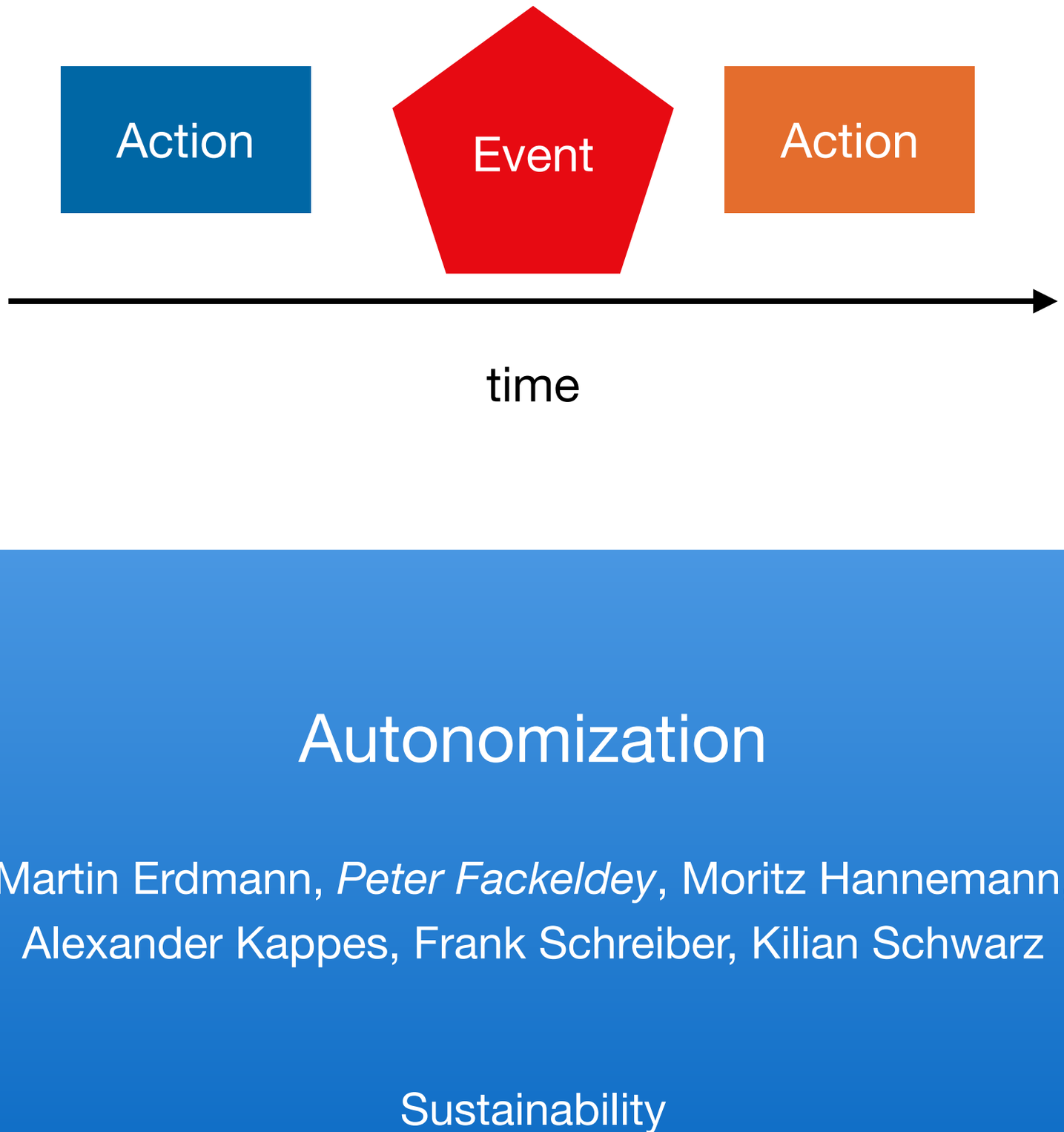


Autonomization

Martin Erdmann, *Peter Fackeldey*, Moritz Hannemann,
Alexander Kappes, Frank Schreiber, Kilian Schwarz

Sustainability

2.6.23

RWTH AACHEN UNIVERSITY

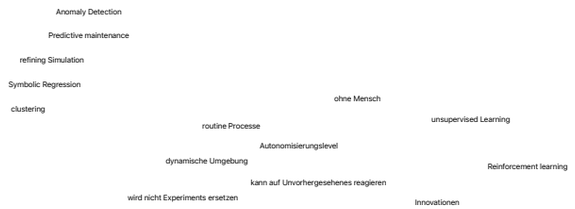
Thank you for the fruitful discussions!

