

Certification of Reinforcement Learning: Challenges per Safety Criticality and Autonomy

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Current State – Machine Learning Certification

Europe



Innovation Network
EASA AI Task Force
Daedalean AG



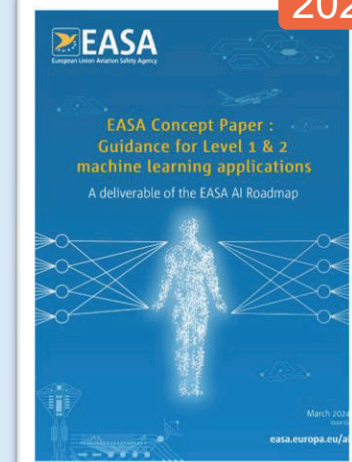
2020

Public Report Extract

**Concepts of Design Assurance
for Neural Networks (CoDANN)**



2024



2024

USA



Challenges in the Verification of
Reinforcement Learning Algorithms

2020

**Roadmap for Artificial Intelligence
Safety Assurance**



2024

ACAS X

2023

Current State – Machine Learning Certification

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2024

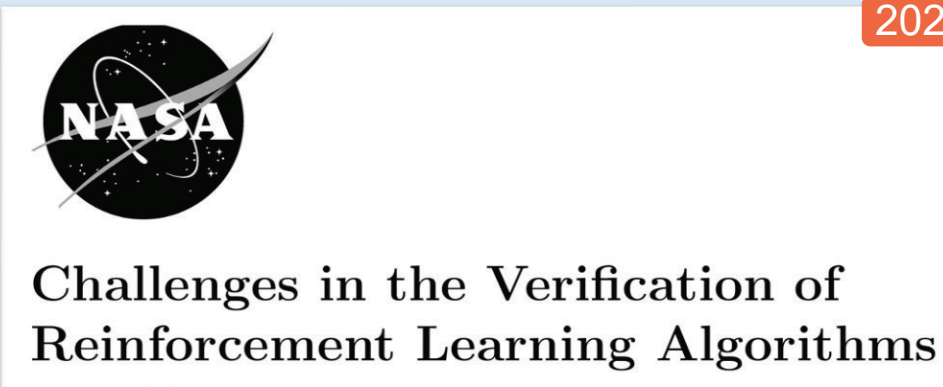
MLEAP
Machine Learning
Application Approval
Final Report



2024

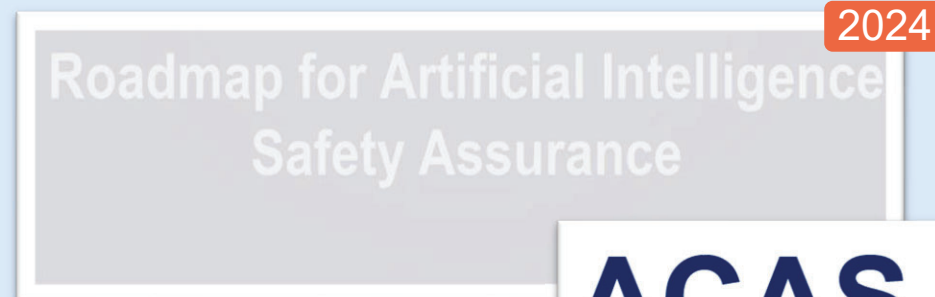
EASA
Concept Paper:
Guidance for Level 1 & 2
machine learning applications
A deliverable of the TASCAL Roadmap

USA



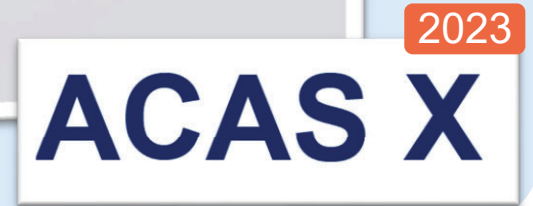
2020

NASA
Challenges in the Verification of
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2024

Roadmap for Artificial Intelligence
Safety Assurance



2023

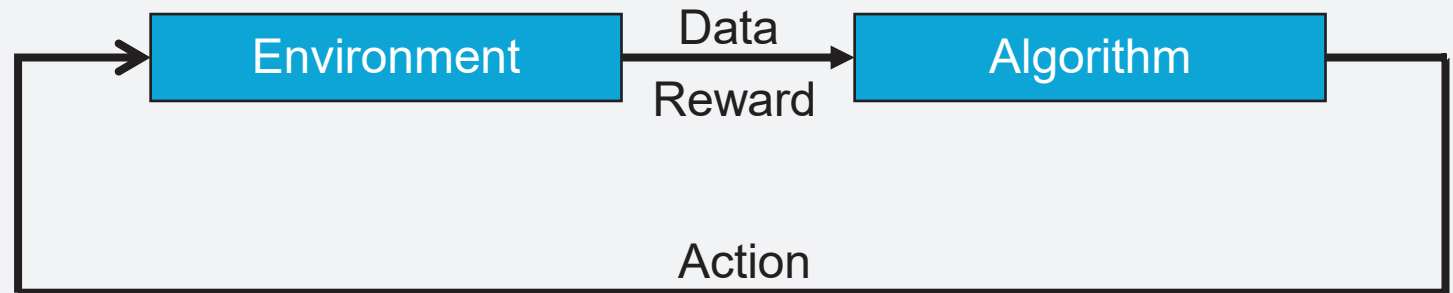
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Supervised vs Reinforcement Learning

