Guided Tour of Machine Learning in Finance

AI and ML, part II

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What is AI?

Artificial Intelligence (AI) studies “intelligent agents” that perceive their environment and perform different actions to solve tasks that involve mimicking cognitive functions of humans (Russell, Norvig, “Artificial Intelligence: A Modern Approach”, 2009)

Agent = architecture + algorithm

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Goals of AI

Agent = architecture + algorithm

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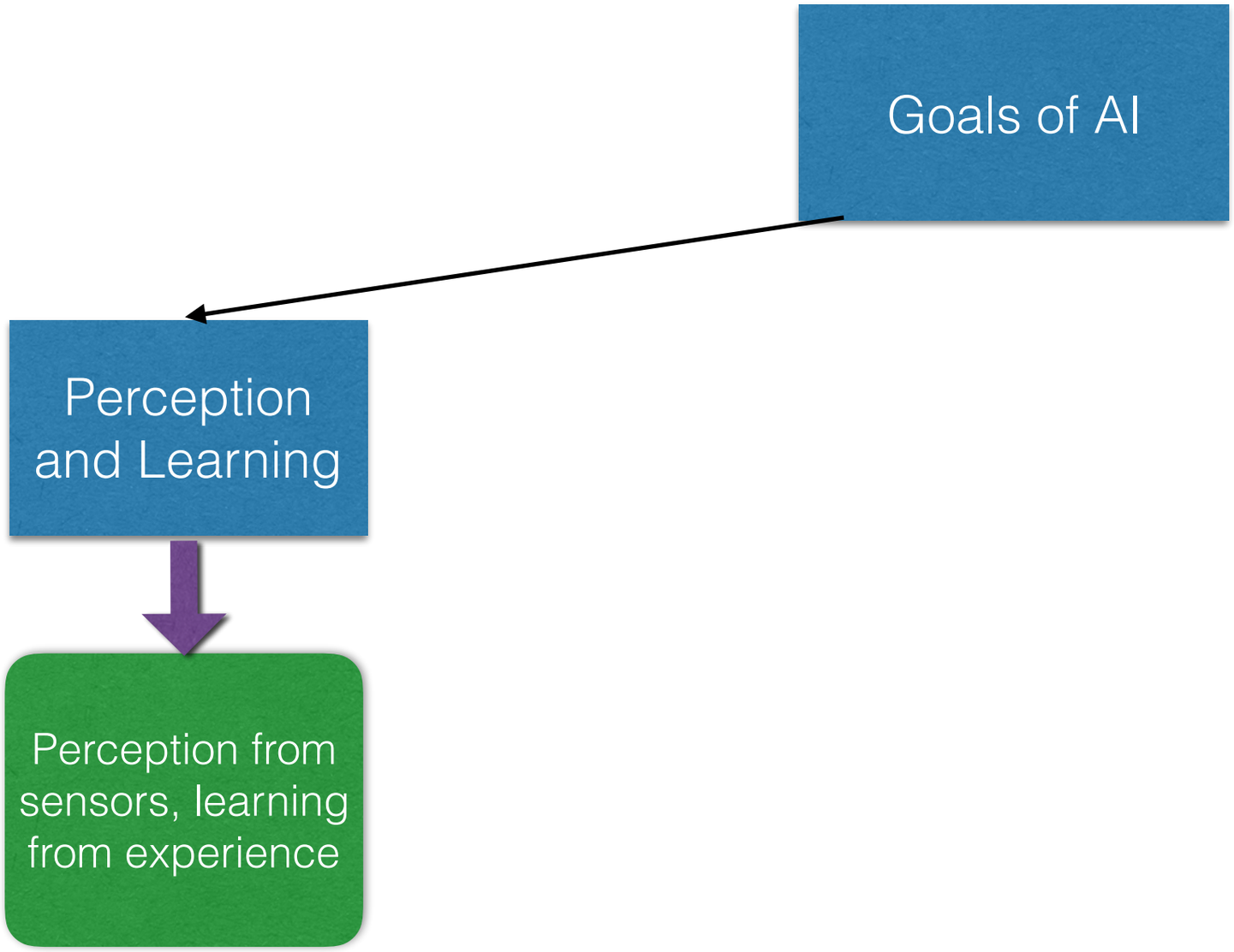

