

AAAI 2019 Spring Symposium on
**Combining Machine Learning
with Knowledge Engineering**

**March 25–27, 2019 @ Stanford University, Palo Alto,
California, USA**

Introduction

Knut Hinkelmann

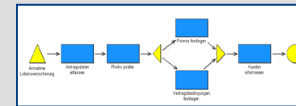
FHNW University of Applied Sciences and Arts Northwestern Switzerland

Knowledge

internal knowledge



documented knowledge

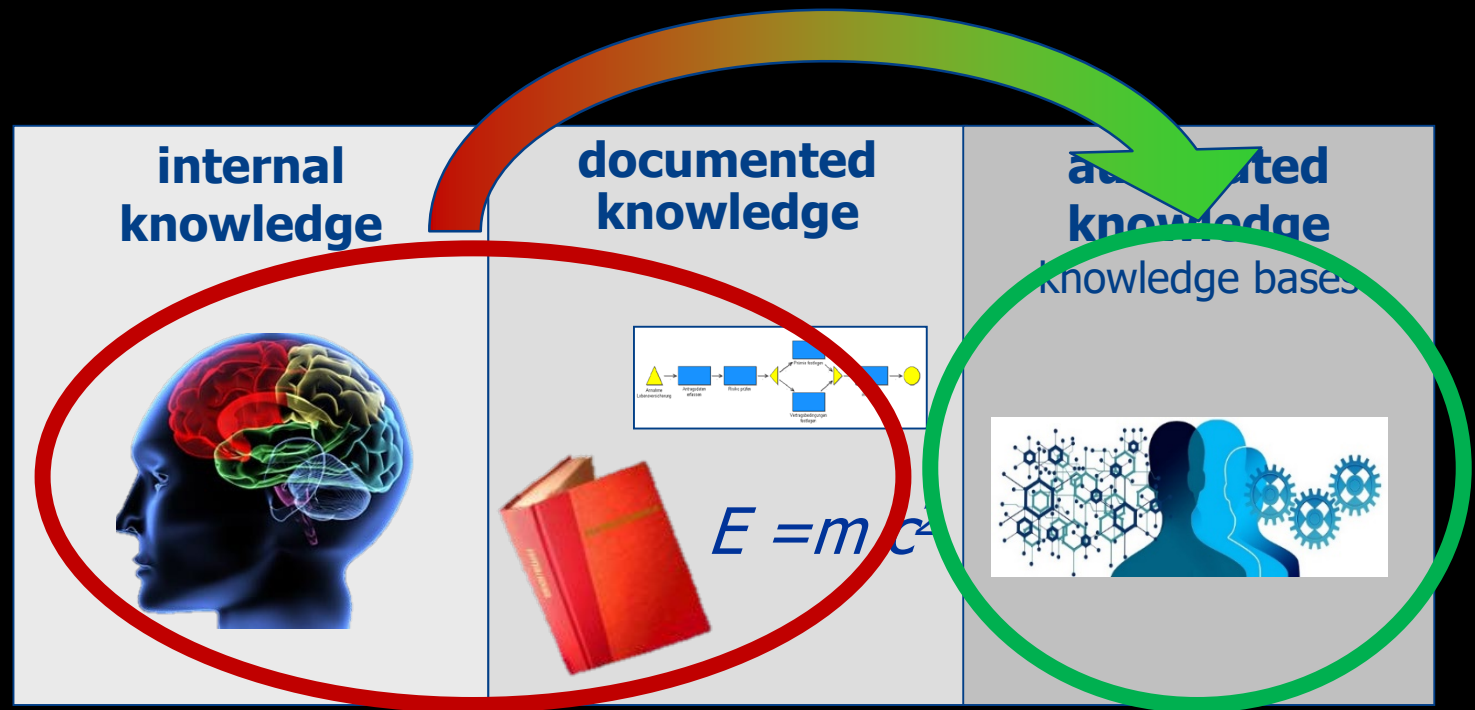