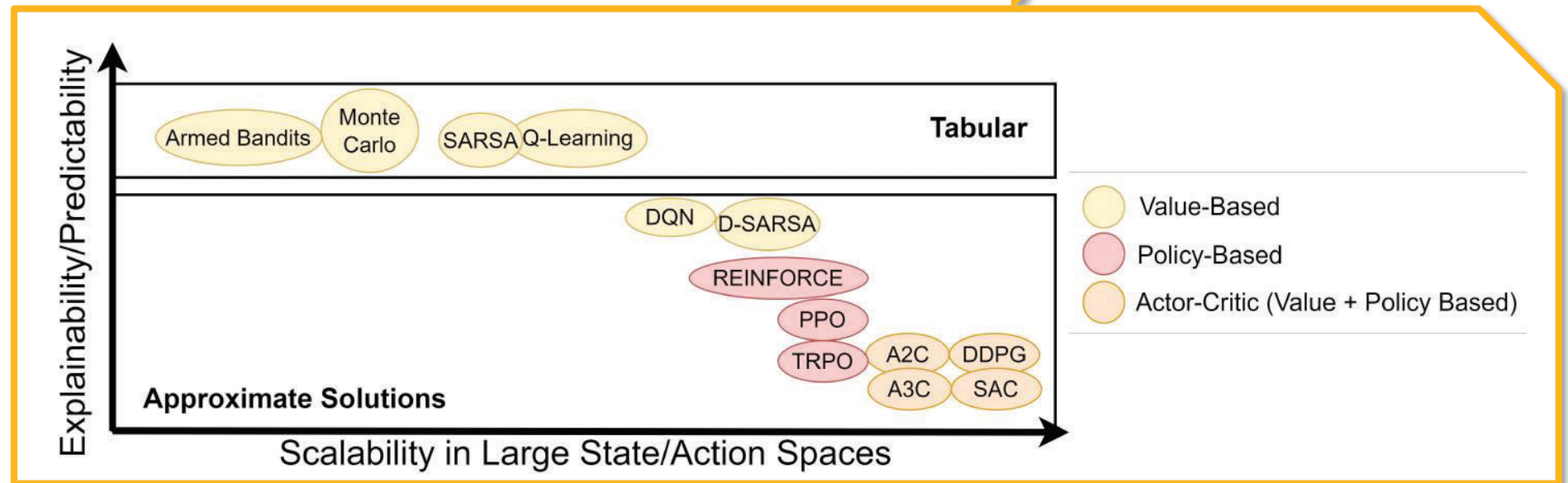
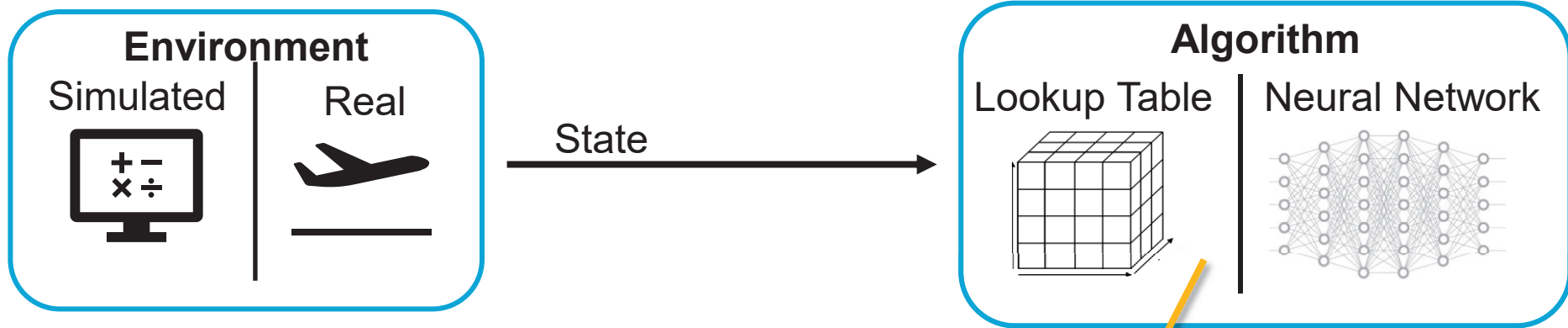
➤ Supervised Learning:



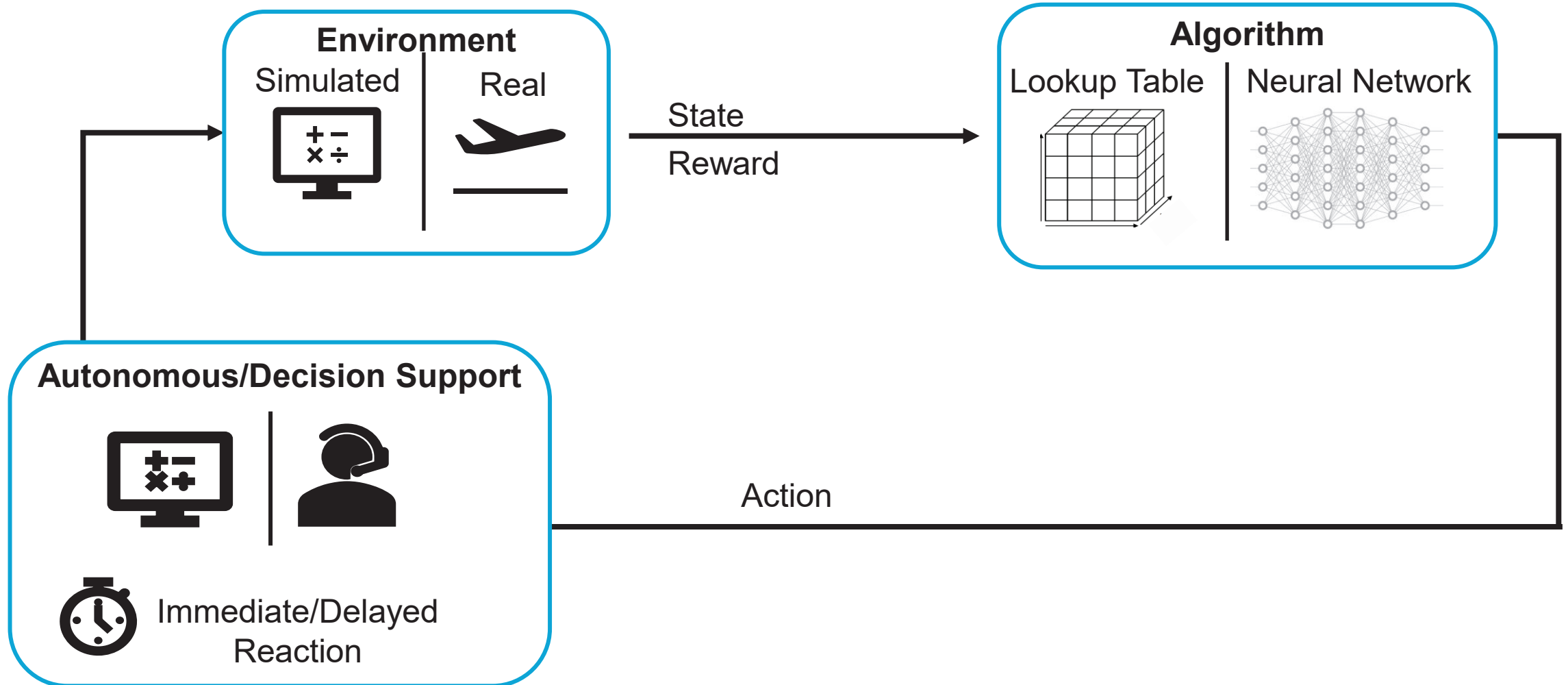
➤ Reinforcement Learning:



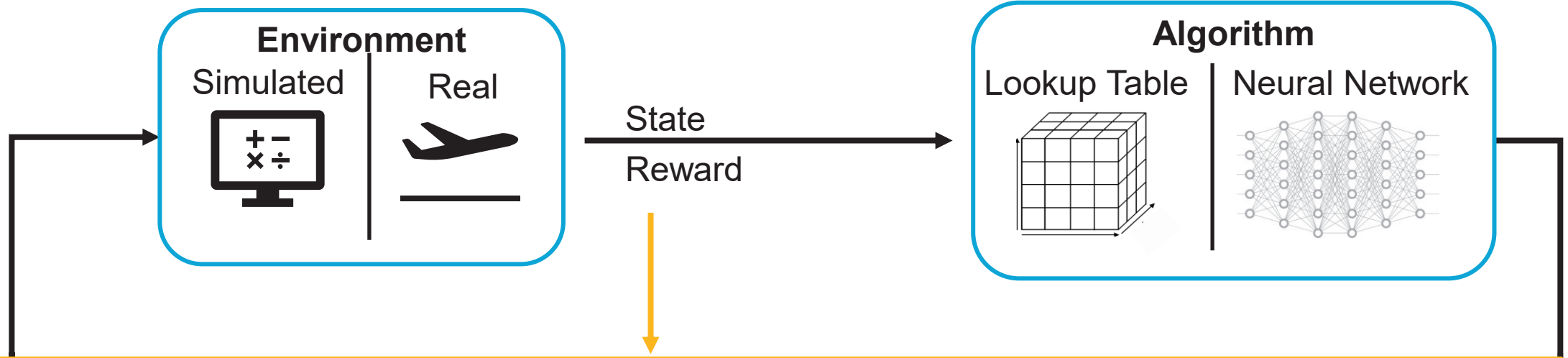
Reinforcement Learning



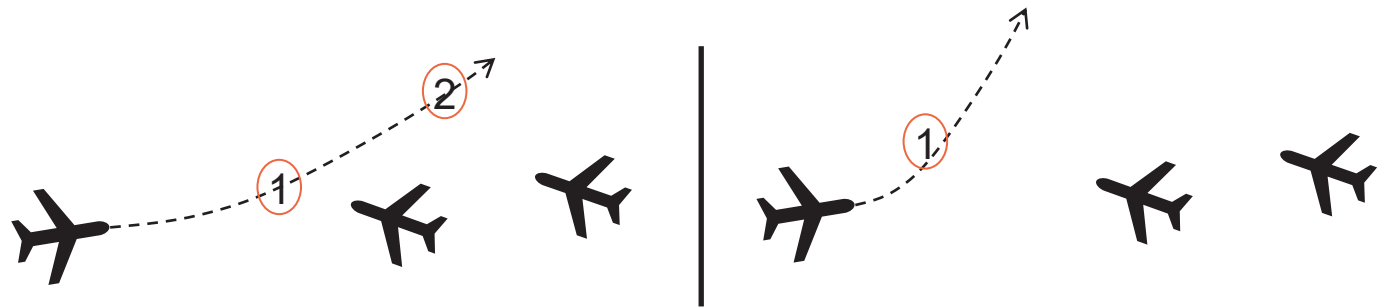
Reinforcement Learning



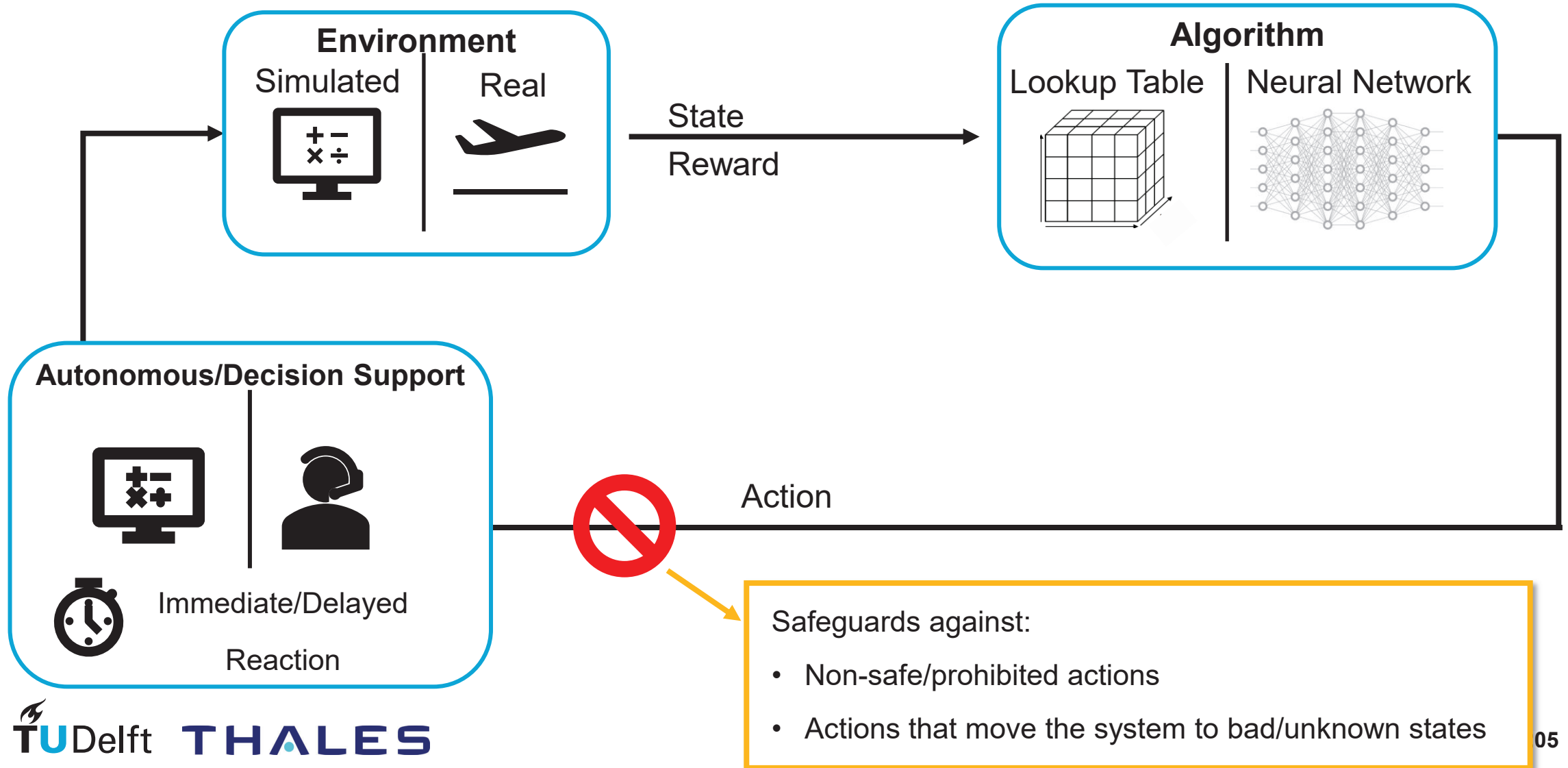
Reinforcement Learning