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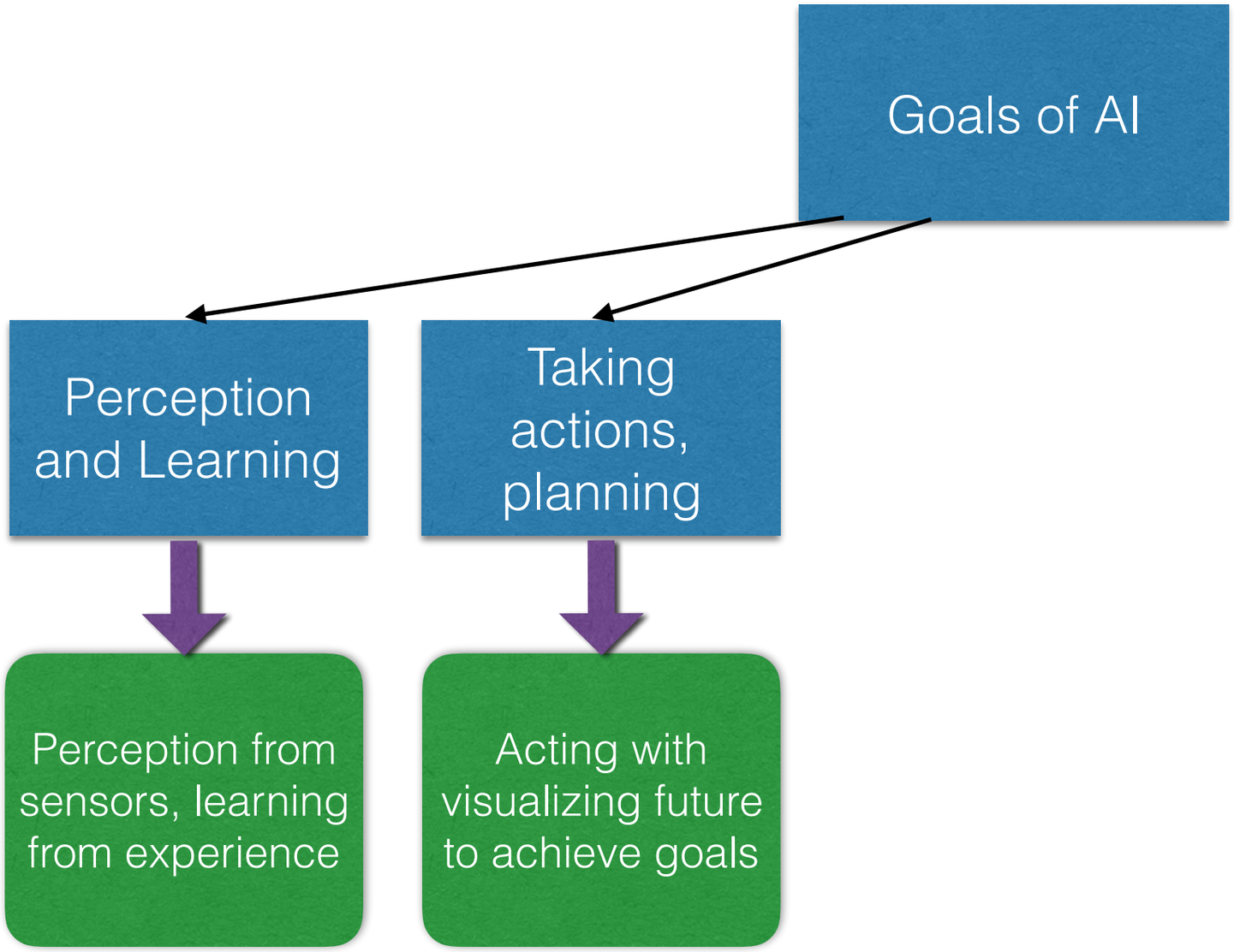