$$E = m c^2$$

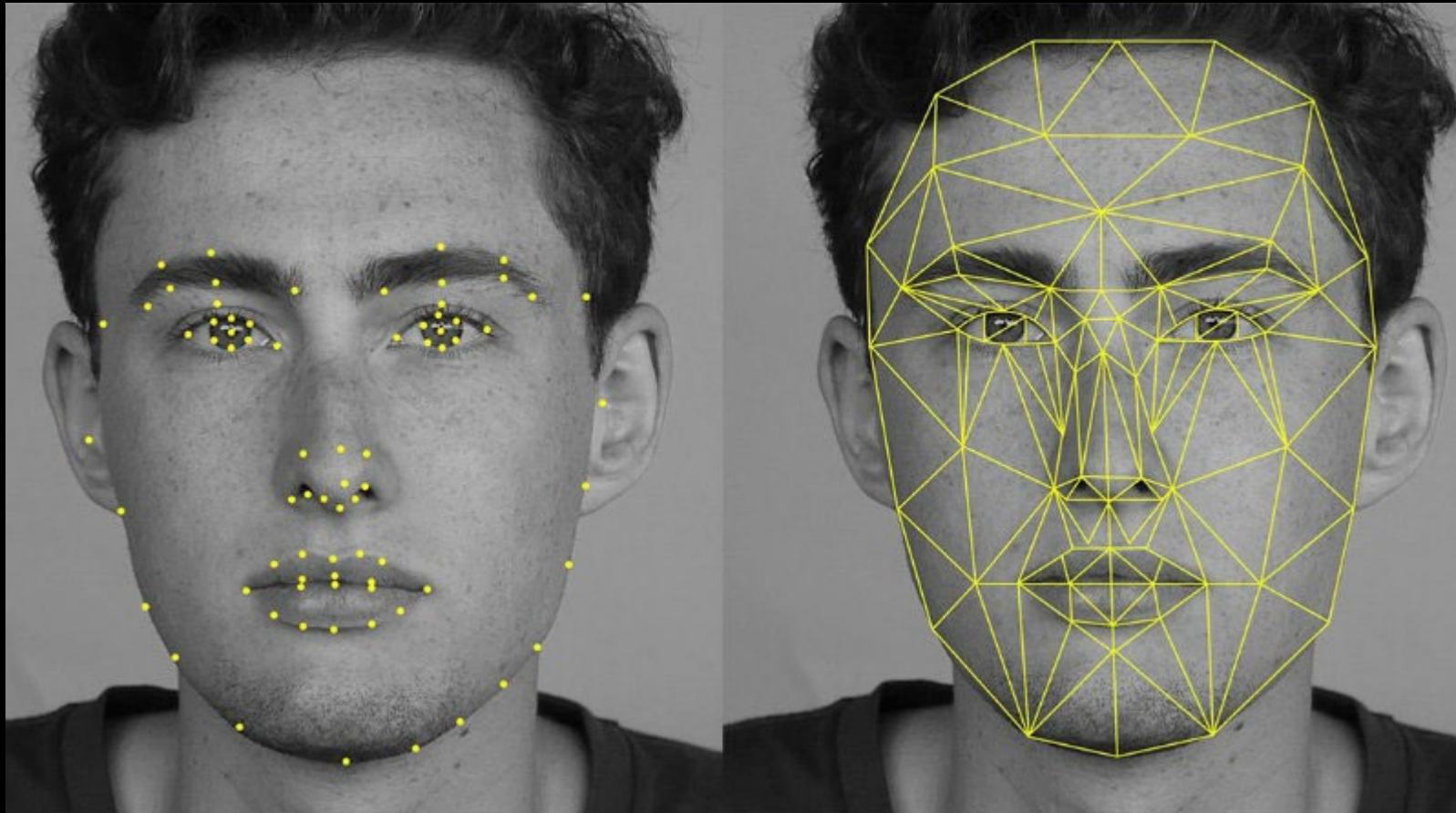
automated knowledge bases



Knowledge Engineering: Human-Created Knowledge Base



Tacit Knowledge: Face Recognition



Tacit Knowledge: Self-driving Cars

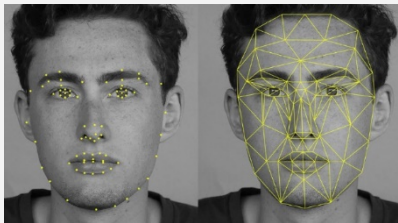

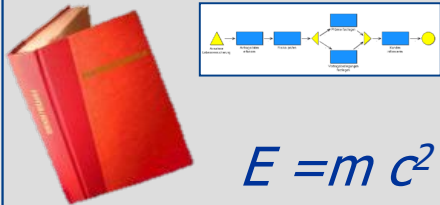



“... it is hard to imagine discovering the set of rules that can replicate the driver’s behavior.”

