



# IRSC 2022

INTERNATIONAL RAILWAY  
SAFETY COUNCIL

SEVILLA, OCTOBER 16-21, 2022





**JULIEN BOUCAULT**

Innovation officer - EPSF



**IRSC 2022**  
INTERNATIONAL RAILWAY SAFETY COUNCIL  
SEVILLA, OCTOBER 16-21, 2022





# MACHINE LEARNING ALGORITHM IN RAILWAY SAFETY CRITICAL APPLICATIONS : A NSA PERSPECTIVE

## INDEX

**AUTOMATIC METRO VS AUTONOMOUS TRAIN, WHAT IS  
SO SPECIFIC WITH MACHINE LEARNING ALGORITHM ?**

---

**DEMONSTRATING SAFETY, THE HOLISTIC APPROACH OF  
RAILWAY**

---

**CHALLENGES AND ISSUES AHEAD**

---



# AUTOMATIC METRO VS AUTONOMOUS TRAIN, WHAT IS SO SPECIFIC WITH MACHINE LEARNING ALGORITHM ?

## Automatic metro vs autonomous train – What is the difference ?

- Automatic metro :

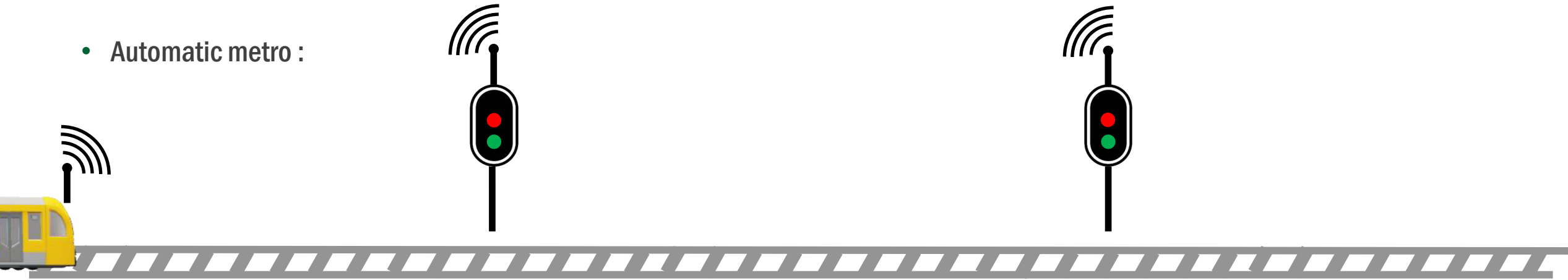


- Autonomous train :

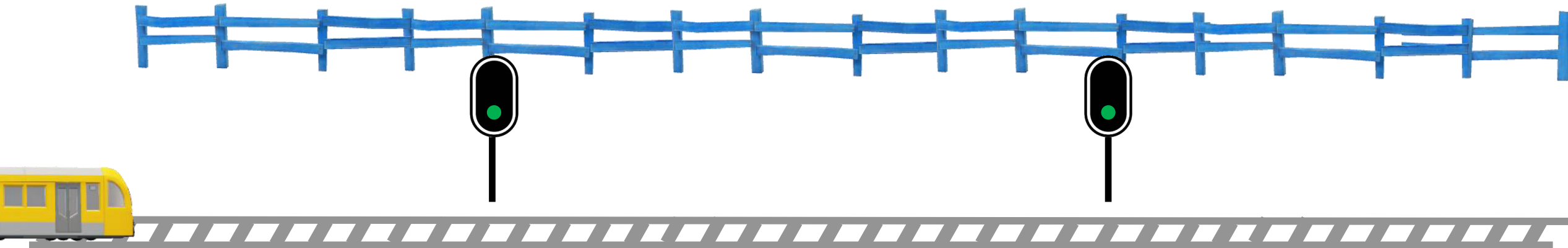


## Automatic metro vs autonomous train – What is the difference ?

- Automatic metro :



- Autonomous train :