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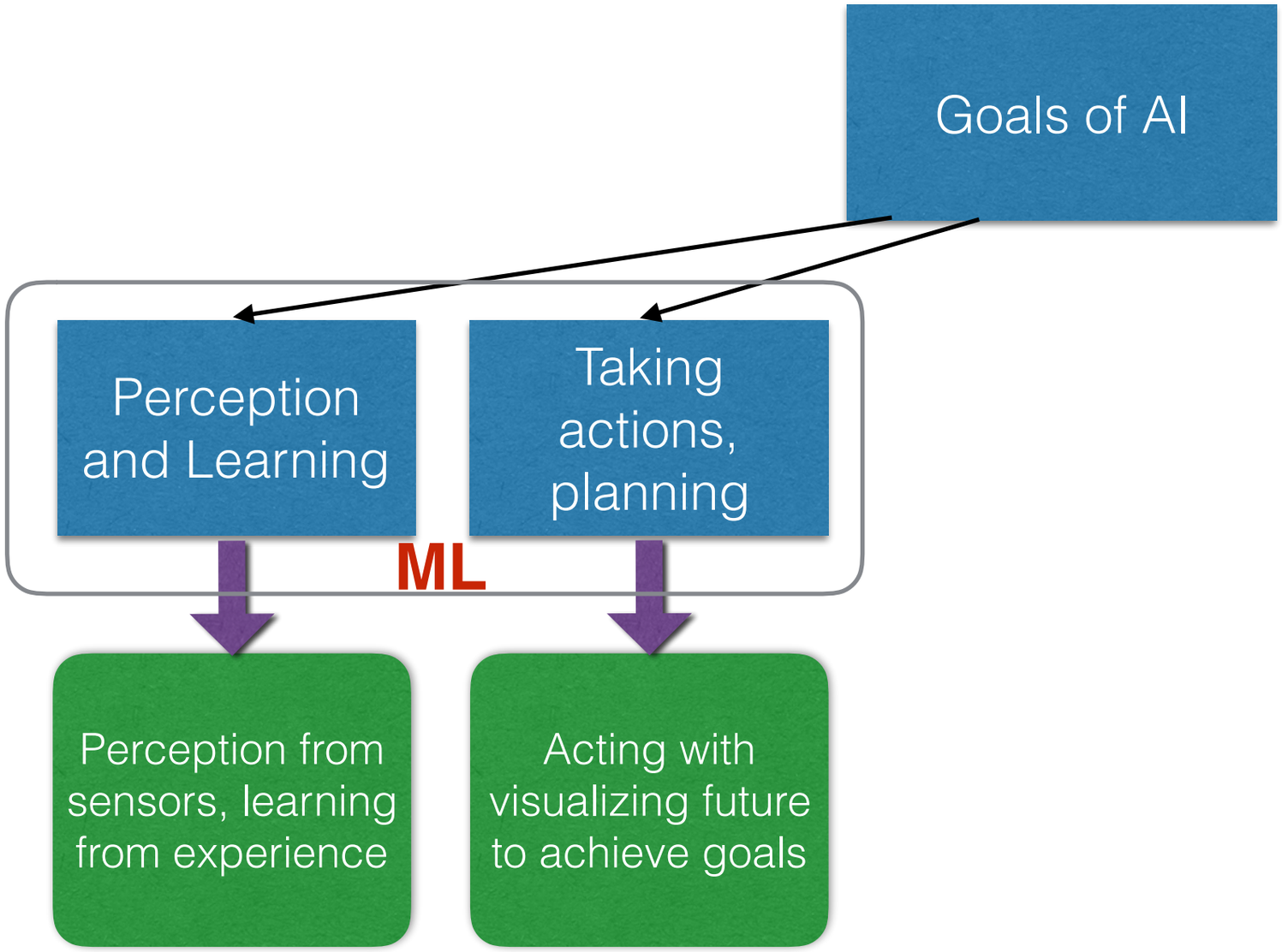

