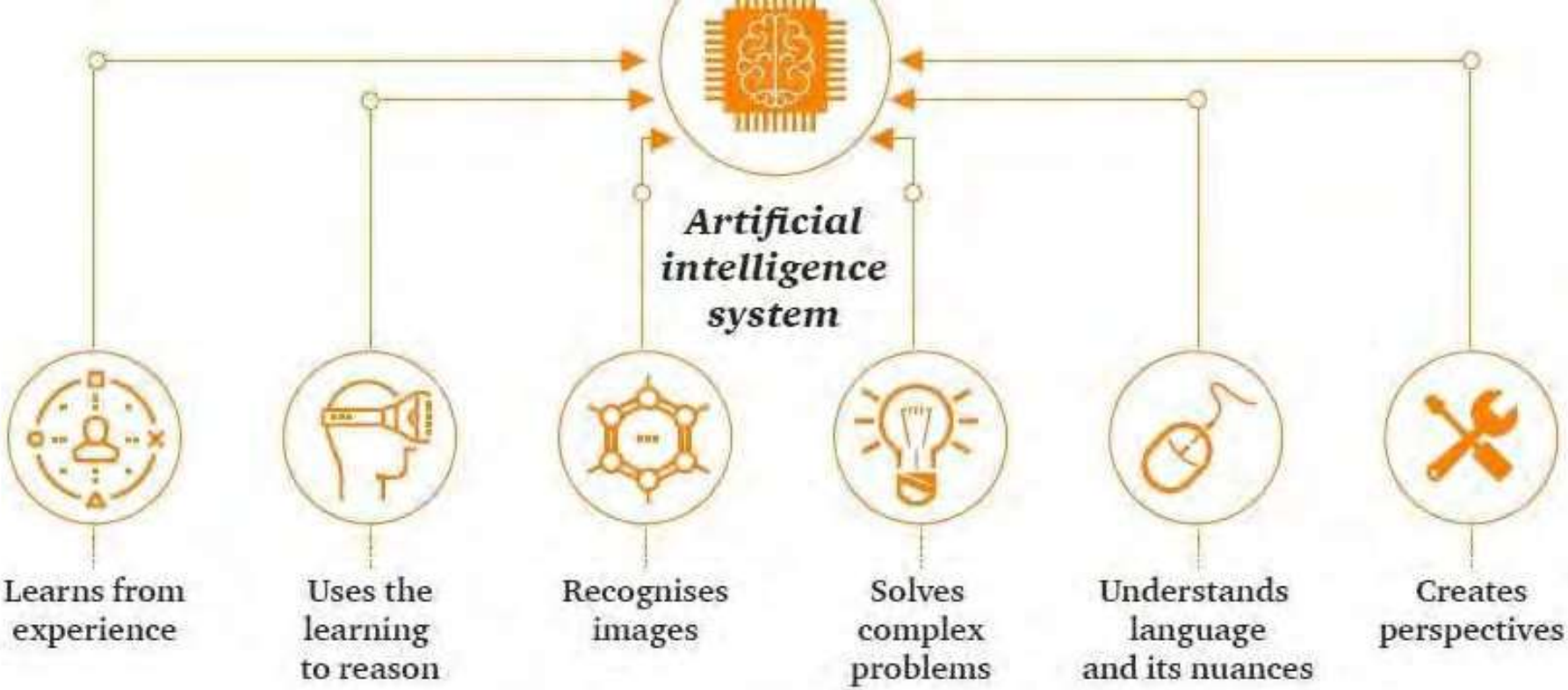
AN INTRODUCTION TO ARTIFICIAL INTELLIGENCE

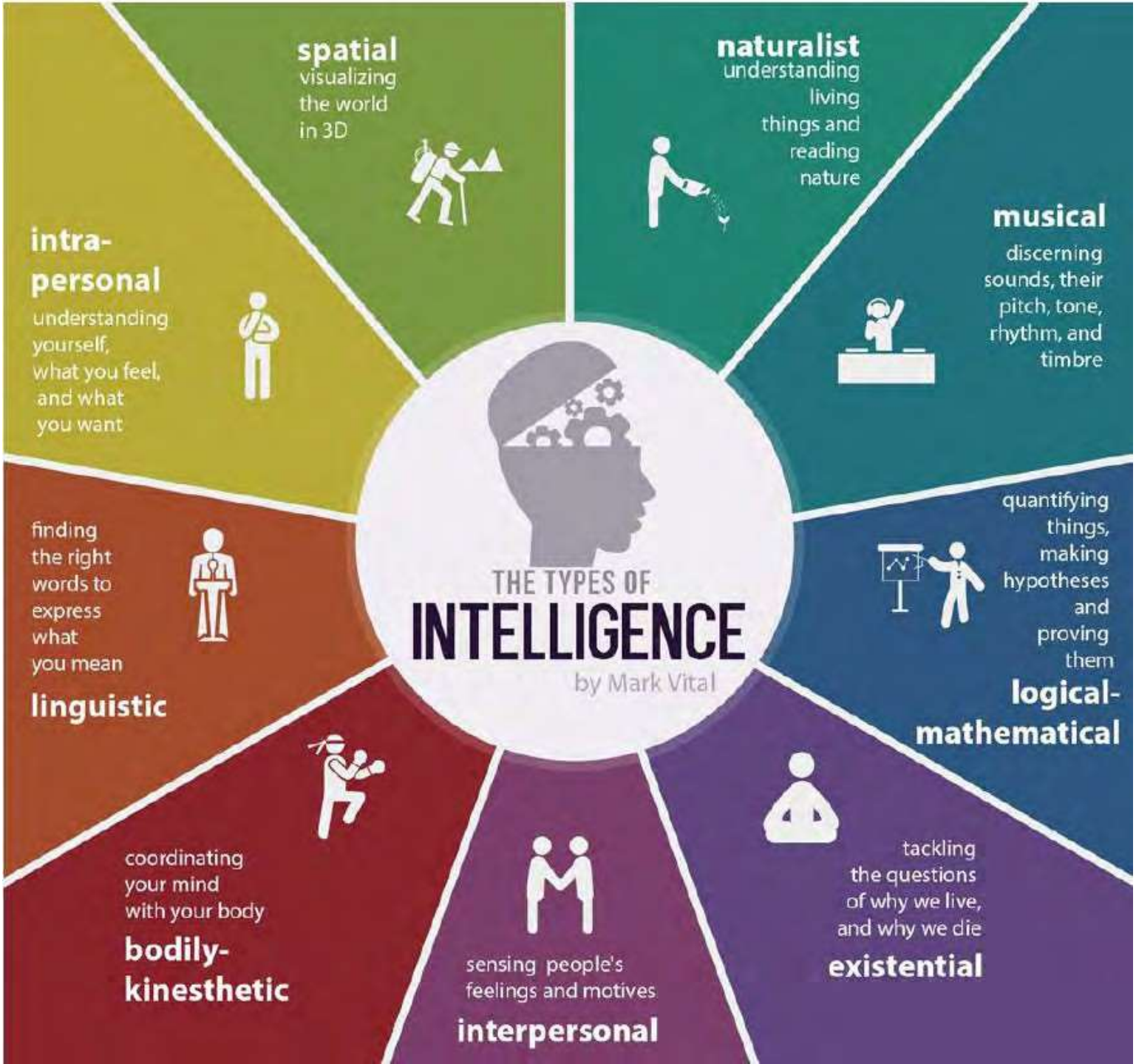


- **Artificial intelligence** (**AI**), sometimes called **machine intelligence**, is intelligence demonstrated by machines, in contrast to the **natural intelligence** displayed by humans and other animals, such as "learning" and "problem solving. .

- **In computer science AI research is defined as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals.**

HOW ARE HUMANS INTELLIGENT ?