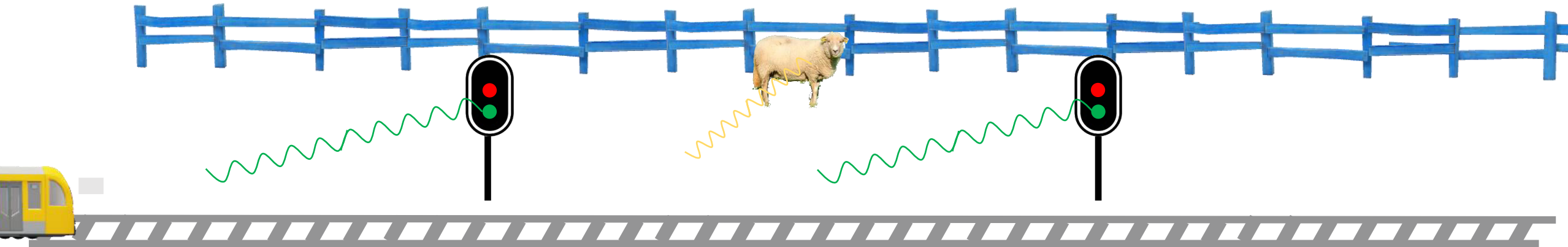


## Automatic metro vs autonomous train – What is the difference ?

- Automatic metro :



- Autonomous train :





# AI and ML, what are we talking about exactly ?

- What is artificial intelligence (AI) ?



# AI and ML, what are we talking about exactly ?

- What is artificial intelligence (AI) ?
- What is machine learning (ML) ?

## Artificial Intelligence

### Machine learning

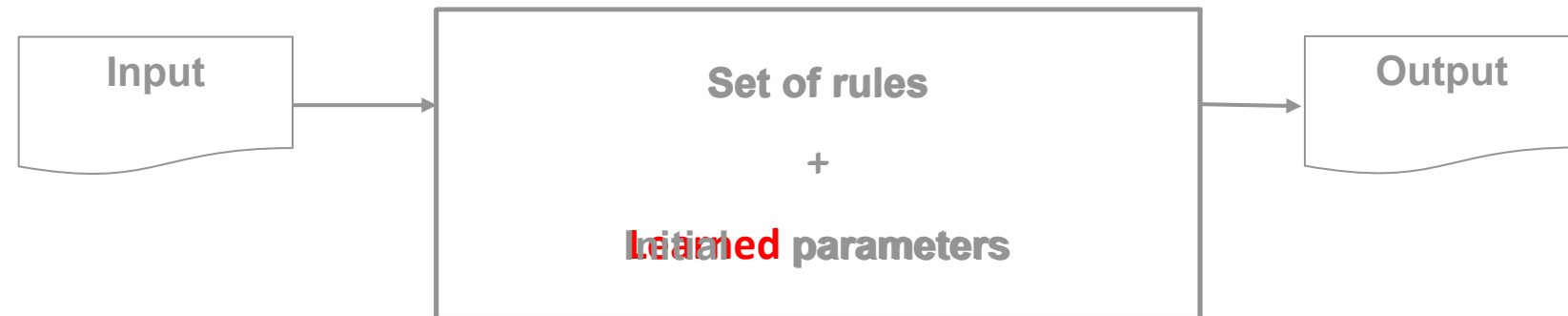
### Deep learning

## What is so specific with ML ?

- “Classic” algorithm:

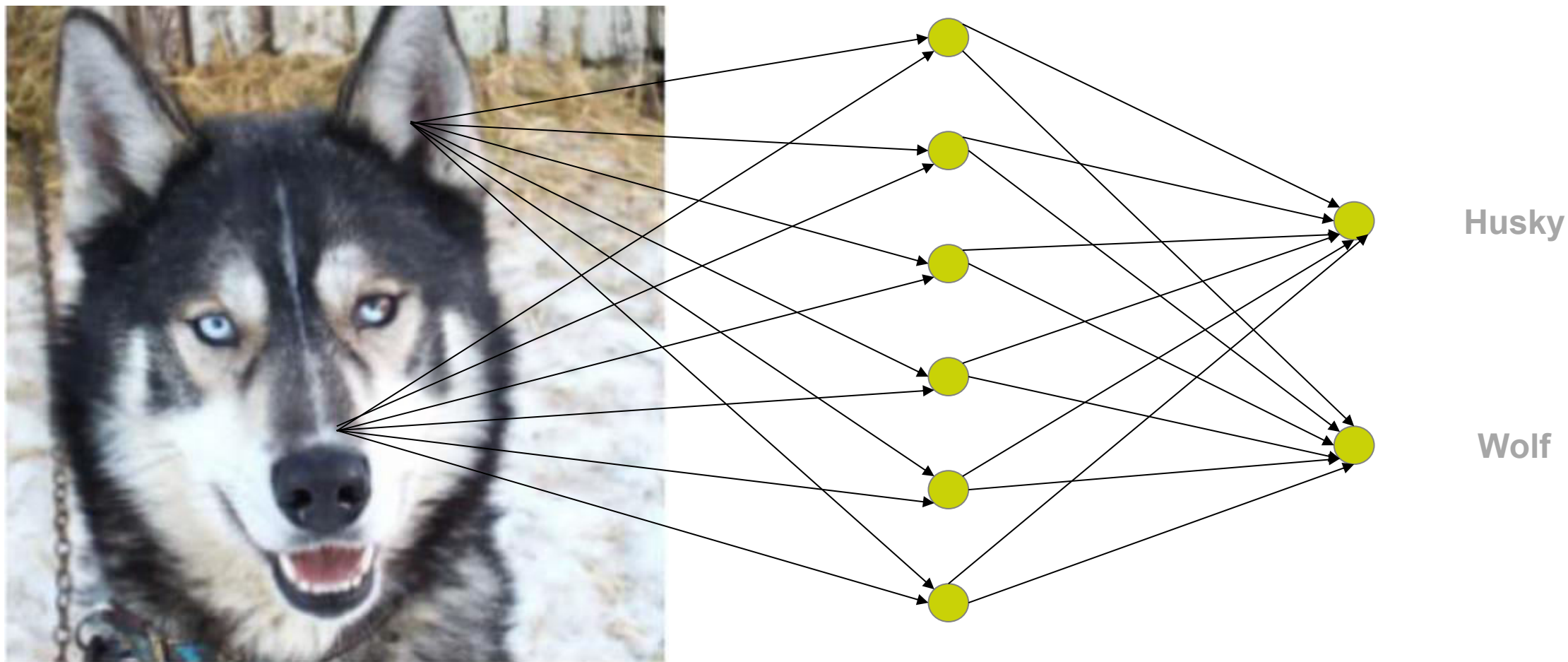


- Machine learning algorithm:





## What is so specific with ML ?



# DEMONSTRATING SAFETY, THE HOLISTIC APPROACH OF RAILWAY

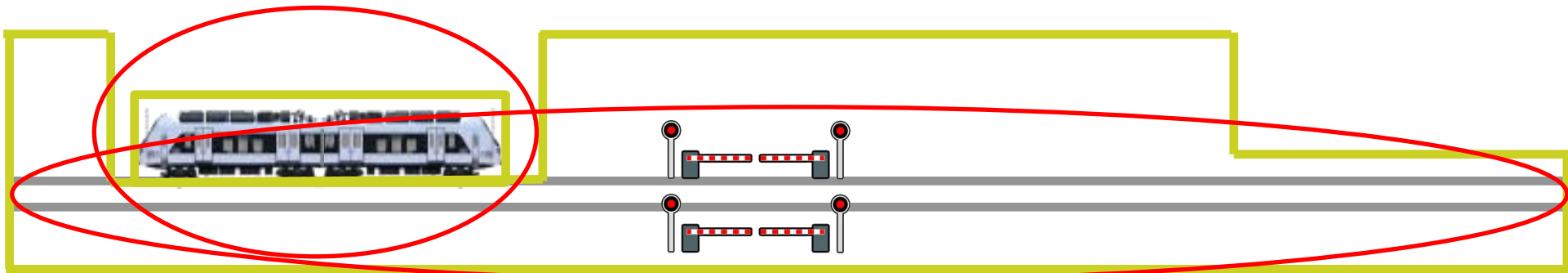
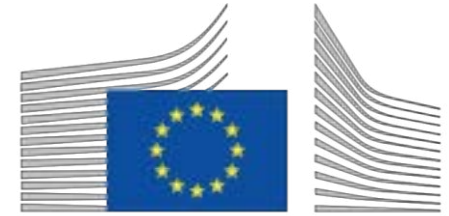