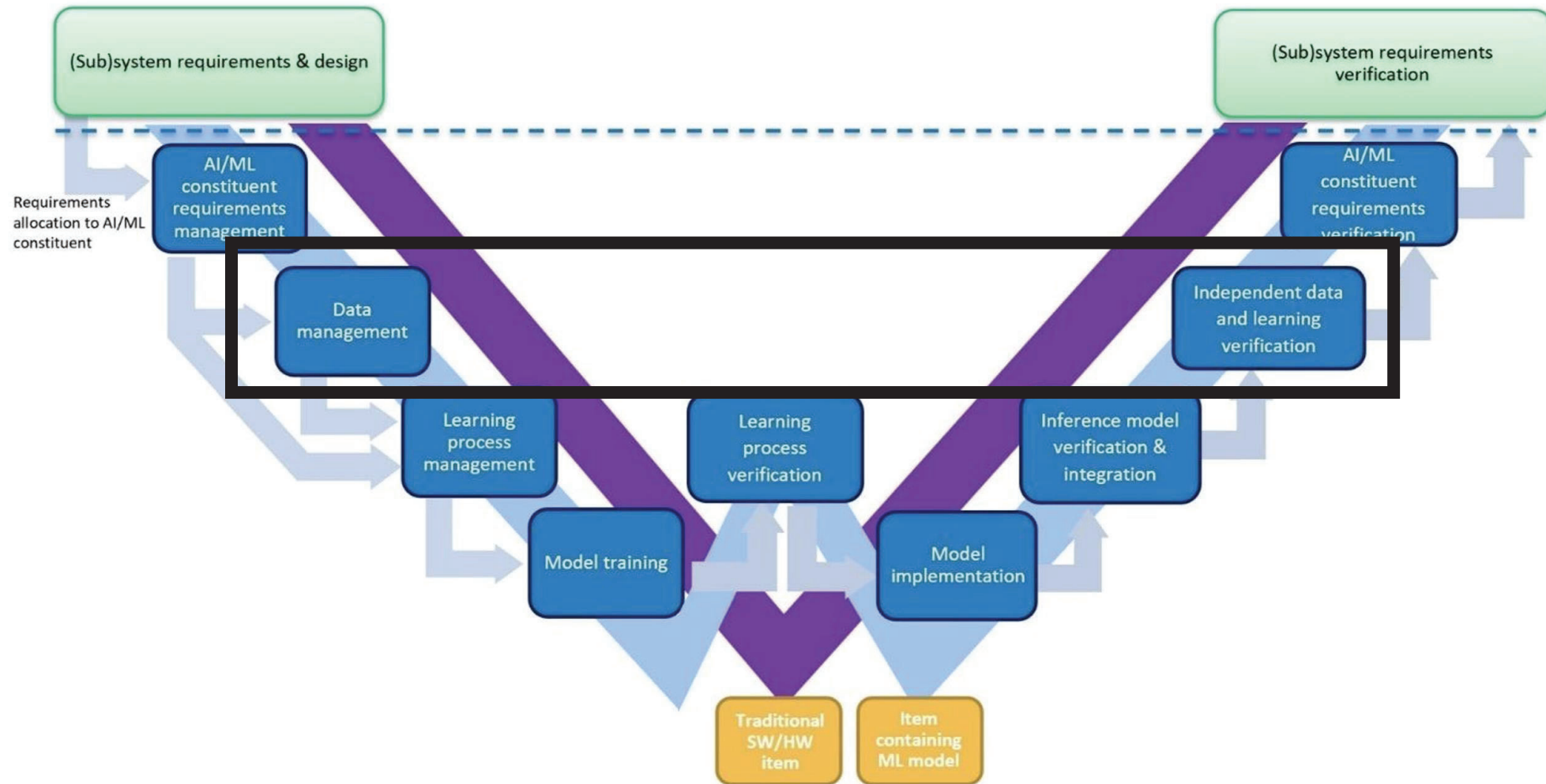
- Future rewards: sequence of actions vs immediate action – bad action can lead to a good state
- Maximization of reward
- Multi-objective reward formulation