- Learning
- Reasoning
- Problem Solving and Creativity
- Social Behavior
- Experiencing our Environment with our senses:
  - Hearing
  - Sight
  - Touch
  - Taste
  - Smelling


spatial
visualizing the world in 3D
naturalist
understanding living things and reading nature
musical
discerning sounds, their pitch, tone, rhythm, and timbre
intra-personal
understanding yourself, what you feel, and what you want
THE TYPES OF
INTELLIGENCE
by Mark Vital
finding the right words to express what you mean
linguistic
quantifying things, making hypotheses and proving them
logical-mathematical
coordinating your mind with your body
bodily-kinesthetic
sensing people's feelings and motives
interpersonal
tackling the questions of why we live, and why we die
existential

Ways that People Think and Learn About Things

- If you have a problem, think of a past situation where you solved a similar problem.
- If you take an action, anticipate what might happen next.
- If you fail at something, imagine how you might have done things differently.
- If you observe an event, try to infer what prior event might have caused it.
- If you see an object, wonder if anyone owns it.
- If someone does something, ask yourself what the person's purpose was in doing that.

Artificial intelligence (AI) - The study of computer systems that attempt to model and apply the intelligence of the human mind.

For example, writing a program to pick out objects in a picture:

This is what Humans do best

Can you list the items in this picture ?

A computer might have trouble identifying the cat there.

FIGURE 13.1 A computer might have trouble identifying the cat in this picture

This is what Computers do best

Can you count the distribution of letters in a book?

Add a thousand 4-digit numbers?

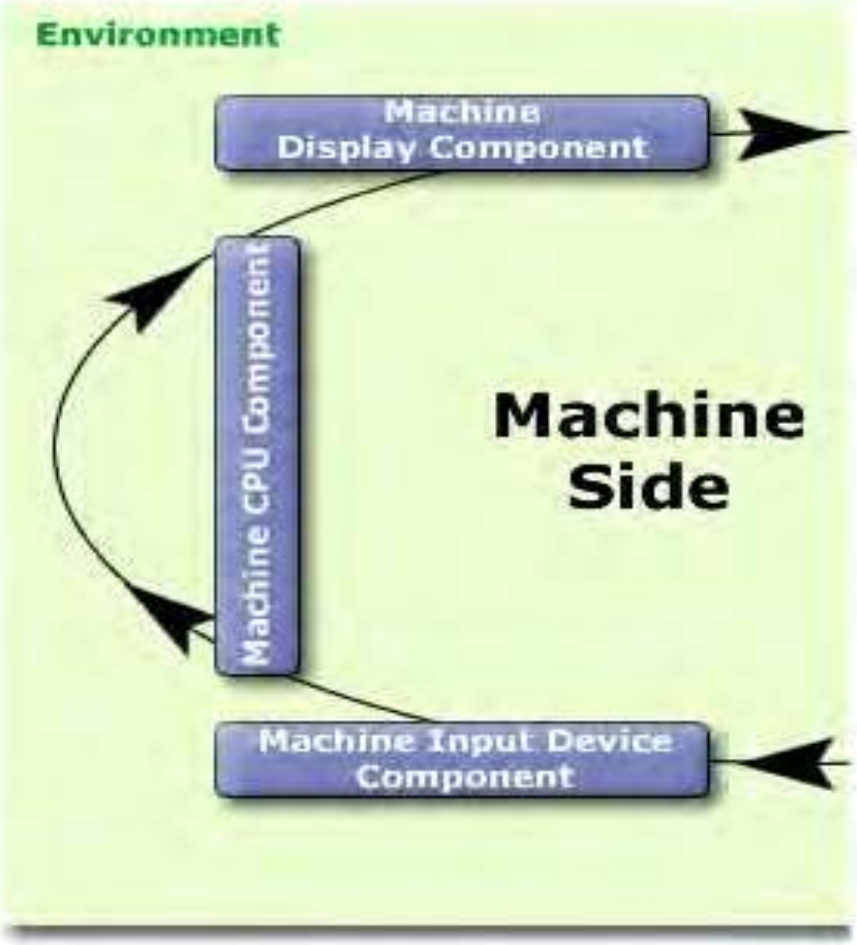
Match finger prints?

Search a list of a million values for duplicates?

When we compare Humans to Machines, it is important to note that a Machine can be a car, a Smart Phone, a Digital Television, etc.