**IRSC 2022**  
INTERNATIONAL RAILWAY SAFETY COUNCIL  
SEVILLA, OCTOBER 16-21, 2022



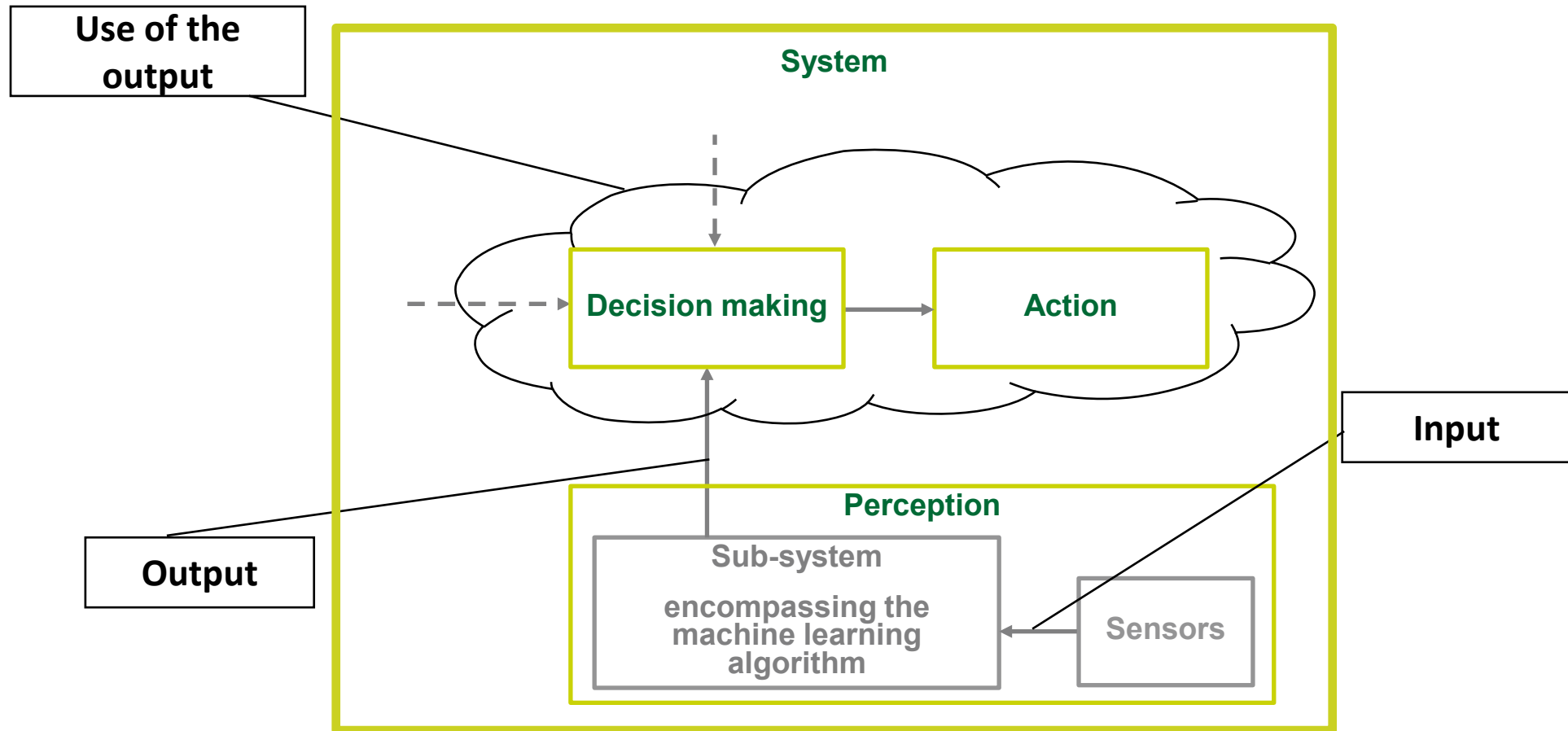
# Authorization within the european interoperable regulatory framework

