

tai911s

José Quenum
PhD Computer Science



introduction to ai

course outline

learning outcomes

- differentiate between **supervised**, **unsupervised** and **semi-supervised** tasks;
- analyse ml techniques and select appropriate ones;
- develop and integrate models to understand/predict complex phenomena

content

- linear and polynomial regression
- logistic regression
- support vector machines
- decision trees

- ensemble methods
- deep learning (and new architecture)
- unsupervised learning
- dimensionality reduction

assessment

- 2 assignments
- 1 test
- 1 project
- 1 paper review

materials

- Artificial Intelligence: A Modern Approach Fourth Edition. Russell and Norvig. 4th ed.
- An Introduction to Machine Learning. Kubat
- Deep Learning. Goodfellow, Bengio and Courville

- conference proceedings/journals
 - arXiv, ijcai, aamas, icml, aaai, acl, iclr, kdd, emnlp, cvpr,

application domains

- healthcare
- education
- finance
- law
- banking
- manufacturing

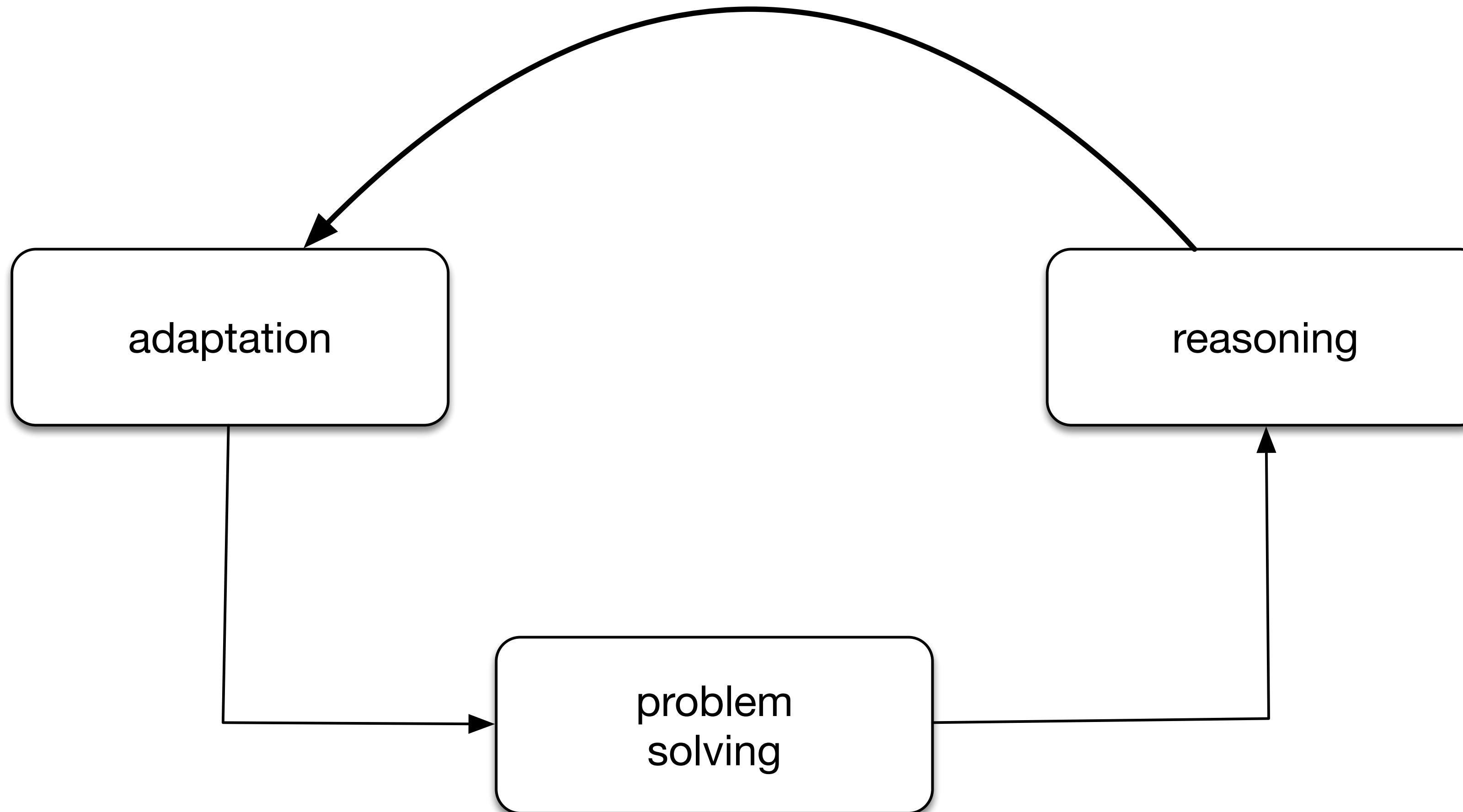
examples

- detecting objects in an image
- robot completing a complex task
- driverless cars
- diagnostic and cure in healthcare
- drug discovery

examples (con't)

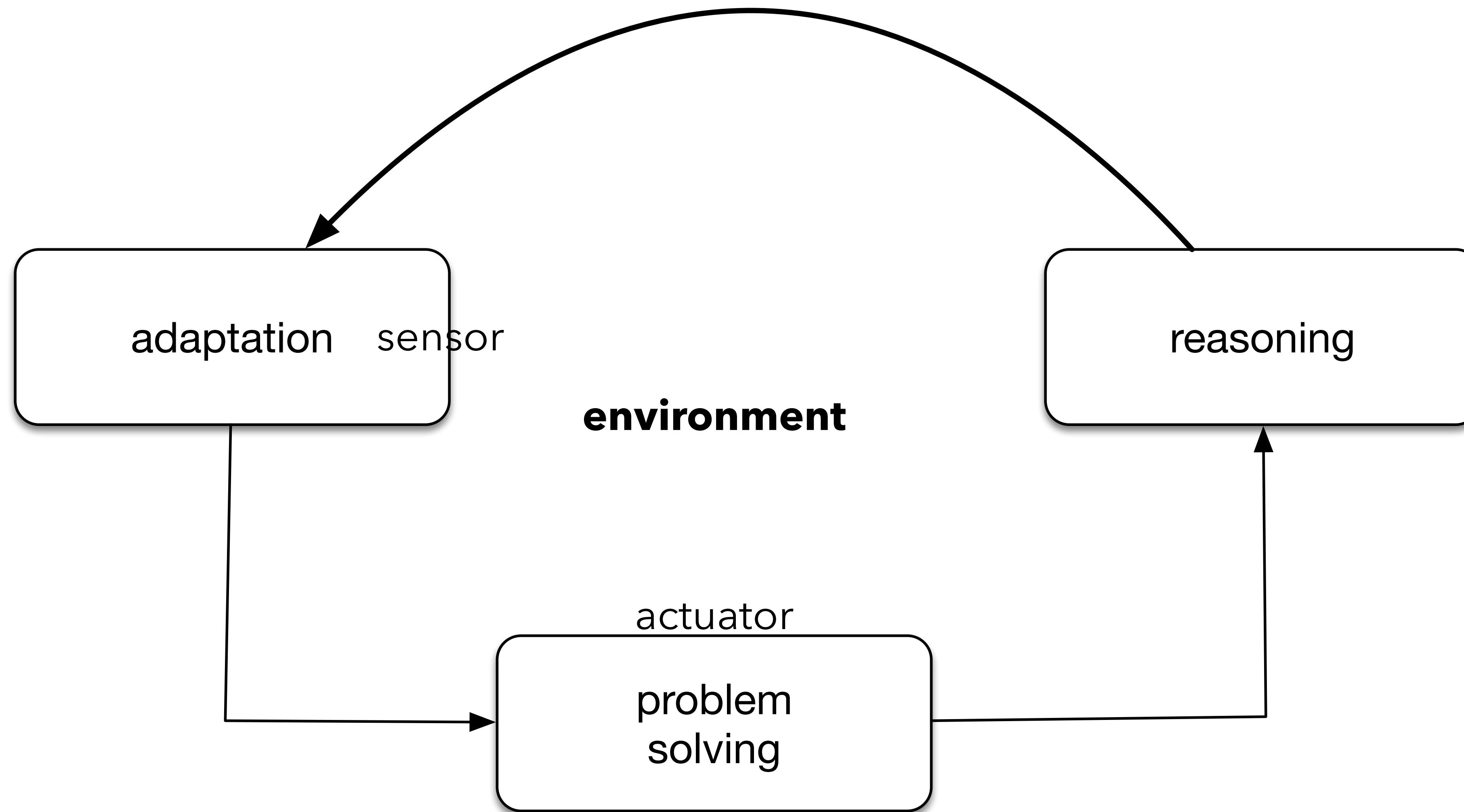
- configuring machines in a lab?