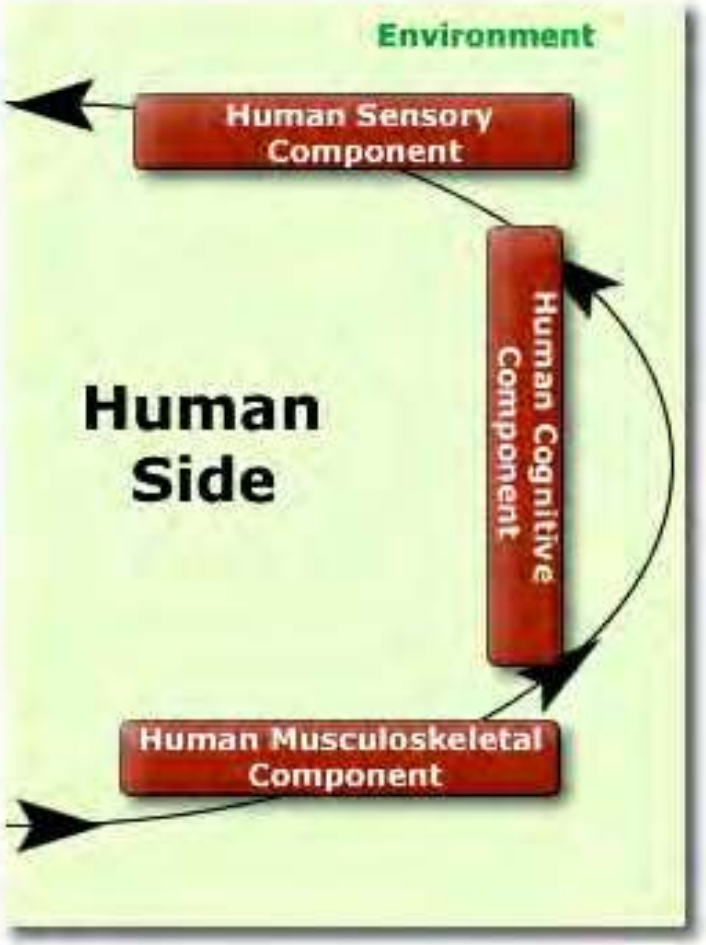
Machines are Better Than Humans in:

- Alertness
- Speed and Power
- Sensor Detection Outside Human Range
- Routine Work
- Computation
- Short-term Memory Storage
- Simultaneous Activities

