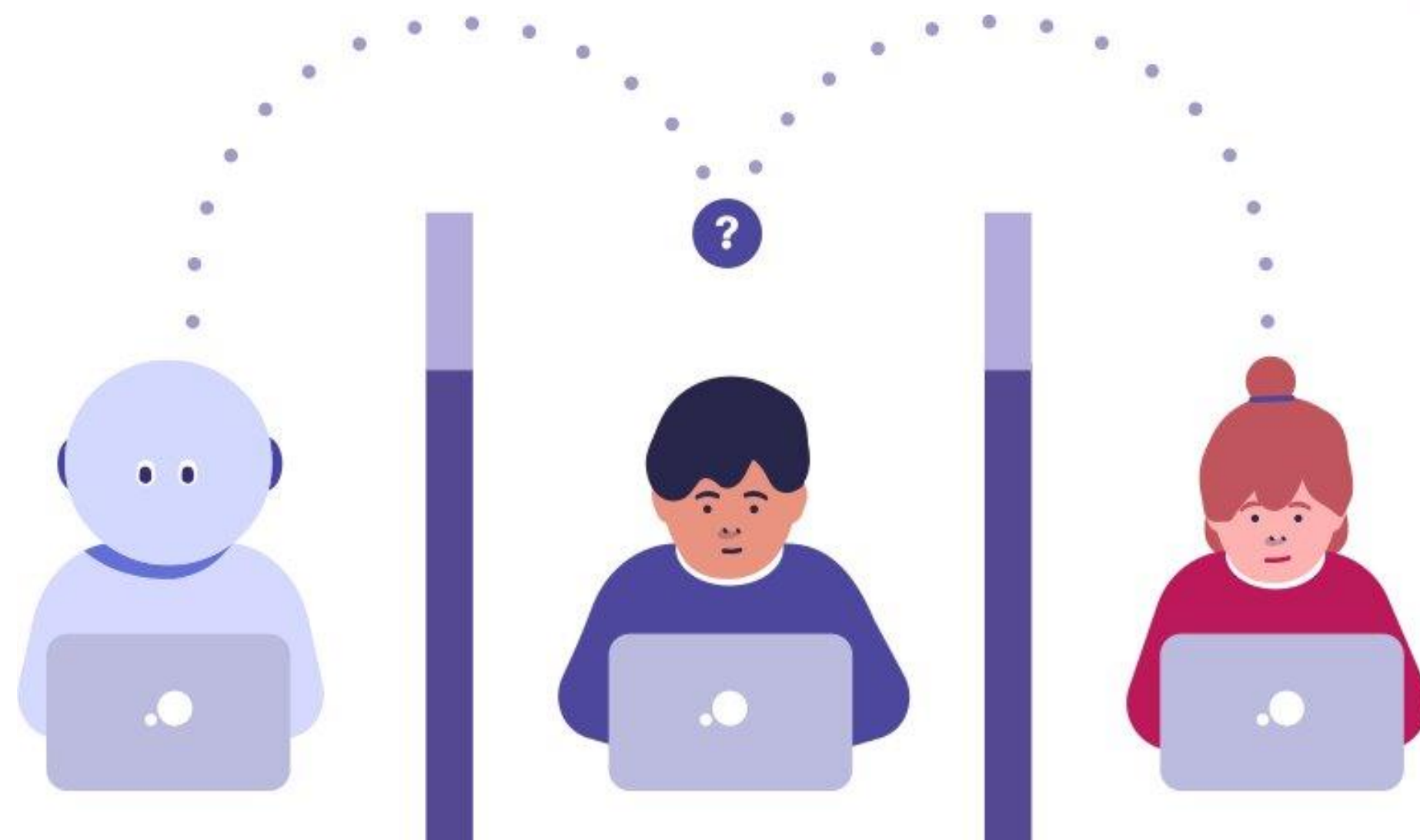
Thinking Humanly: Cognitive approach

- Requires to determine how humans think! 1960's "cognitive revolution"
- Requires scientific theories of internal activities of the brain
- Level of abstraction? "Knowledge" or "circuits"?
- How to validate?
- Today, Cognitive Science and Artificial Intelligence are distinct disciplines.