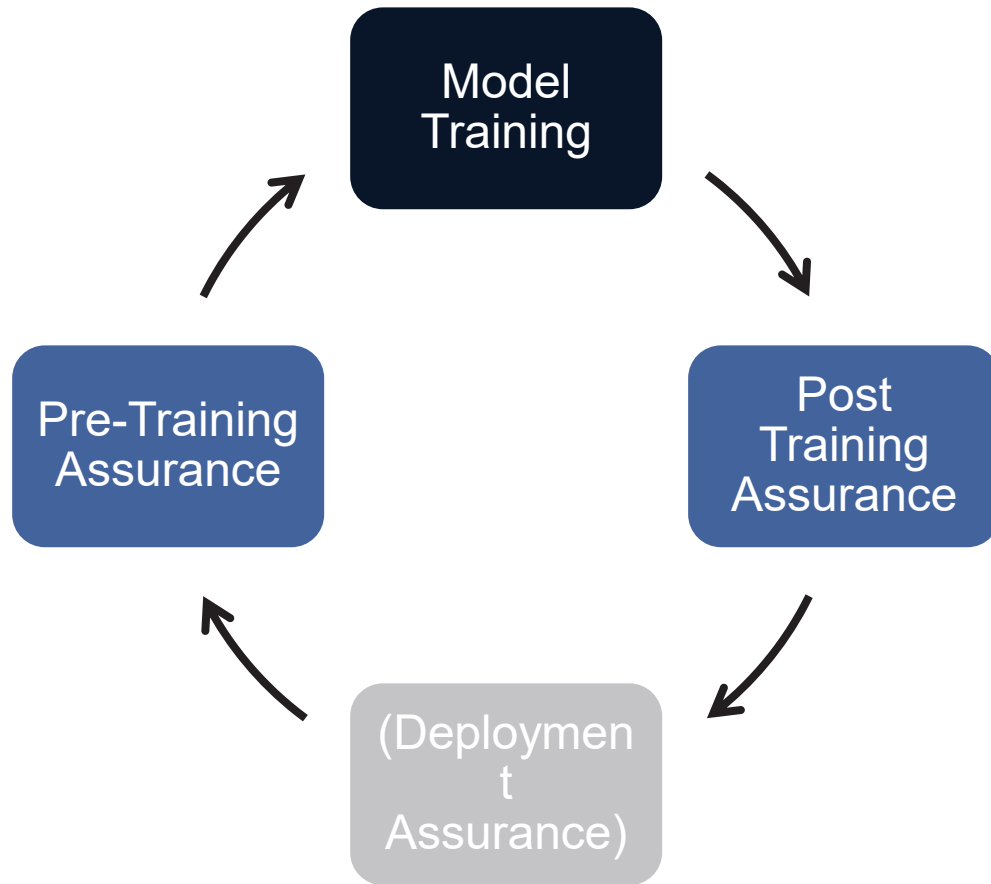
Reinforcement Learning



Reinforcement Learning – Data?