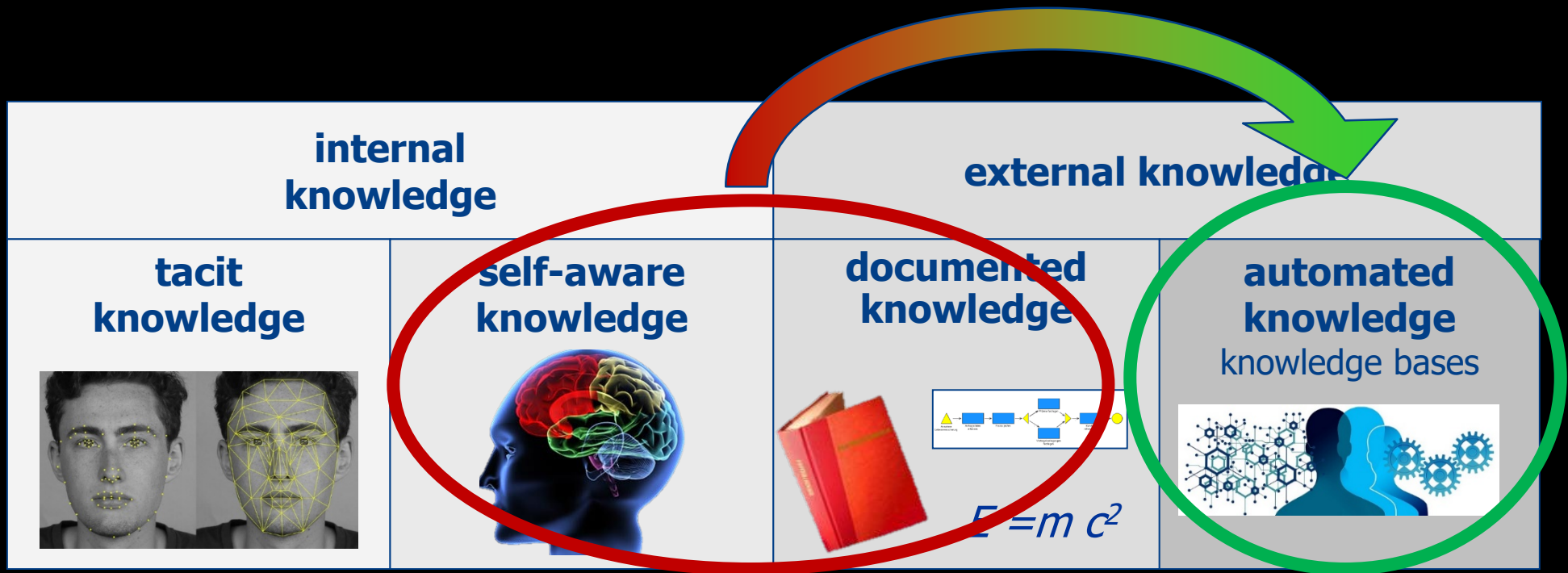
(Levy & Murnane 2006)