*"AI is about making computers solve complex problems, that if people solved them would require intelligence – **it is the result that counts.** Cognitive Science is about making computers solve complex problems similar to how humans solve problems – **it is the process that counts.**"*

Acting Humanly

- Turing test(Alan Turing 1950): A computer passes the test of intelligence, if it can fool a human interrogator.
- Major components of AI: knowledge, reasoning, language, understanding & learning.



Acting Humanly



Thinking Rationally: Laws of thoughts

- Codify “right thinking” with logic
- Several Greek schools developed various forms of logic: notation and rules of derivation for thoughts
- Problems:
 - Not all knowledge can be expressed with logical notations
 - Computational blow up

Acting Rationally

- The right thing: that which is expected to maximize goal achievement, given the available information.
- A rational agent is one that acts so as to achieve the best outcome, or when there is uncertainty, the best expected outcome.

“Every art and every inquiry, and similarly every action and pursuit, is thought to aim at some good.” (Aristotle)

Foundations of AI



ARTIFICIAL INTELLIGENCE



Philosophy: Where does knowledge come from?



Linguistics: How does language relate to thought?



Neuroscience: How do our brains process information?



Behavioral Economics: How do you make decisions to maximize utility?

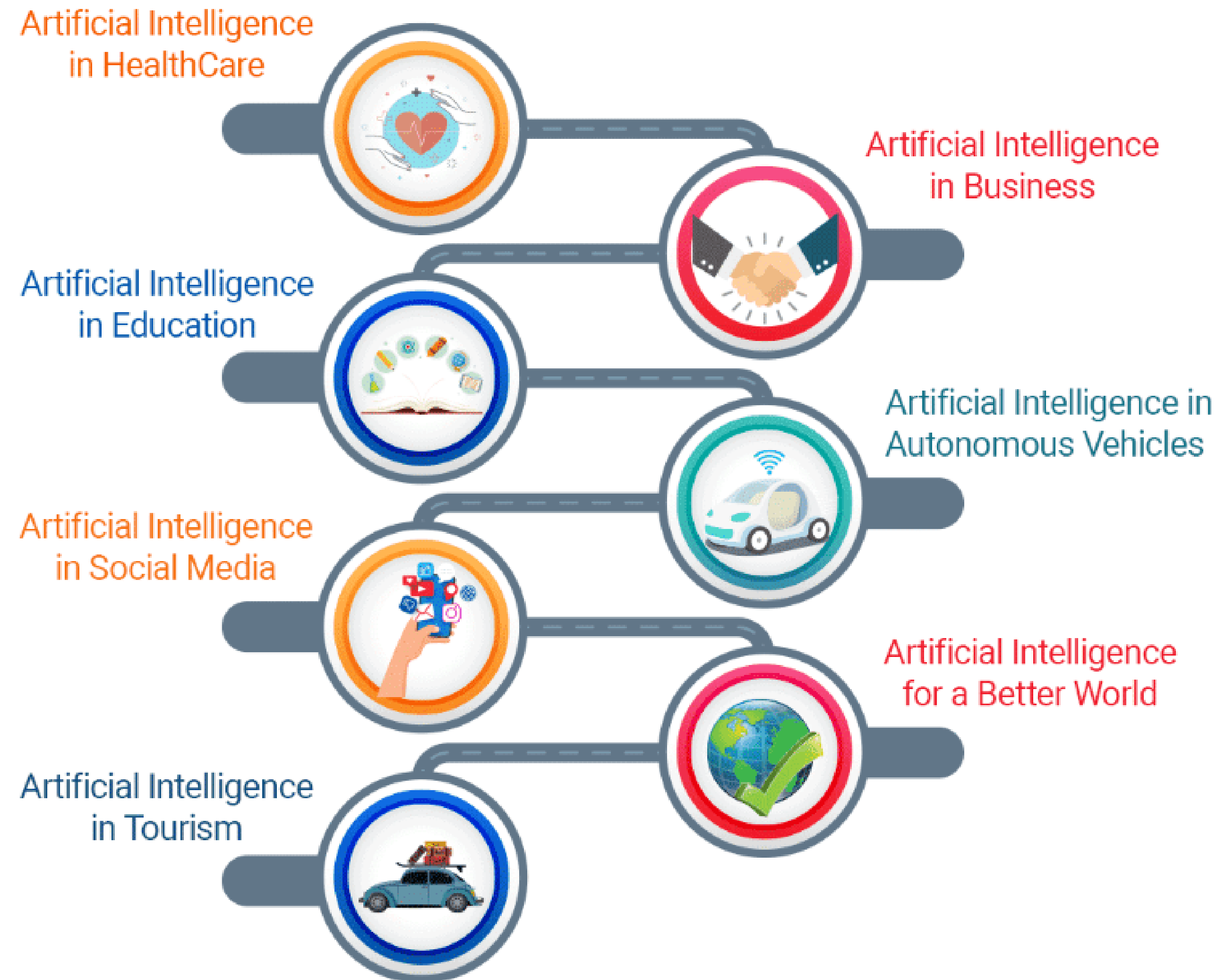


Mathematics: What can be computed?



Computer Science: How can we build an efficient computer?

Applications of AI



Applications of AI

Breakdown of use cases by applicable techniques, %

Full value can be captured using non-AI techniques

15

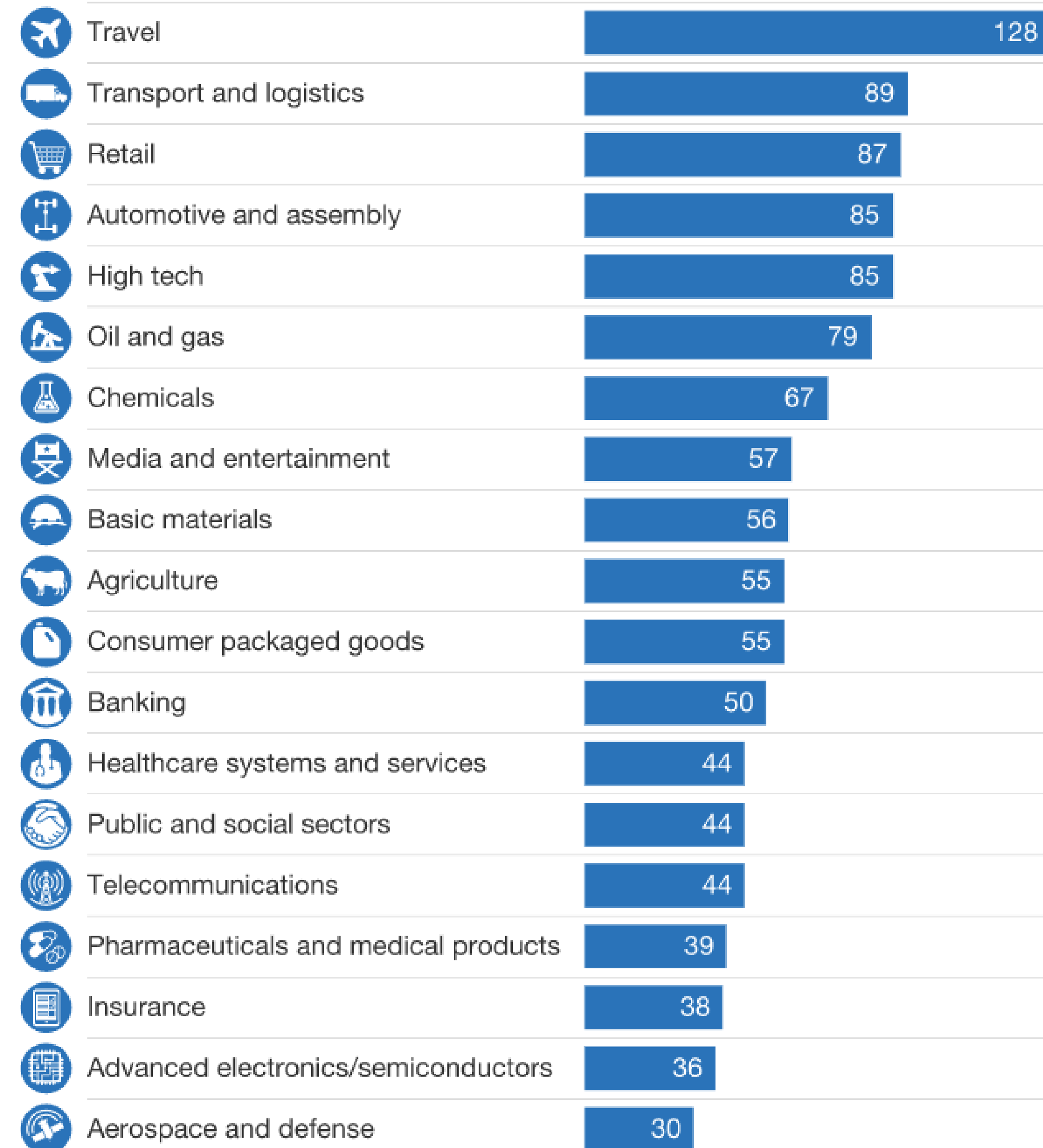
AI necessary to capture value ("greenfield")