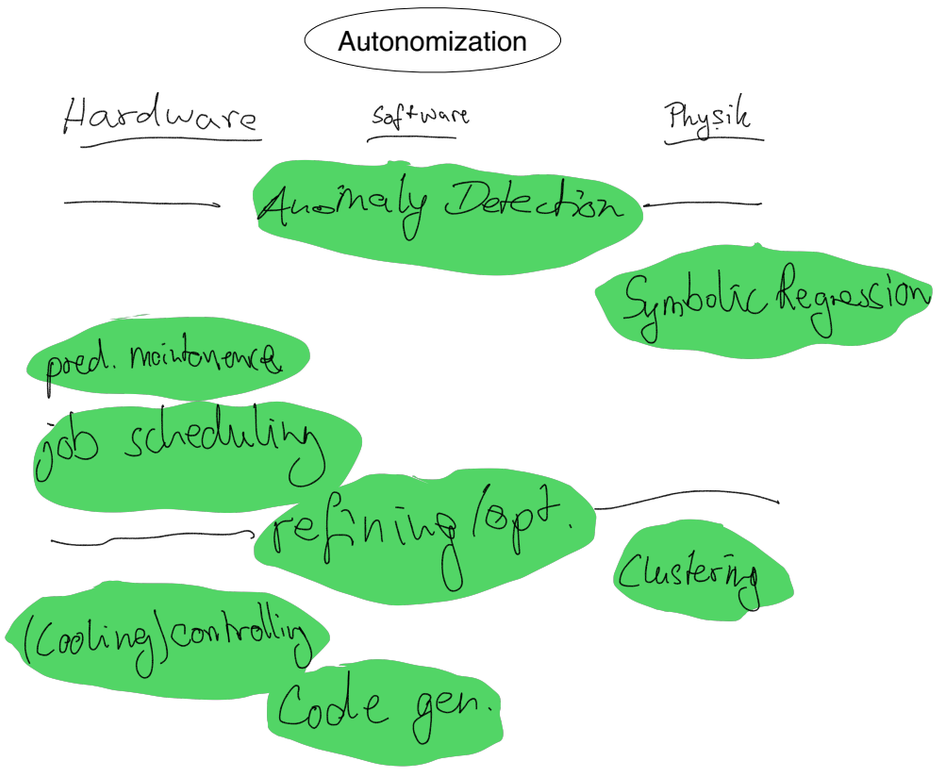
Peter F. - 2.6.23

1: Vorschlag
2: Eingriff
3: Autonom

Autonomization Level

1
2
3





Anwendungs- & Designphase

Anwendungsphase

⇒ unsupervised & reinforcement learning, IFT & supervised learning & classic algorithms

Autonomization level depends on application

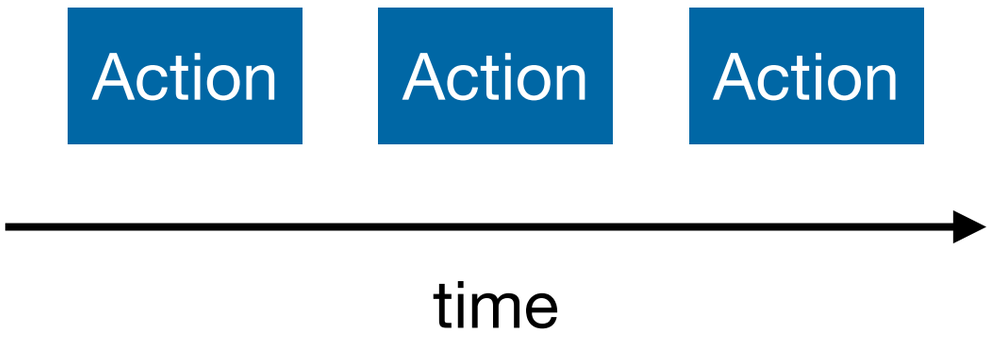
Transfer (Industrie)

Innovationspotential (disruptiv)

What is "Autonomization"?

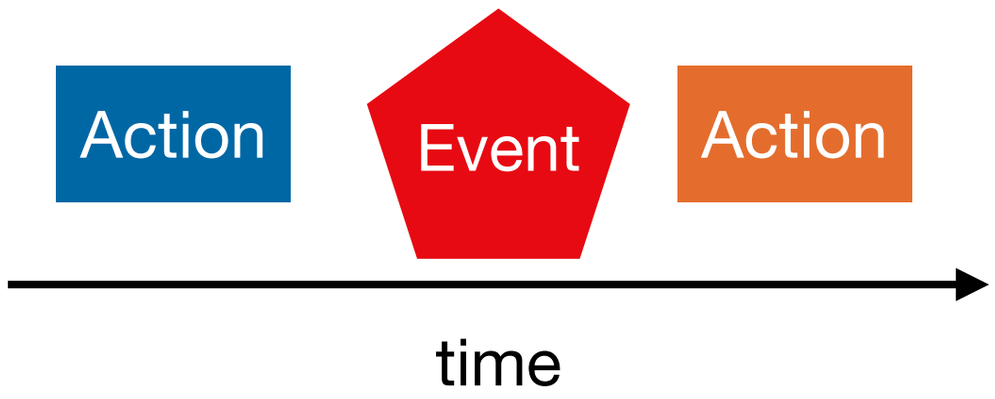
Automatization

Machines execute repetetive actions instead of humans (e.g. robots)



Autonomization

Machines interact with a dynamic environment and evaluates actions there



Where can we use autonomization?

Hardware	Software	Physics
Predictive maintenance		
(Cooling) controlling		
Job scheduling		
	Code generation	
		Symbolic Regression
		Clustering
Anomaly Detection		
Refining / Optimisation		

Are they sustainable (green)?

Hardware	Software	Physics
Predictive maintenance		
(Cooling) controlling		
Job scheduling		
	Code generation	
		Symbolic Regression
		Clustering
Anomaly Detection		
Refining / Optimisation		

How autonomous are these concepts?

- The level of autonomization can vary *significantly*

- Some concepts are clear:
  - Anomaly detection "only" notifies, no action afterwards
  - Reinforcement learning algorithm fully control their own actions

- Some are not so clear:
  - E.g. predictive maintenance ?

→ **depends on the application**

Notifying a human — Full control over actions

Key takeaways

- *AI/ML* plays a key role in autonomization:
  - Unsupervised and reinforcement learning by design autonomous
  - Supervised learning, IFT, "classic" algorithms can be autonomous (only in application phase, i.e. not during training)

- Autonomization can happen on different levels

  → *how* autonomous an algorithm acts often depends on its application

- Many application already in industry (e.g. hardware anomaly detection)

  → we don't have to reinvent the wheel ("*Transfer*")

- The innovation potential is huge and largely unknown

  → we expect a *disruptive* change in our workflows with plenty of undiscovered opportunities!