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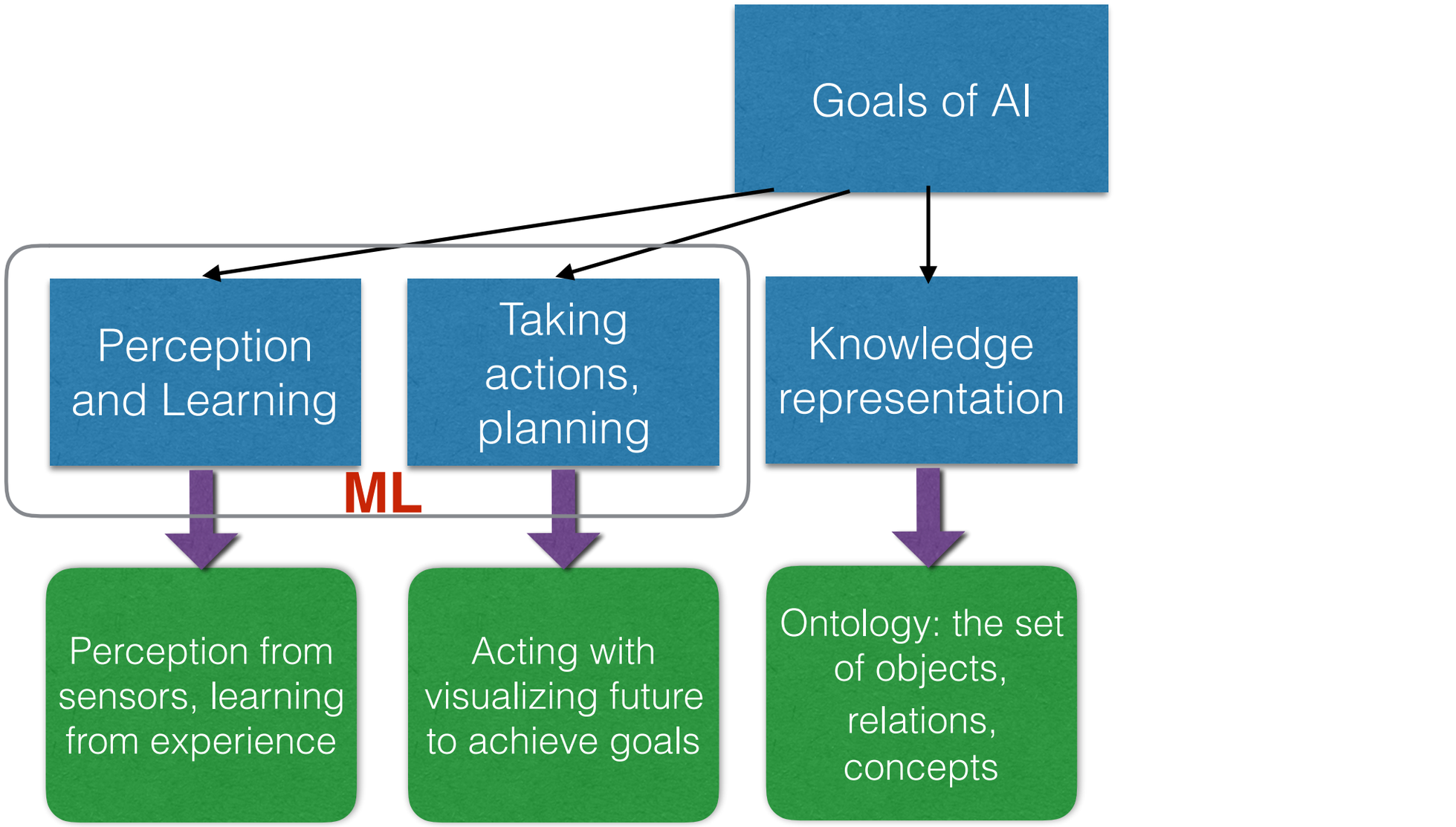

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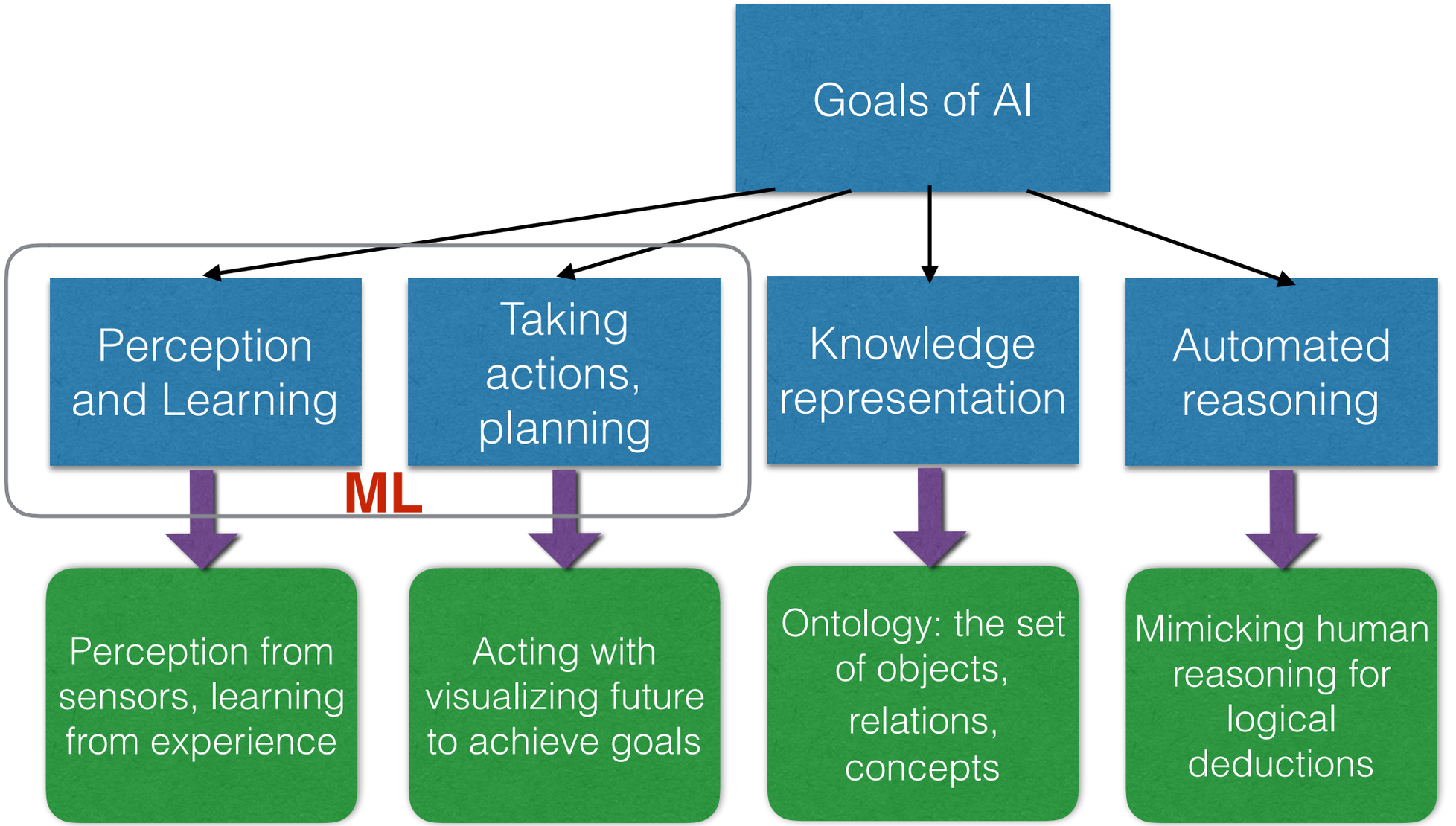