what is ai?

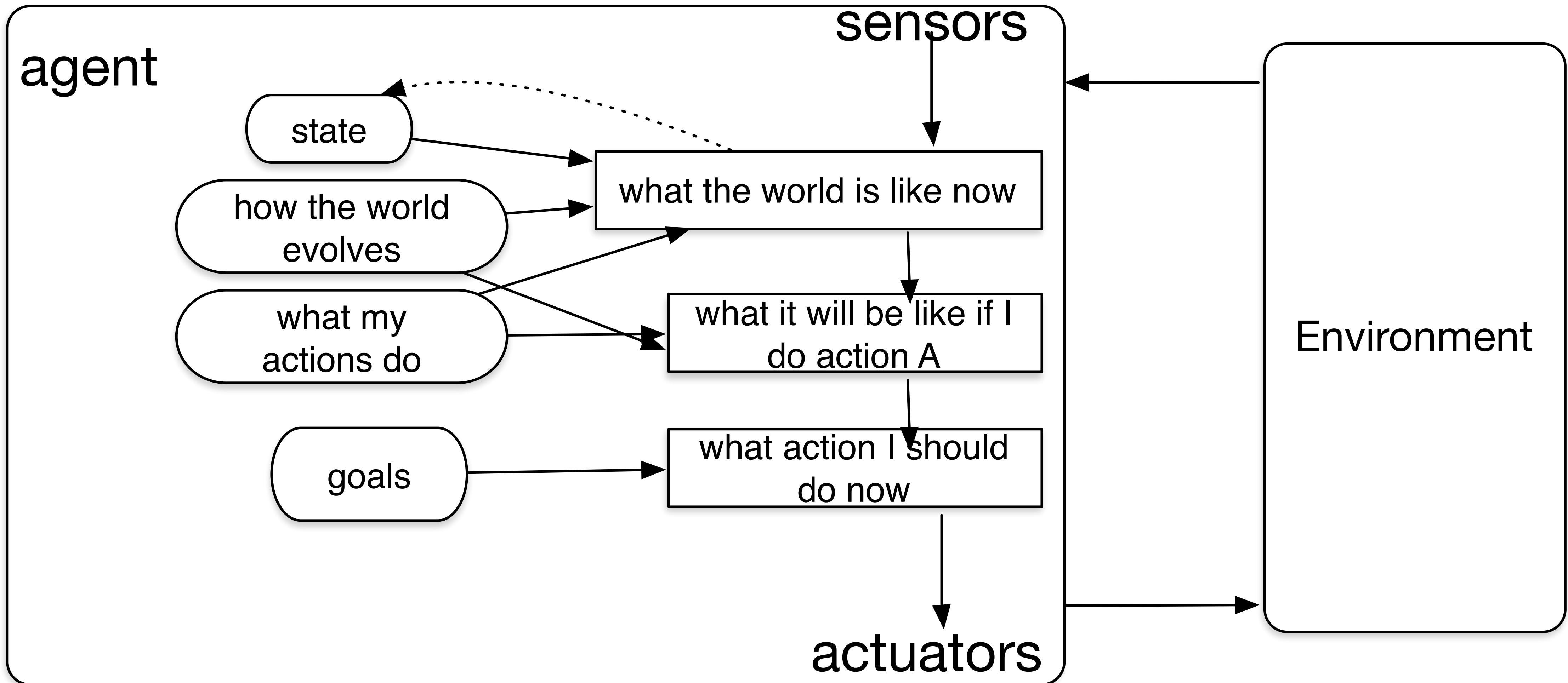


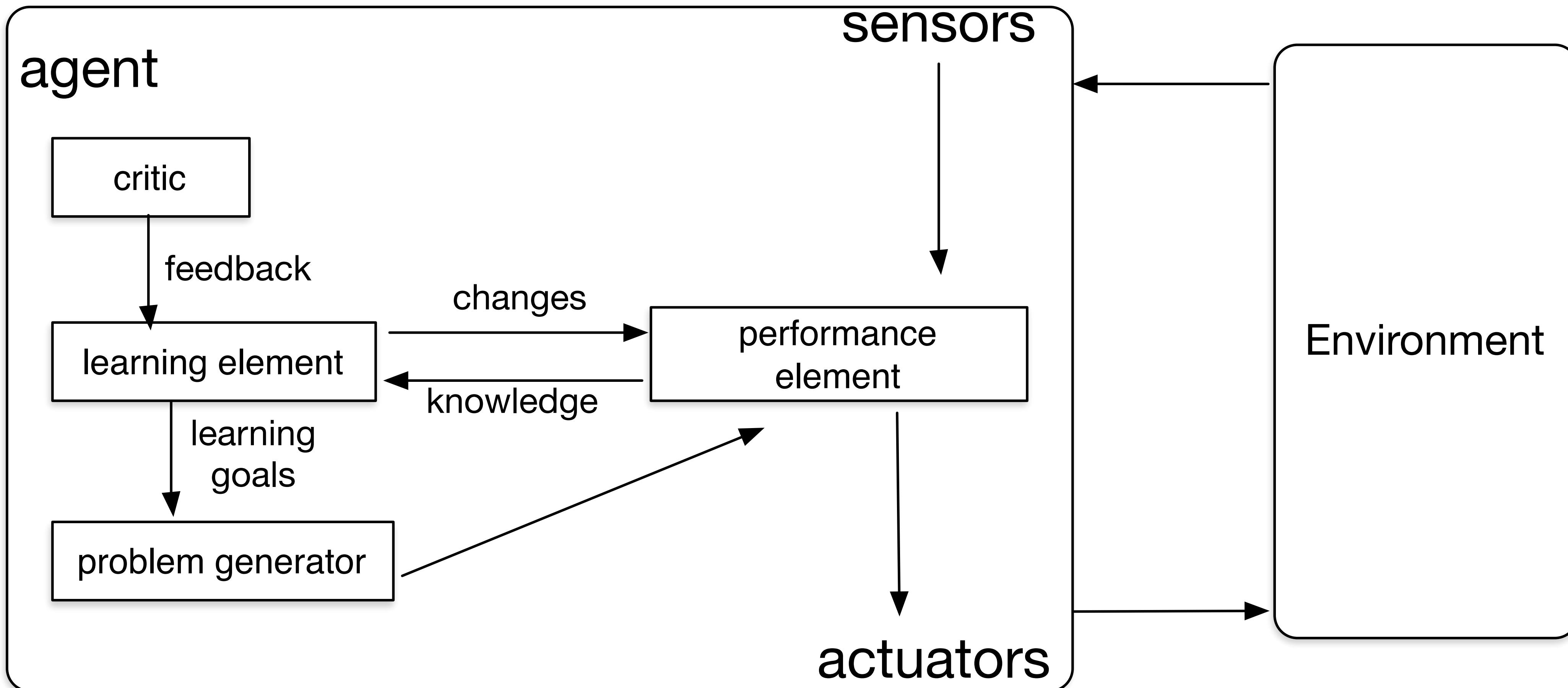
dimension\criteria	like a human	rationally
thought	cognitive science	inference, formal KR
behavior	NLP, KR, AR	behave according to inference

study of rational agents



agent = architecture + program







techniques

$$p = \langle S, A, T, g, I \rangle$$

- search
 - uninformed (**breadth-first, depth-first, uniform-cost, iterated deepening dfs**)
 - informed
 - heuristic (consistent, admissible)
 - **greedy-first, A***

- search (con't)
 - local (**hill climbing, simulated-annealing**)
 - evolutionary and genetic algorithms
 - branch and bound
 - adversarial (**minimax, alpha-beta**)

