
INSTITUT TEKNOLOGI BANDUNG
1920

Modul 8: Learning

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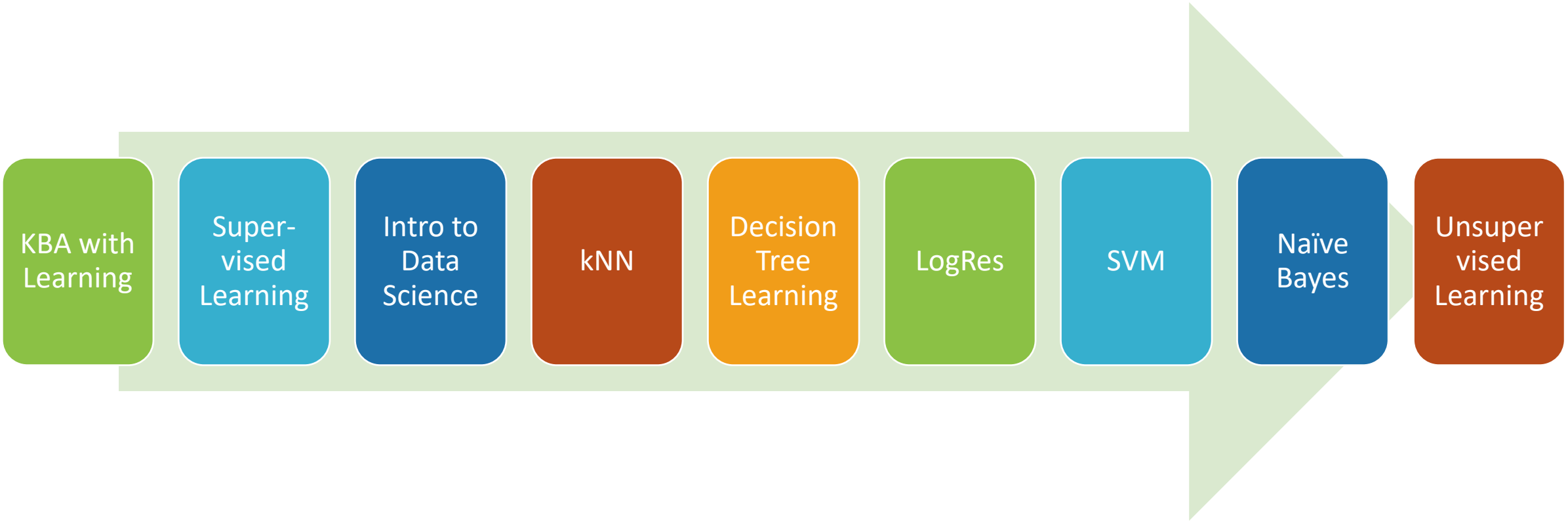
KK IF – Teknik Informatika – STEI ITB

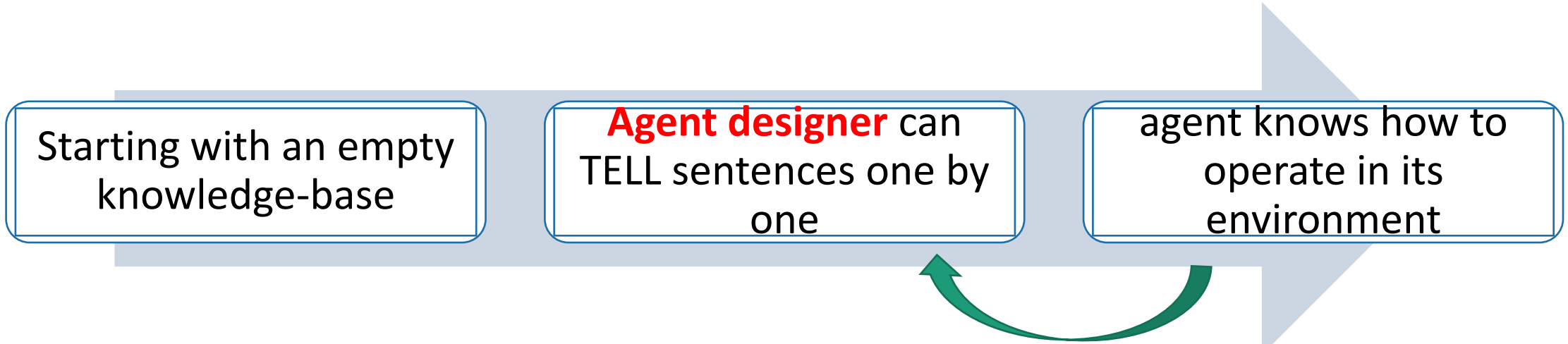
01 Knowledge-based Agent with Learning

Inteligensi Buatan
(*Artificial Intelligence*)

Learning


KBA with Learning
Super-vised Learning
Intro to Data Science
kNN
Decision Tree Learning
LogRes
SVM
Naïve Bayes
Unsuper vised Learning

Knowledge-based Agent with Learning



Learning allows agent to operate in initially unknown environments

Learning improves its performance on future tasks after making observation about the world

Why Need Learning?