- Technical systems :
  - Fixed installations ;
  - Vehicle ;
- Entities (safety management system – SMS) ;
  - Railway undertaking ;
  - Infrastructure manager ;





## A holistic approach



# CHALLENGES AND ISSUES AHEAD

## Three main challenges

**Certifiable**

**Auditable**

**Reproducible**



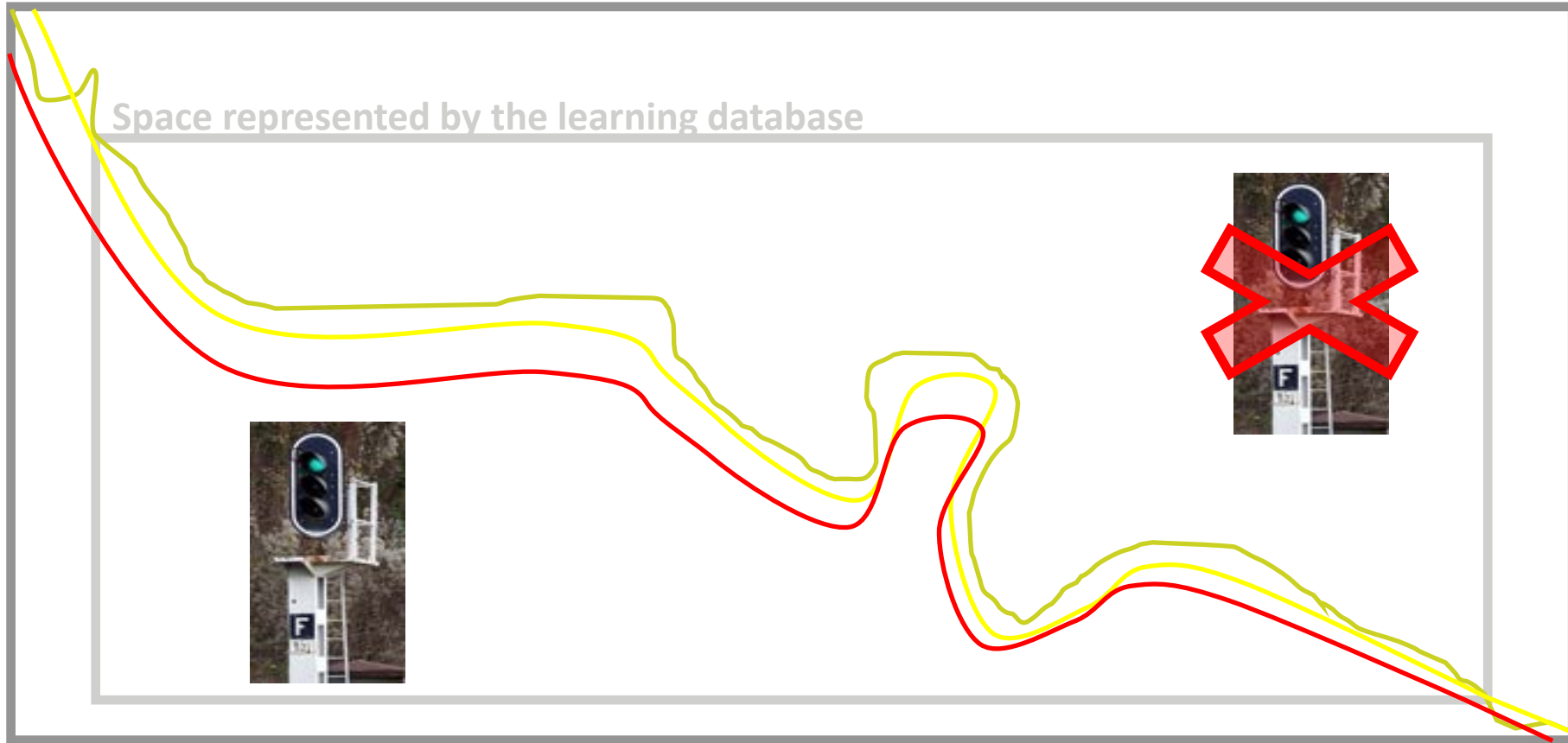
## Three main challenges

**Certifiable**

**Accuracy**

Space of the area of use

Space represented by the learning database



## Three main challenges

Certifiable

Over time



1977



2022