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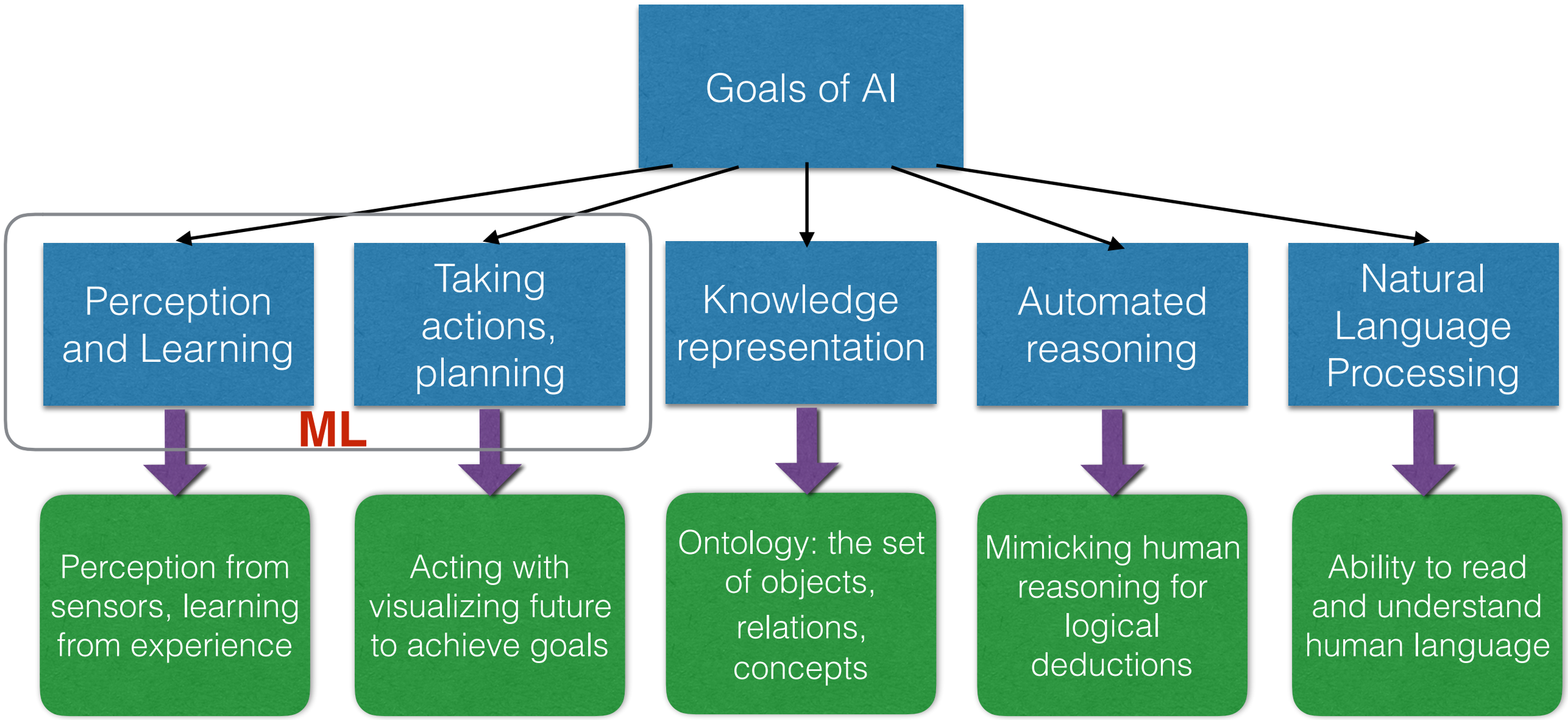