- search (con't)
 - constraint satisfaction/optimisation
 - planning

$$p = \langle S, A, T, R \rangle$$

- mdp
- pomdp

$p = \langle D, \Omega? \rangle$

- given an email, determine whether it is a spam or not
- determine resource allocation from a request

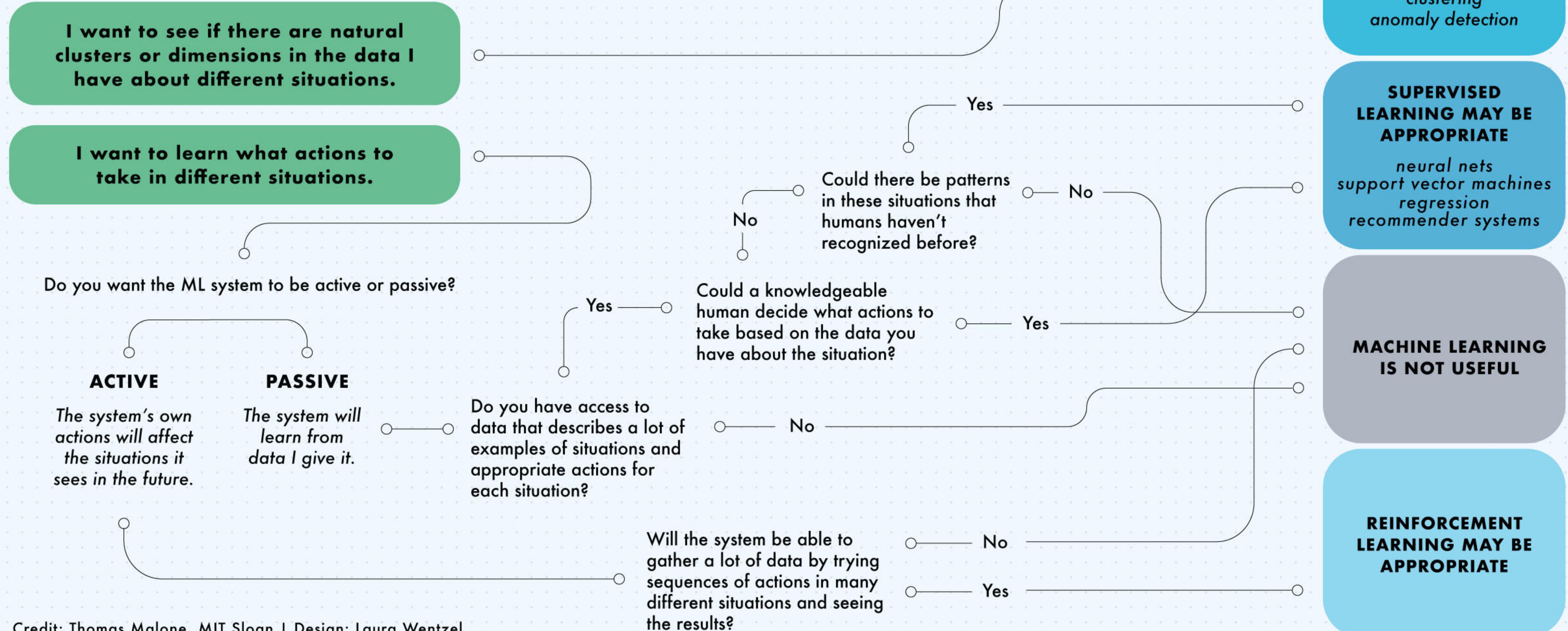
- train the model
 - extract and optimise the function from the dataset

- supervised machine learning
 - svm, linear models
 - deep learning
 - feed-forward, cnn, rnn, lstm

- unsupervised machine learning
 - clustering

- reinforcement learning
 - feedback-based
 - trial and error

What do you want the machine learning system to do?



Credit: Thomas Malone, MIT Sloan | Design: Laura Wentzel

but,

- responsible ai
 - explainability and reproducibility of models
 - bias in datasets
 - security



which techniques to use?

in short, ...

- various symbolic techniques
- connectionist approaches
- ethics...