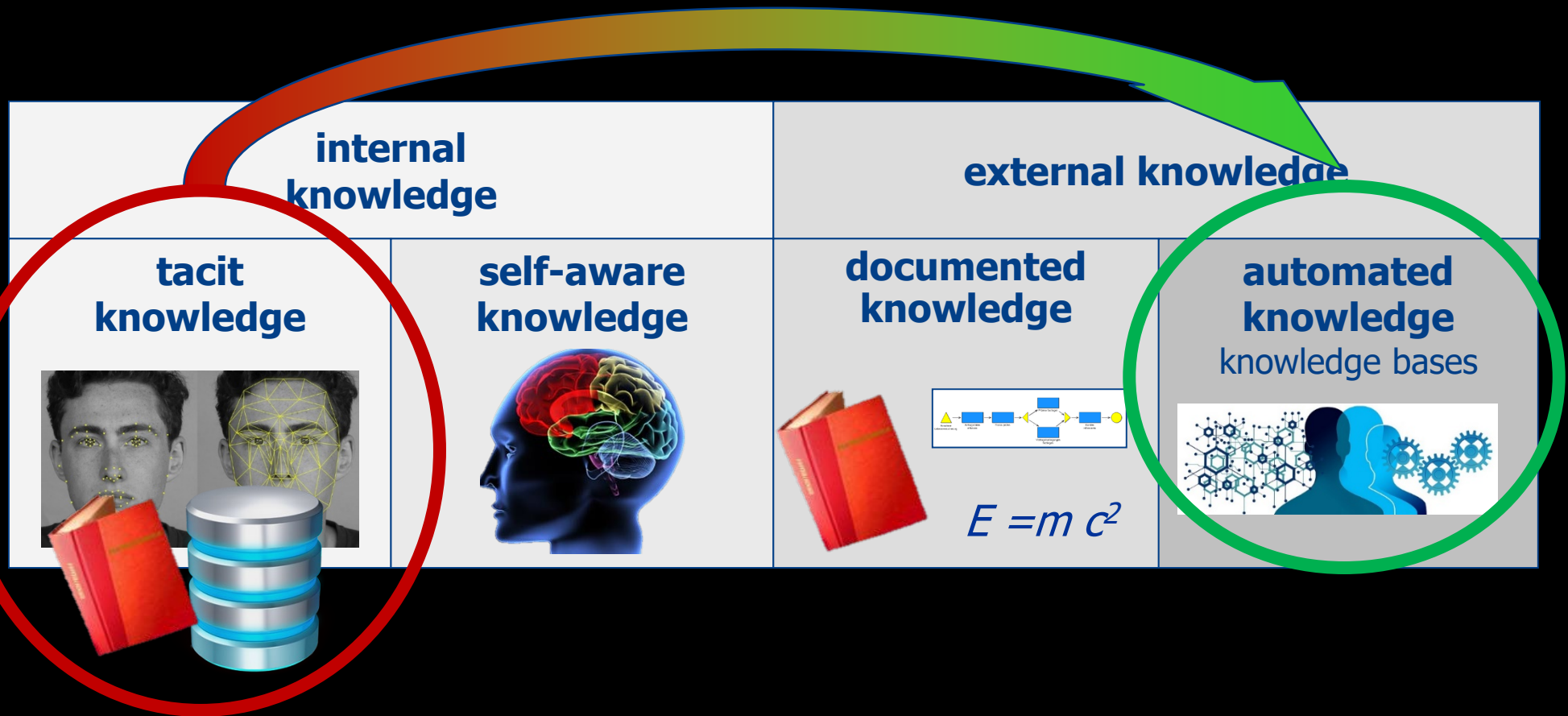
Knowledge

internal knowledge		external knowledge	
tacit knowledge 	self-aware knowledge 	documented knowledge 	automated knowledge bases 