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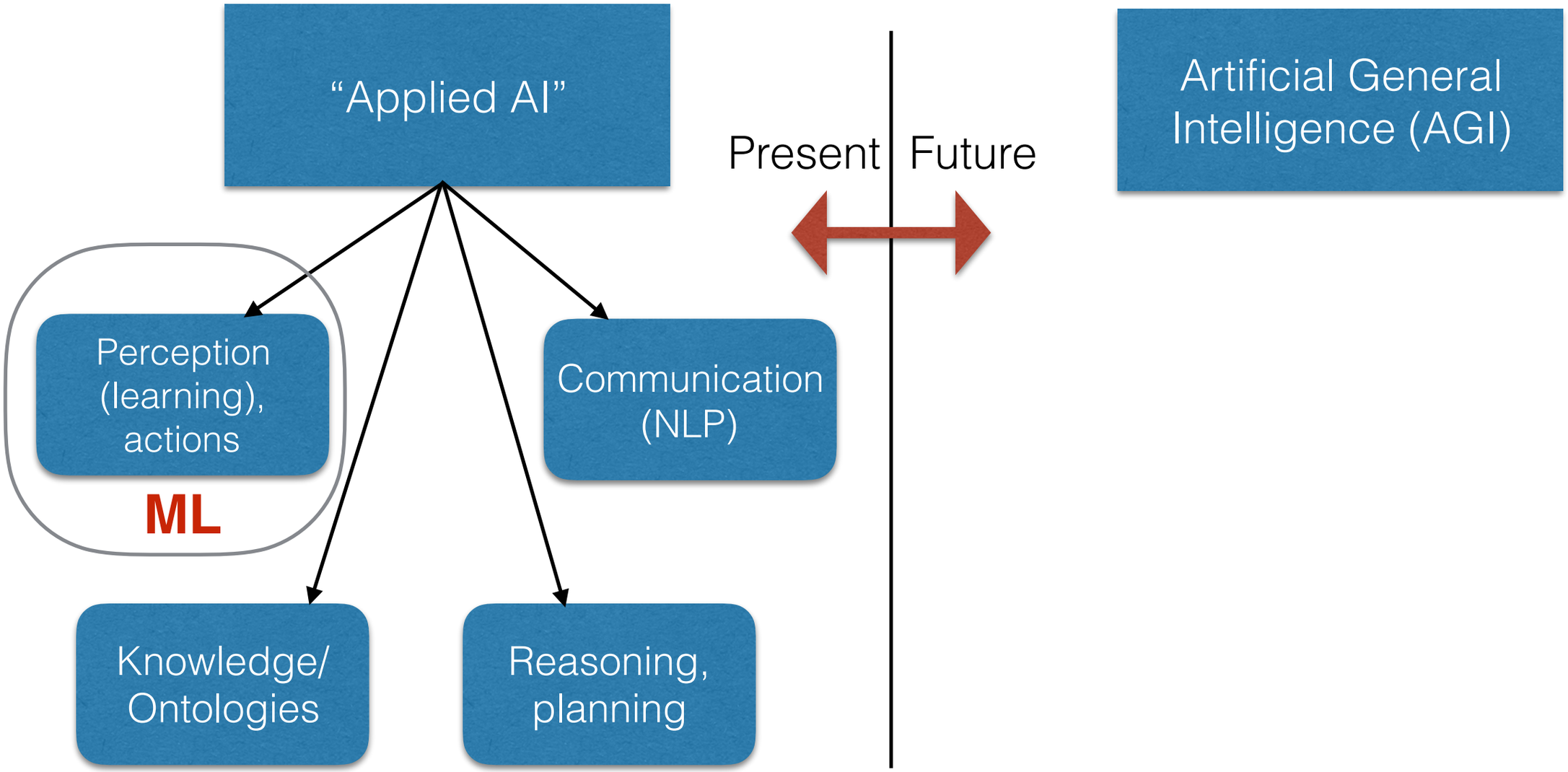
Long term goals: “Applied AI” vs AGI