16

AI can improve performance over that provided by other analytics techniques

69

Potential incremental value from AI over other analytics techniques, %



Applications of AI

3 Key Artificial Intelligence Statistics You Should Know

 **FinancesOnline**
REVIEWS FOR BUSINESS

1 Which processes rely heavily on AI?

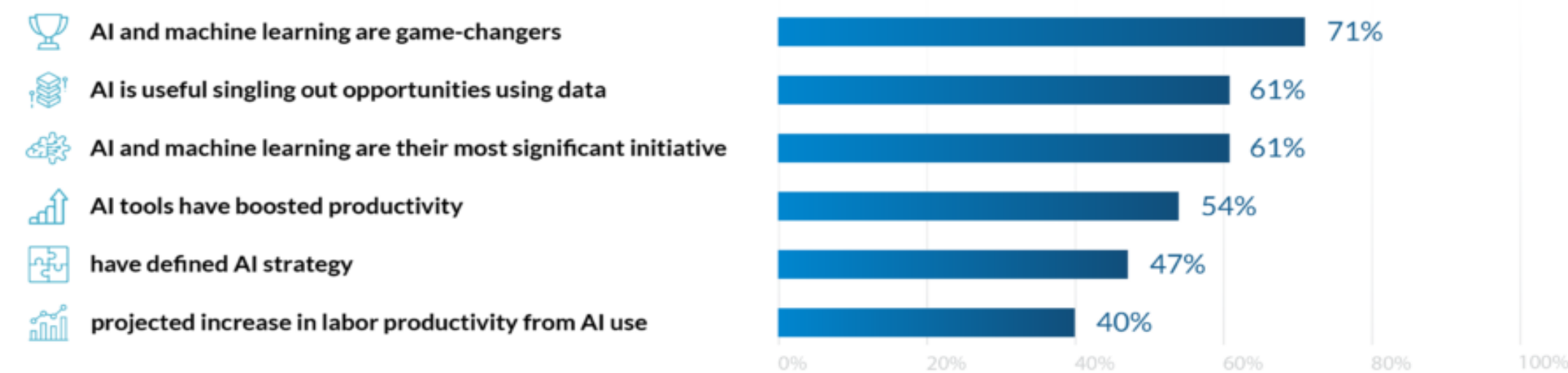
Source: Statista

Global AI ranked by revenue of use cases:



2 How do organizations and leaders perceive AI?

Sources: MemSQL, Accenture, narrativesscience.com, cmo.com, pwc.com



3 What are the top benefits of AI adoption?

Source: The Economist, Forbes, pwc.com, hbr.org

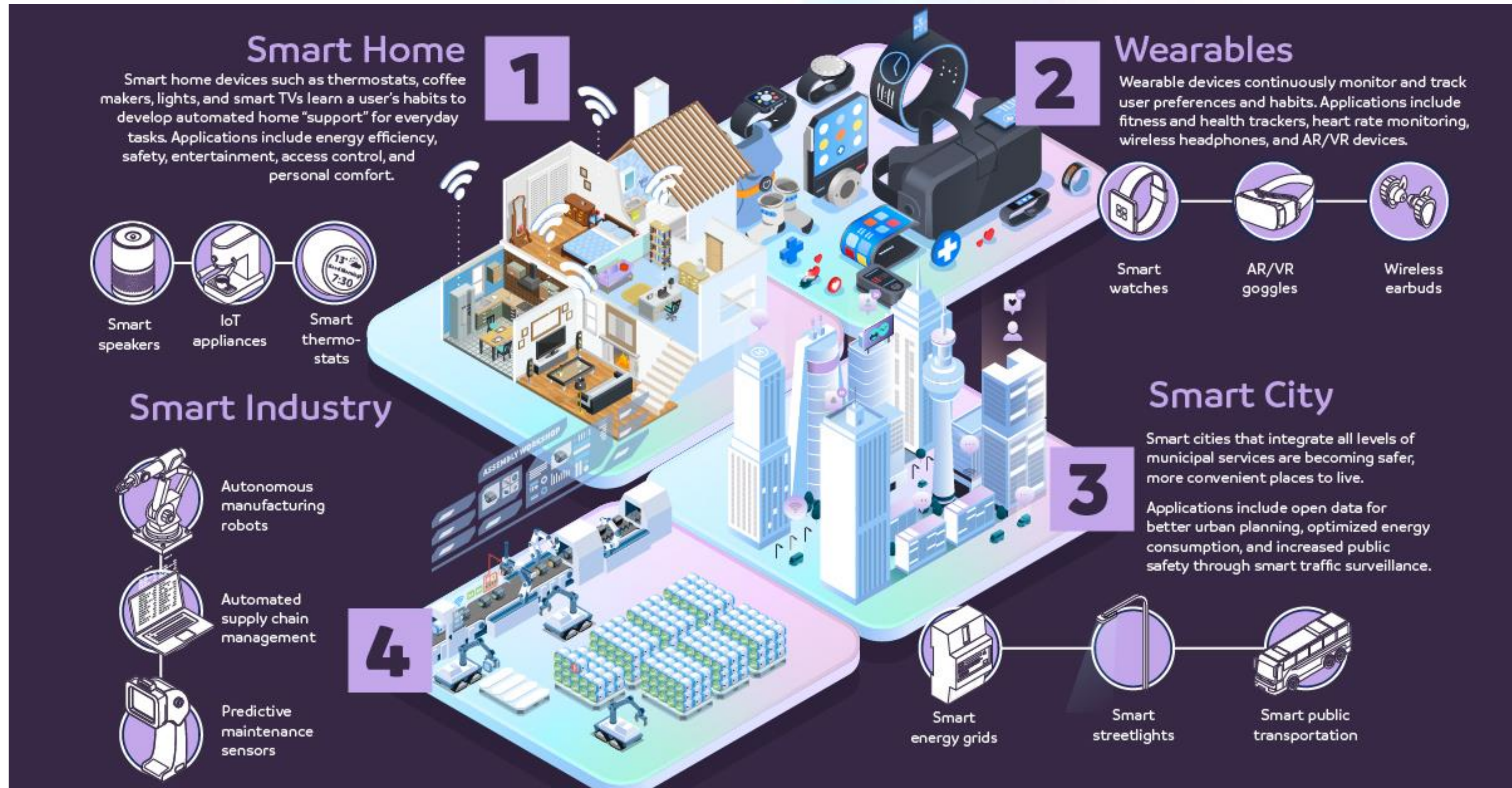


Applications of AI



- | | |
|---------------------------------|-----------------------------------|
| 1 Administration | 6 Virtual Nurse Assistants |
| 2 Tele-medicine | 7 Error Reductions |
| 3 Assisted Diagnosis | 8 Fraud Detection |
| 4 Robot Assisted Surgery | 9 Research and Study |
| 5 Monitor of Vital Stats | 10 Chronic Care Management |

Applications of AI



Types of AI

3 Types of Artificial Intelligence

Artificial Narrow Intelligence (ANI)



Stage-1

Machine Learning

- Specialises in one area and solves one problem



Siri



Alexa



Cortana

Artificial General Intelligence (AGI)