Knowledge Engineering: Human-Created Knowledge Base



Machine Learning: Learning (Tacit) Knowledge from Data



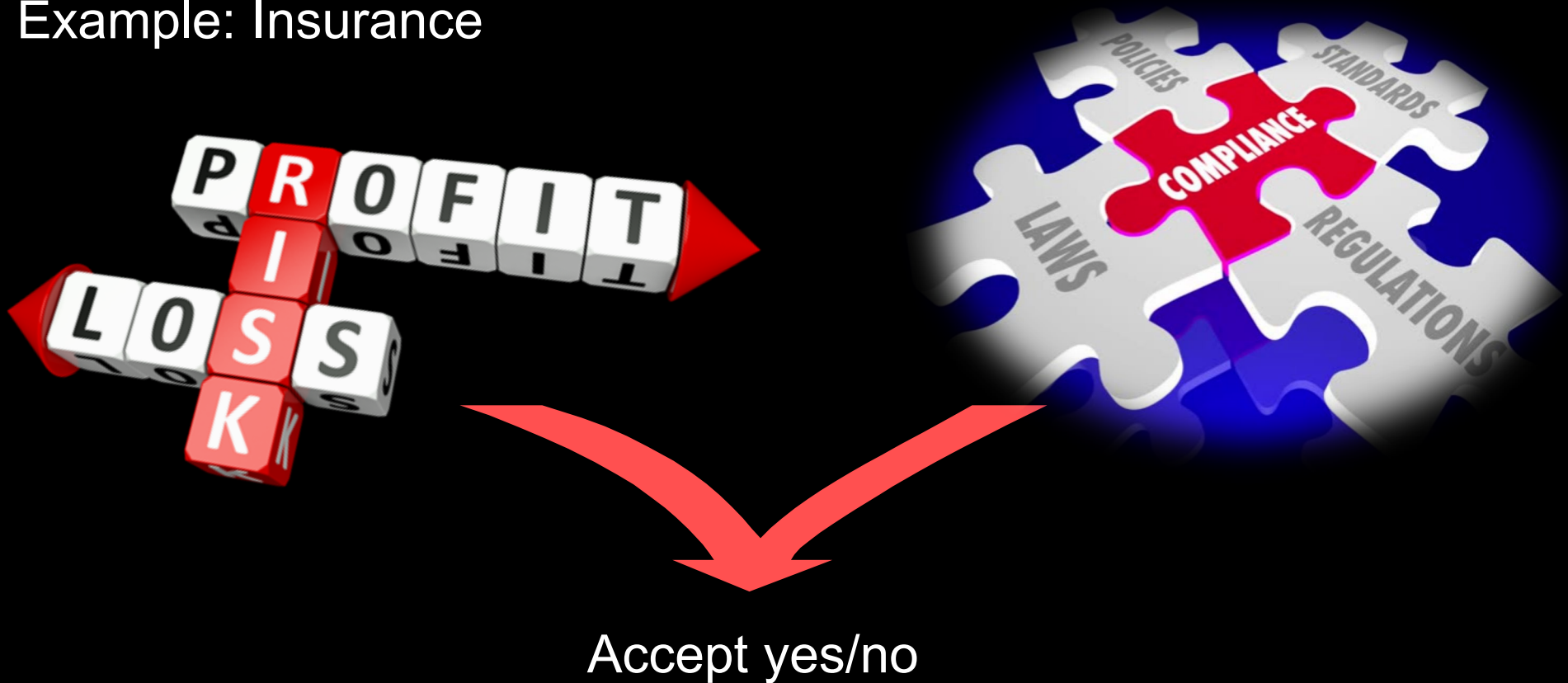
Combining Machine Learning and Knowledge Engineering