“Applied AI” (“weak AI”):

- Performs one pre-specified task
- Operates with human-provided algorithms
- Works with numerical and symbolic information
- Remarkable technological and commercial success, strong impact on many industries

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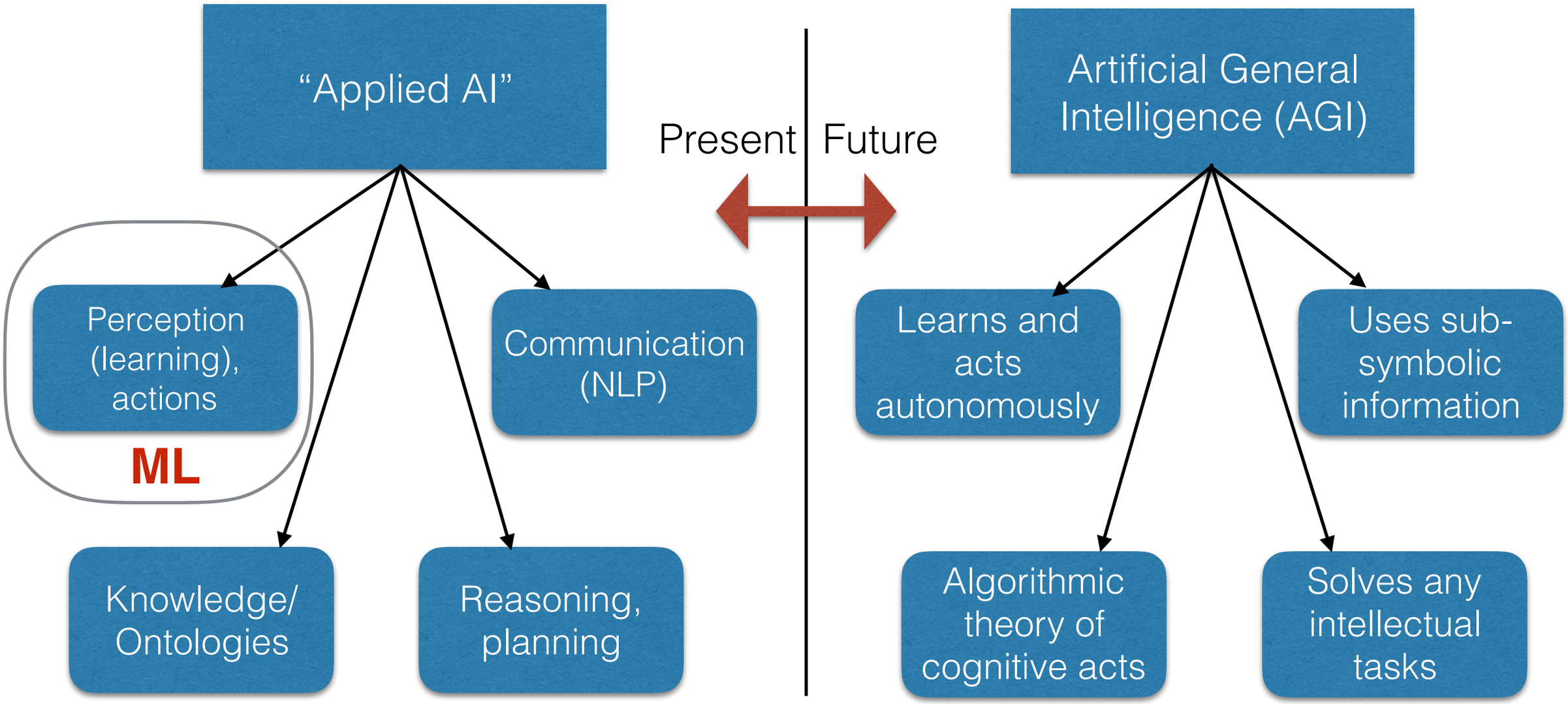

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AGI (“strong AI”):

- Autonomous learning and acting involves building its own models of the world
- Formalizes sub-symbolic information (“He took his bag and left the room”)
- Algorithmic theory of novelty, surprise, creativity, curiosity etc. (Schmidhuber 2010)
- Solving any intellectual tasks: around 2045, per Ray Kurzweil