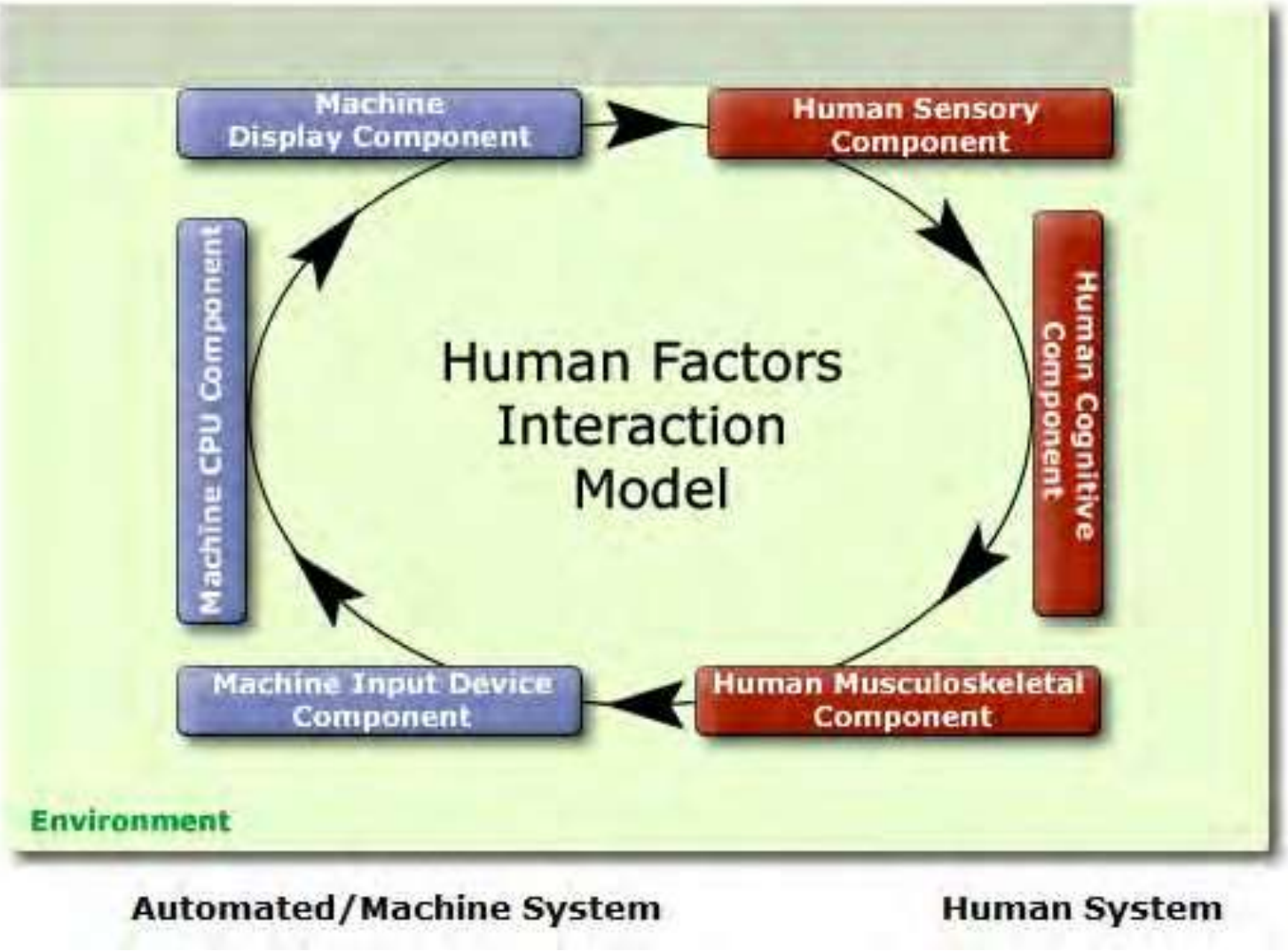


Humans are Better than Machines in:

- Sensory Functions
- Perceptual Abilities
  - Stimulus Generalization
  - Abstract Concepts
- Flexibility
  - Ability to Improvise
- Judgment
- Selective Recall
- Inductive Reasoning