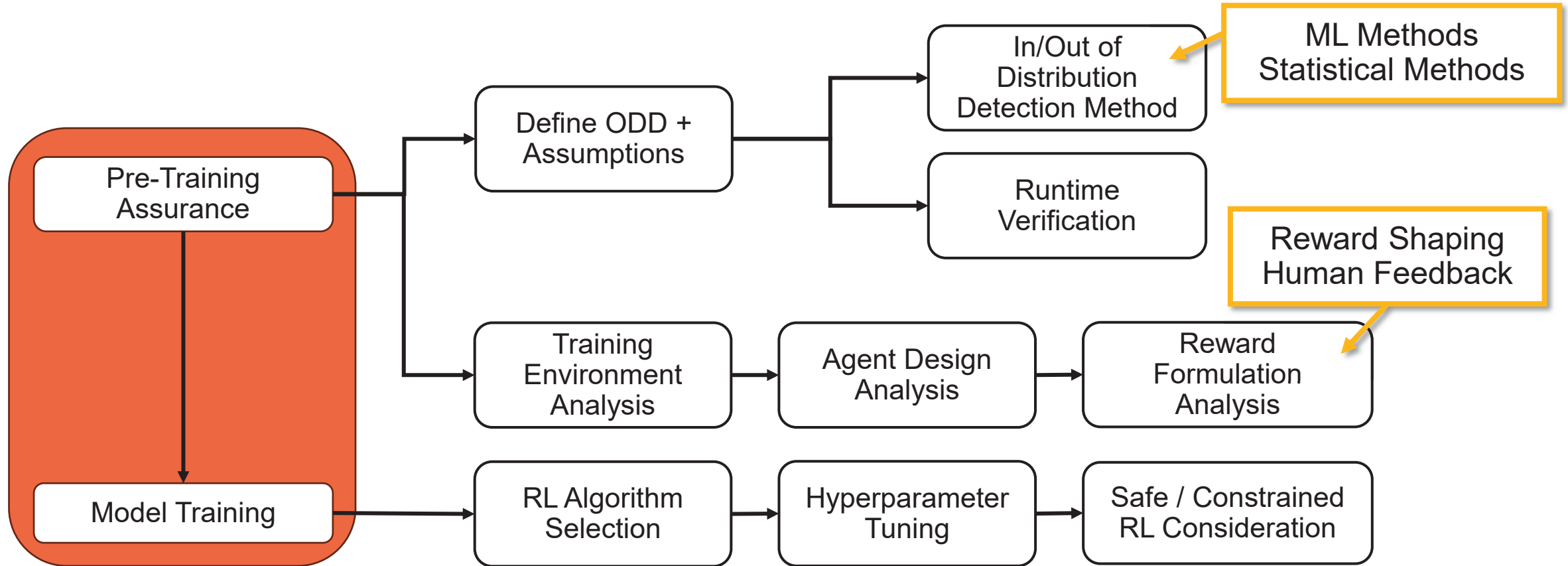


Reinforcement Learning – Data?