Stage-2

Machine Intelligence

- Refers to a computer that is as smart as a human across the board



Stage-3

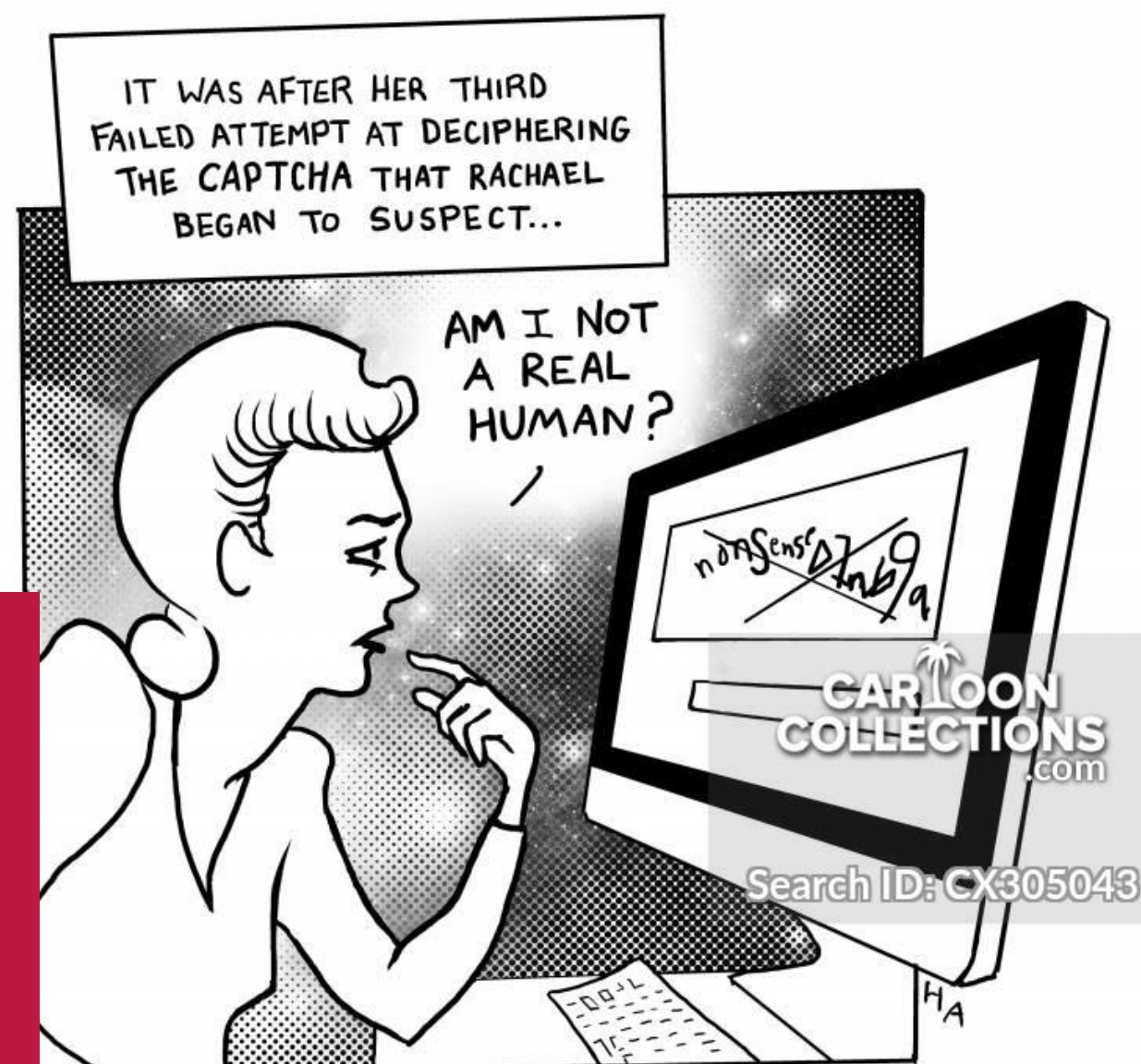
Machine Consciousness

- An intellect that is much smarter than the best human brains in practically every field

Food for thought?



**Artificial
Intelligence
is no match
for Natural
Stupidity.**



"The good news, Dave, is that the computer's
passed the Turing test. The bad news
is that you've failed."