Agents and Environments

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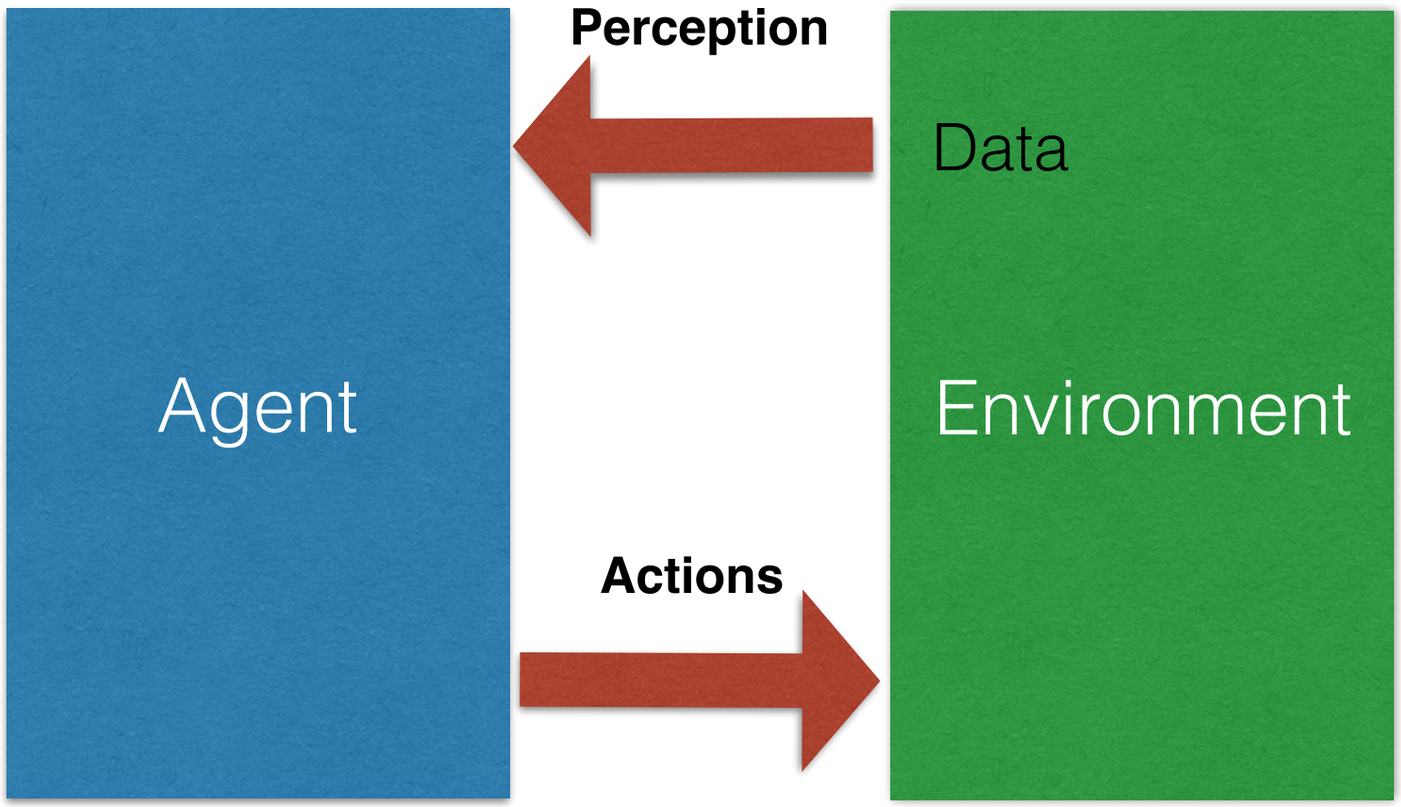

Perception: the physical world (through sensors), or digital data (read from a disk)

Actions: can be fixed, or can vary. May or may not change the environment

Rational AI agents

Rational agent: “For each possible percept sequence, a rational agent should select an action that is expected to maximize its performance measure, given the evidence provided by the percept sequence and whatever built-in knowledge the agent has.” (RN 2009)

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Example: a vacuum-cleaner agent (RN 2009)

- A-priori knows the geography of the environment
- The dirt distribution and initial location are not known
- Perceives its location and whether the location contains dirt
- Chooses actions on each step (Left, Right, Suck) to maximize a performance measure (e.g. the amount of a cleaned area)
- Plans to clean as much as possible given the resources (battery charge)

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