

# Multi-Agent System and Digital Twin Models for Security Study of Cyber-Physical System

Individual Plan  
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Keywords: MAS, Digital Twins

# 1 Background & main objective

The research work should provide the following outcomes:

- State of the art of most important security issues of cyber-physical systems;
- Development of a simple model for security analysis of Cyber-Physical systems using Digital Twins and Multi-Agent Systems, in a combined way;
- Experimental analysis and evaluation of the proposed model by simulation

During the thesis work, I will provide preliminary results to the research questions bellow such as highlighting main features of both models with regards to a security study.

## 2 Research question & method

### 2.1 Questions

The aim of this internship project is to investigate three research questions:

1. What are the interesting features of both digital twins and multi-agent systems for studying security of cyber-physical systems?
2. How could digital twins and multi-agent systems be combined to offer a better support for a security study of cyber-physical systems?
3. What security claims of a system can be made from integrating multi-agent systems and digital twins?

### 2.2 Objectives

From the three questions above, we can derive these objectives:

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### 2.3 Tasks

Here are the tasks we will have to do to reach our objectives:

### 2.4 Method

### 2.5 Ethics and Sustainability

### 2.6 Limitations

Both definitions of Multi-Agent systems and Digital Twins does not have a consensus on their definition. I will have to choose one that could limit the set of possible interpretations of these two concepts.

## **2.7 Risks**

Falling behind schedule on the state of the art.

## **3 Evaluation & news value**

Peer-review? Feedback meetings?

## **4 Pre-study**

DT, SMA, most important security issues of cyber-physical systems  
Lab preliminary resources, gscholar.  
cf zotero ?

## **5 Condition & schedule**

Computers, internet, zotero, MESA

- Setting up the project: 2 weeks
- State of the art: 1 month
- Personal contribution: 3 months
- Personal contribution writing refining: 3 weeks

A regular supervision will be done on the basis of weekly meetings and additional meetings if needed in which I will present the work in progress which will be analysed by the supervising team.

## **6 References**

List references, including information Authors, Title, Journal/Book/Conference/Website, Publication date