- Machine Learning:
Driving Behaviour
- Knowledge Engineering:
Traffic Rules



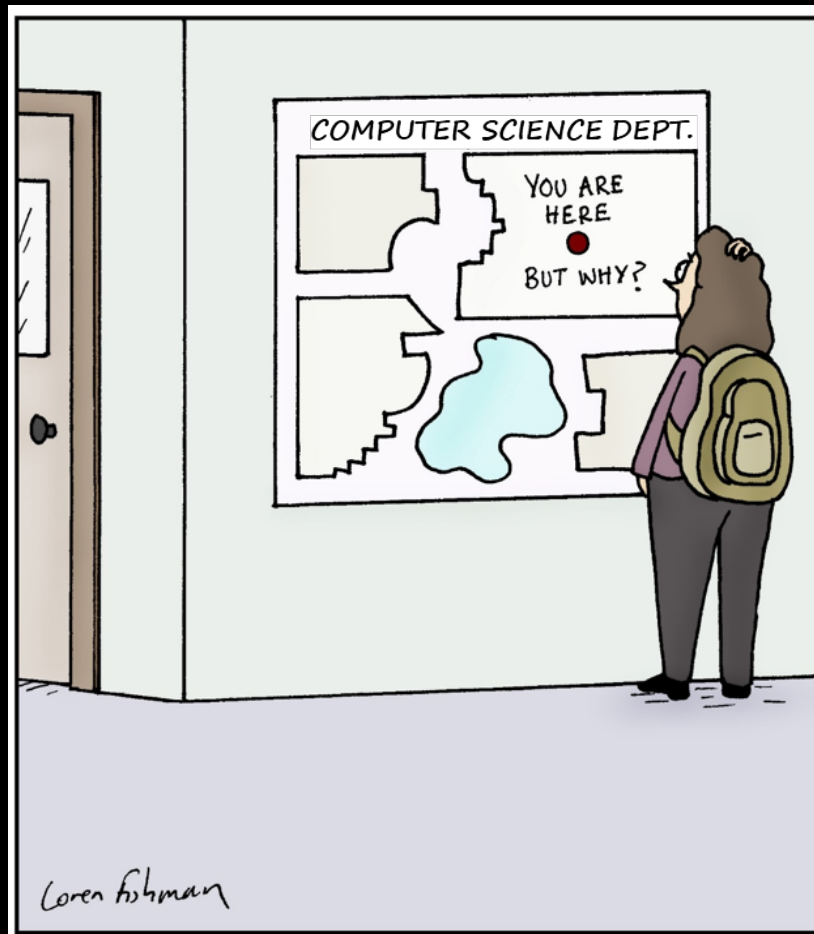
Eligibility Decision

Example: Insurance



Explanations

Can decisions without explanation be intelligent?



Trust
Compliance
Tracability

THINKING,
FAST AND SLOW



DANIEL
KAHNEMAN
WINNER OF THE NOBEL PRIZE IN ECONOMICS

System 1



Fast



Unconscious



Automatic



Everyday
Decisions



Error prone

System 2



Slow



Conscious



Effortful



Complex
Decisions

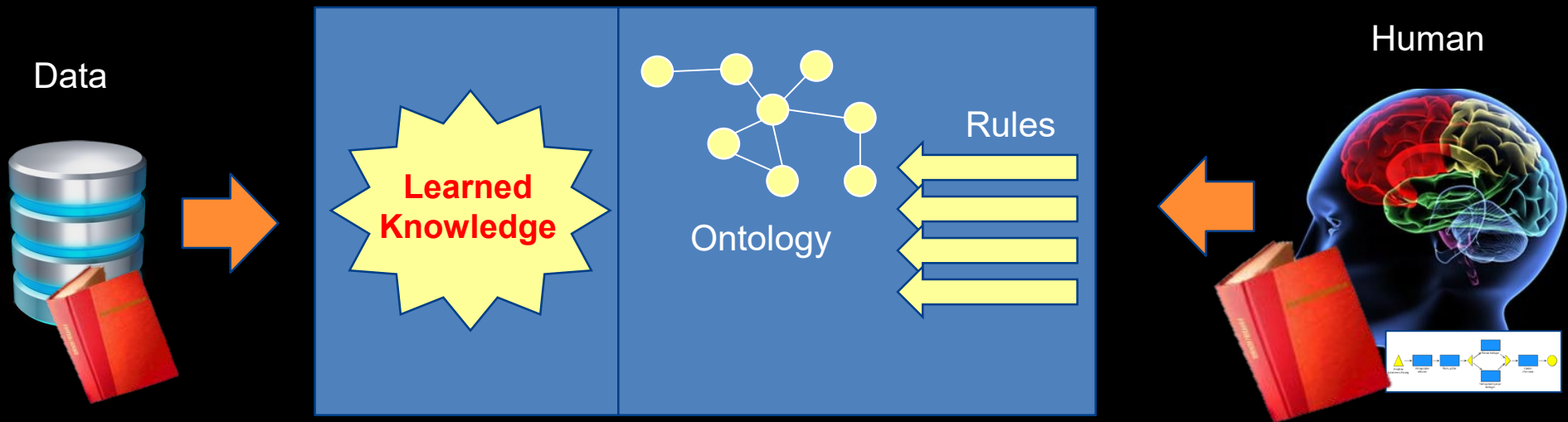


Reliable

Knowledge in Intelligent Systems

Machine Learning

Knowledge Engineering



- Tacit or unknown knowledge
- Adaptable to new situations

- Knowledge we are aware of
- Knowledge that must be correct