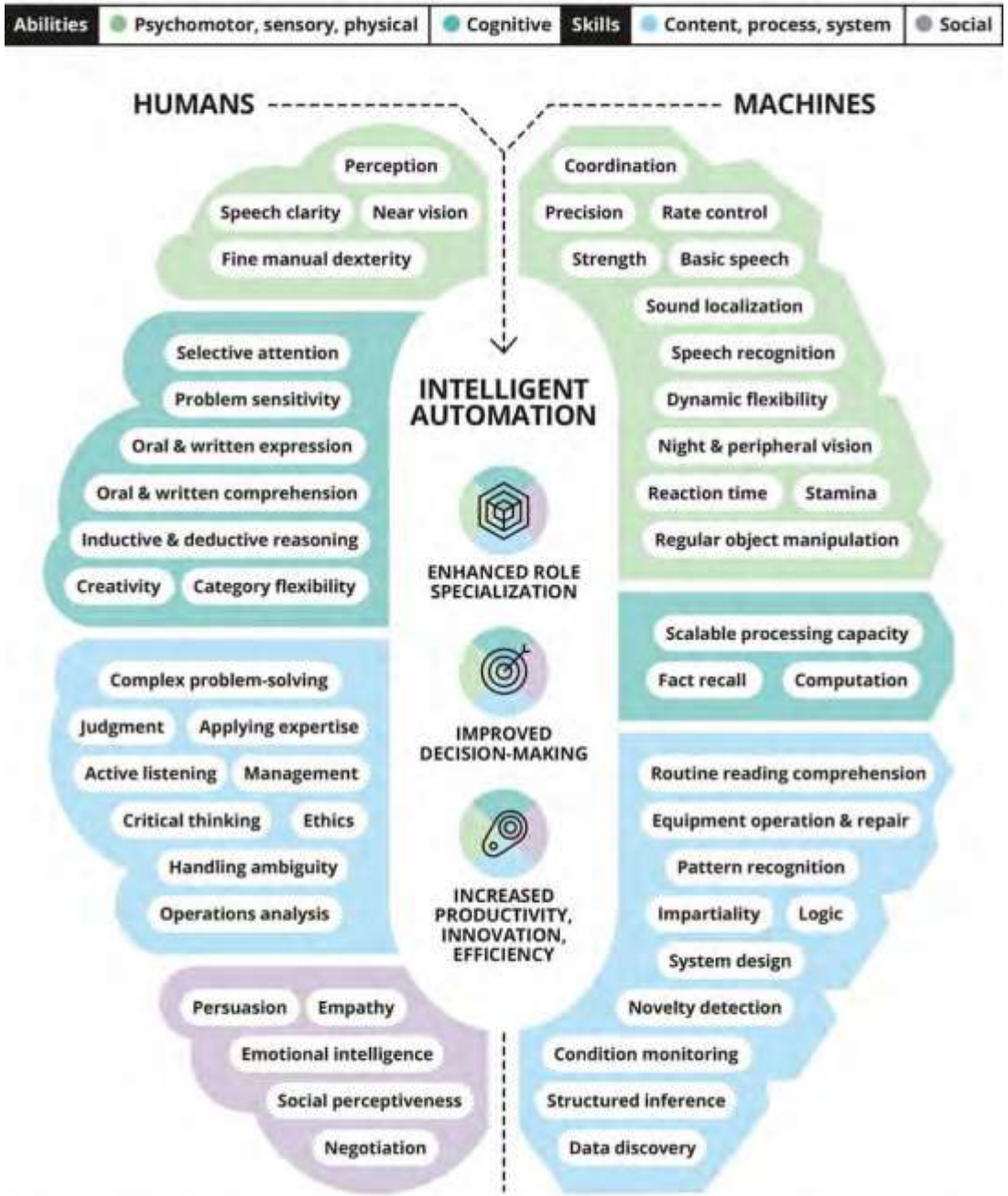
The illustration below illustrates a typical information flow between the "human" and "machine" components of a system. For a properly designed system, its important to know the capabilities and flexibilities of both.



https://www.hf.faa.gov/webtraining/HFModel/HFInterModel/overview.htm

Figure 1. A new mind-set for the no-collar workforce

Humans and machines can develop a symbiotic relationship, each with specialized skills and abilities, in a unified workforce that delivers multifaceted benefits to the business.



KEY RESEARCH AREAS IN AI

- **Problem solving, planning, and search --- generic problem solving architecture based on ideas from cognitive science (game playing, robotics).**
- **Knowledge Representation – to store and manipulate information (logical and probabilistic representations)**
- **Automated reasoning / Inference – to use the stored information to answer questions and draw new conclusions**
- **Machine Learning – intelligence from data; to adapt to new circumstances and to detect and extrapolate patterns**
- **Natural Language Processing – to communicate with the machine**
- **Computer Vision --- processing visual information**
- **Robotics --- Autonomy, manipulation, full integration of AI capabilities**

From SIRI and Alexa, to self-driving cars, artificial intelligence (AI) is progressing rapidly.

While science fiction often portrays AI as robots with human-like characteristics, AI can encompass anything from Google's search algorithms, to IBM's Watson, to autonomous weapons.

Artificial intelligence today is properly known as narrow AI (or weak AI), in that it is designed to perform a narrow task such as only facial recognition, or only internet searches, or only driving a car).

However, the long-term goal of many researchers is to create general AI (AGI or strong AI).

While narrow AI may outperform humans at whatever its specific task is, like playing chess or solving equations, AGI would outperform humans at nearly every thinking task.