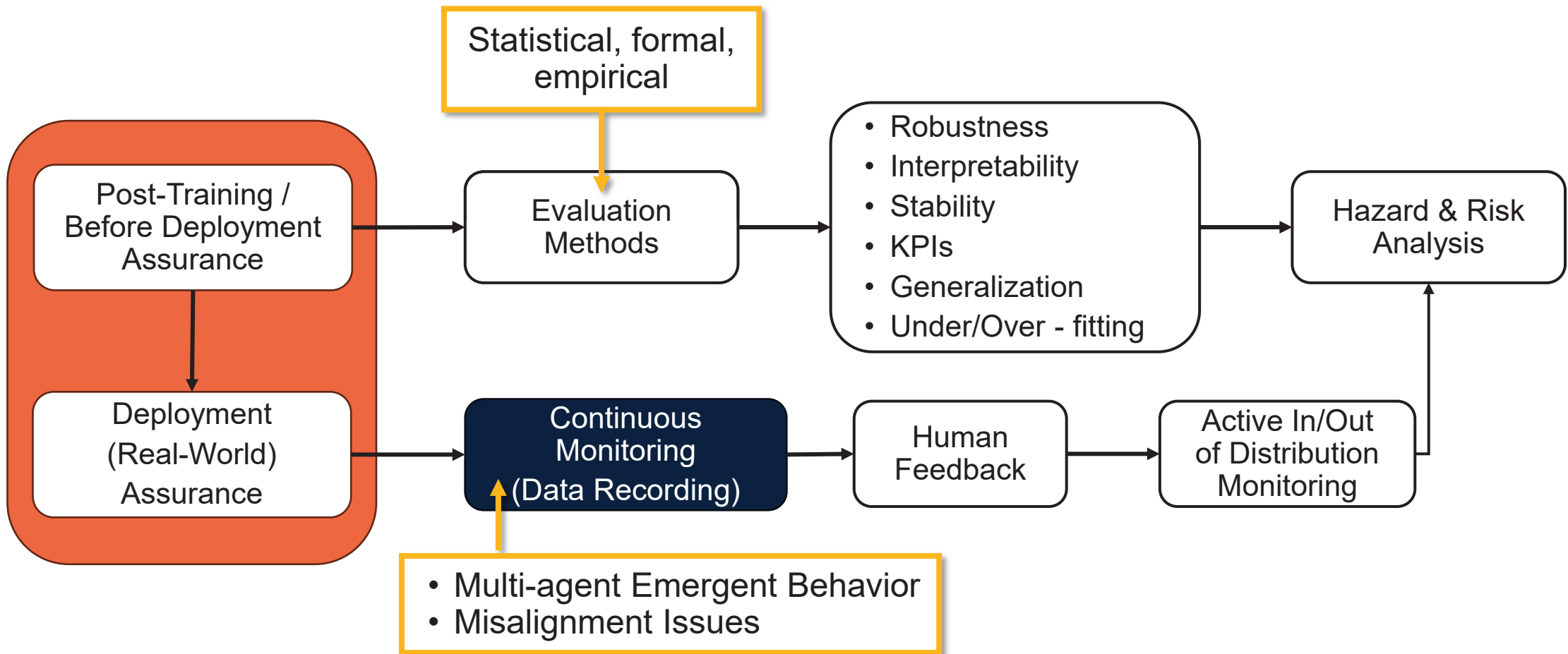


- No pre-existing data
- Running the model to learn about actions taken
- Post-assessment explainability/predictability of actions

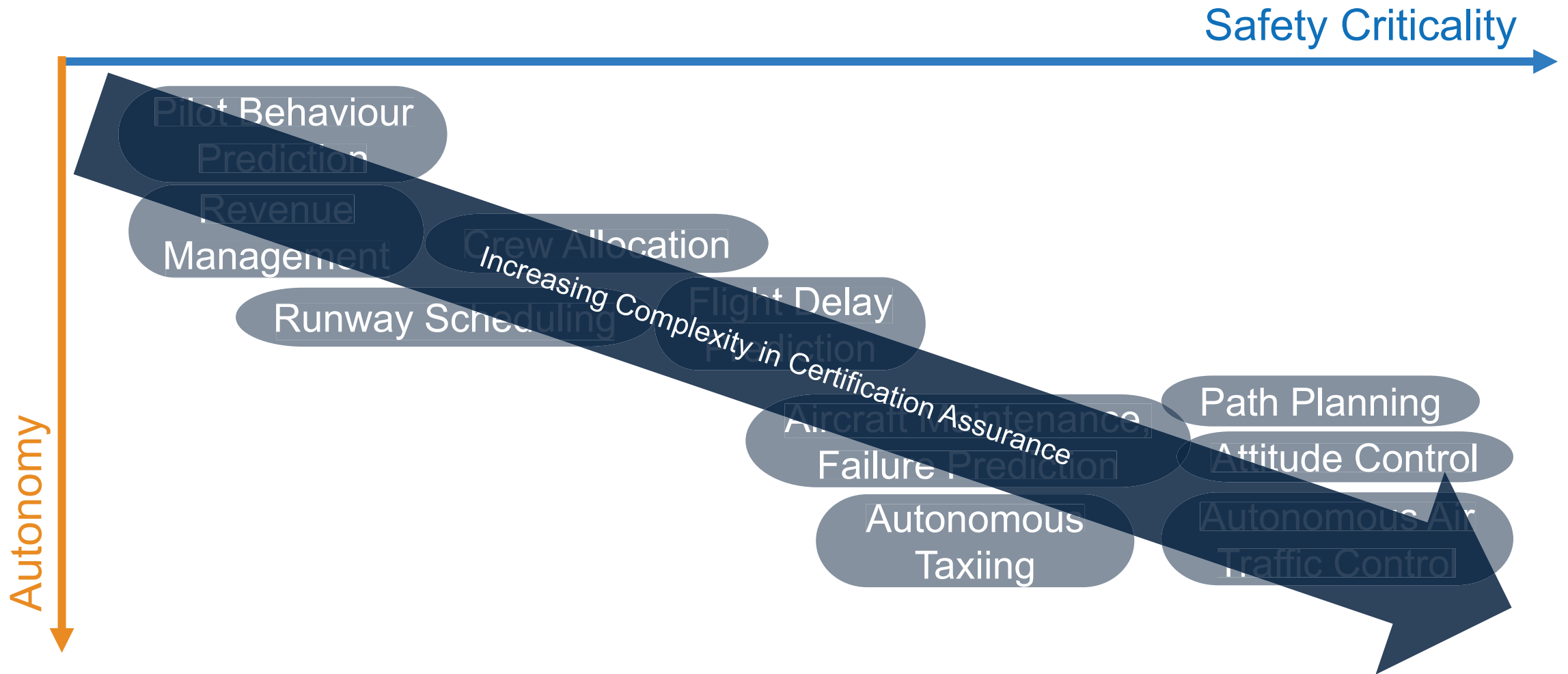
Proposal – Model Training



Proposal – Post Training



Certification Reinforcement: Criticality/Autonomy



Conclusions



Certification of reinforcement learning starts before the training processing



Iterative process – post deployment analysis will be used for future training



Certification procedure should differ per characteristics of the model



Much more still: human factors, safety risk mitigation....



THALES

Thank you for your attention!

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