Learning is essential for unknown environments,

- i.e., when designer lacks omniscience, agent doesn't know world dynamics

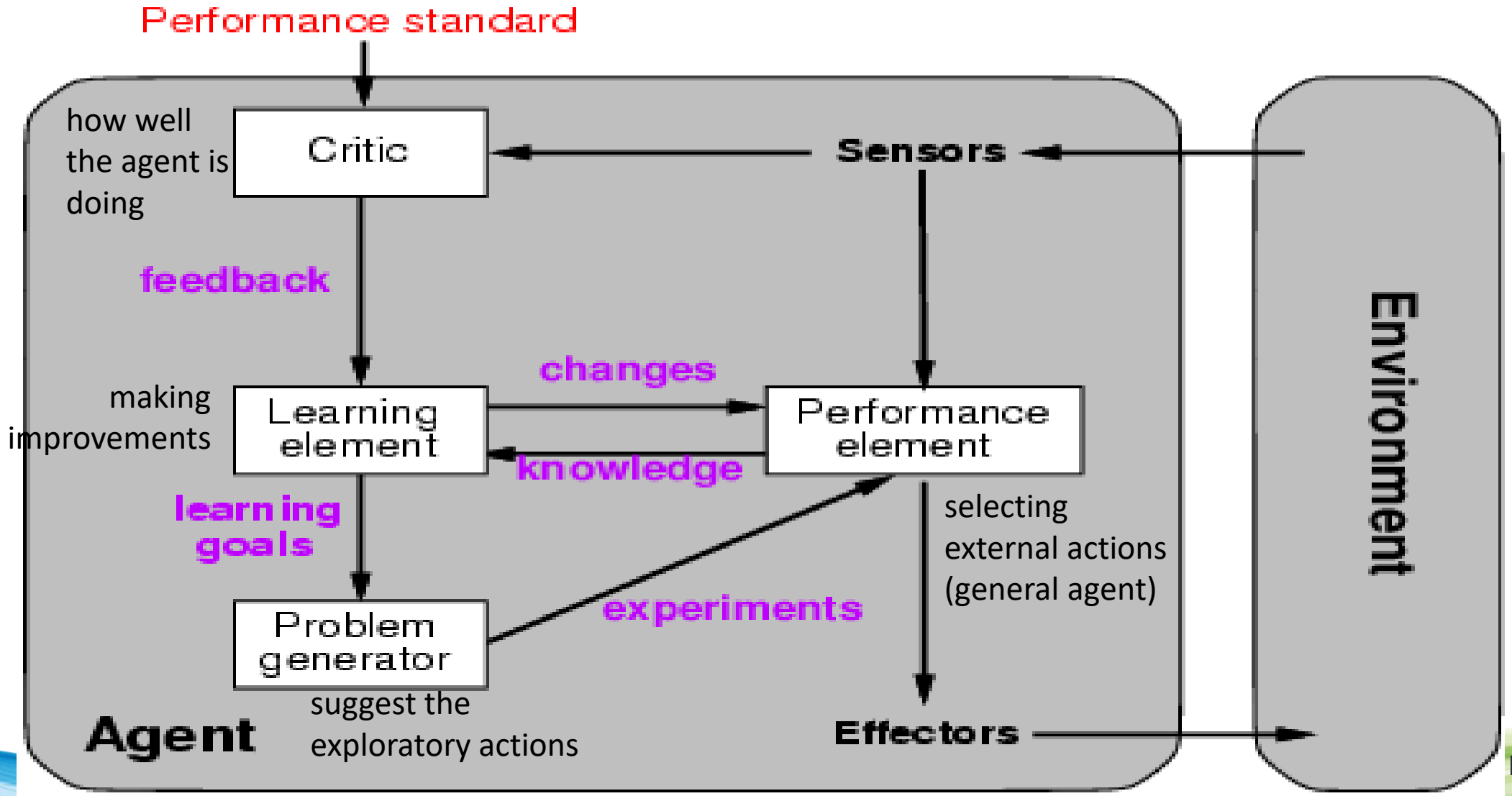
Learning is useful as a system construction method,

- i.e., expose the agent to reality rather than trying to write it down

Learning modifies the agent's decision mechanisms to improve performance

- Learning from observations, Feedback for improving the agent's ability to act in the future

KBA with Learning = Learning Agent



Russell, S. J., & Norvig, P. (2010). Artificial Intelligence-A Modern Approach, Third International Edition.

Design of A Learning Element

Learning: **changes** in the system that are **adaptive** in the sense that they enable the system to do the task or tasks drawn from the same population **more efficiently** and **more effectively** the next time.

Which component of performance element are to be learned	Availability of prior knowledge	What feedback is available to learn these components	What representation is used for the components

Taxi Driver Agent: PE & Feedback

http://www.gettyimages.com/detail/83988175/Stone

http://www.stahle.com/

- Brake decision:
  - f: states → boolean (brake or not)
  - Feedback: instructor shouts
- Buses recognition:
  - f: images → boolean
  - Feedback: labeling bus images
- Good/bad traffic day recognition
  - Develop own concepts
  - No feedback
- Desirable/undesirable behavior recognition from tip indication
  - Feedback: tip from customer at the end of journey

Learning Type based on Feedback

Unsupervised Learning (no feedback)	• Given set of examples without label, detect potentially useful clusters of input examples. E.g. god/bad traffic day recognition.
Supervised Learning	• Given set of examples (input-output pairs), learns a function that maps from input to output. E.g. brake decision
Reinforcement Learning	• Agent learns from a series of reinforcements (rewards or punishments). It is up to agent to decide which if the actions prior to the reinforcement were most responsible for it.

Summary

KBA with learning = learning agent

Why: unknown environment, system construction method, improve performance

Design learning element: which PE, prior knowl, feedback, representation

Learning type: supervised, unsupervised, reinforcement

Supervised Learning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