Tomorrow ?

## Three main challenges

**Certifiable**

**Auditable**

**Reproducible**



## Three main challenges

Auditable

Explainability



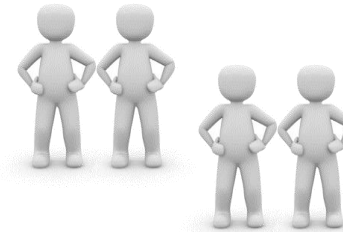
Operator using a tool working with ML



Immediate accident analysis



In-depth accident analysis



Time

## Three main challenges

**Certifiable**

**Auditable**

**Reproducible**

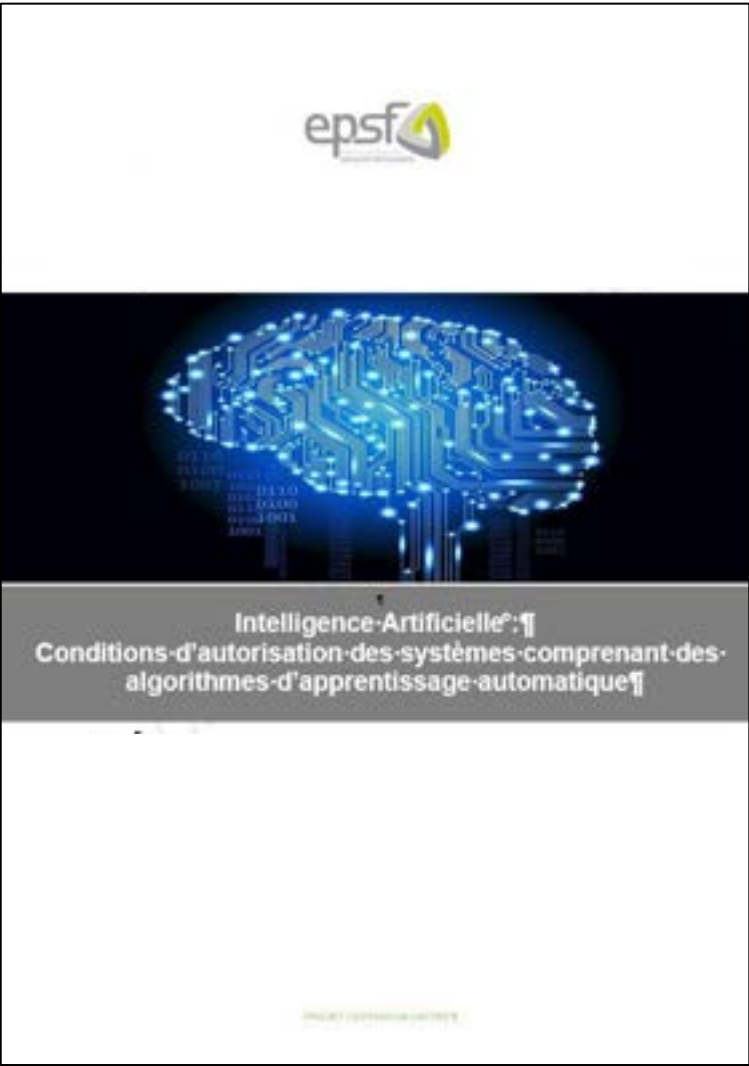
## Three main challenges

Reproducible

Learning



Position paper...coming soon...







[www.irsc2022.com](http://www.irsc2022.com)

