Chapter 18
Adoption of Machine Learning With Adaptive Approach for Securing CPS

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ABSTRACT

The cyber physical system safety and security is the major concern on the incorporated components with interface standards, communication protocols, physical operational characteristics, and real-time sensing. The seamless integration of computational and distributed physical components with intelligent mechanisms increases the adaptability, autonomy, efficiency, functionality, reliability, safety, and usability of cyber-physical systems. In IoT-enabled cyber physical systems, cyber security is an essential challenge due to IoT devices in industrial control systems. Computational intelligence algorithms have been proposed to detect and mitigate the cyber-attacks in cyber physical systems, smart grids, power systems. The various machine learning approaches towards securing CPS is observed based on the performance metrics like detection accuracy, average classification rate, false negative rate, false positive rate, processing time per packet. A unique feature of CPS is considered through structural adaptation which facilitates a self-healing CPS.

INTRODUCTION

Cyber Physical Systems (CPS)

CPSs are frameworks that connect the physical world (e.g., through sensors or actuators) with the virtual universe of data handling. They are formed from differing constituent parts that team up to make some worldwide conduct. These constituents will incorporate programming frameworks, correspondences innovation, and sensors/actuators that communicate with this present reality, frequently including installed advances.

An average CPS as shown in Figure 1 may:

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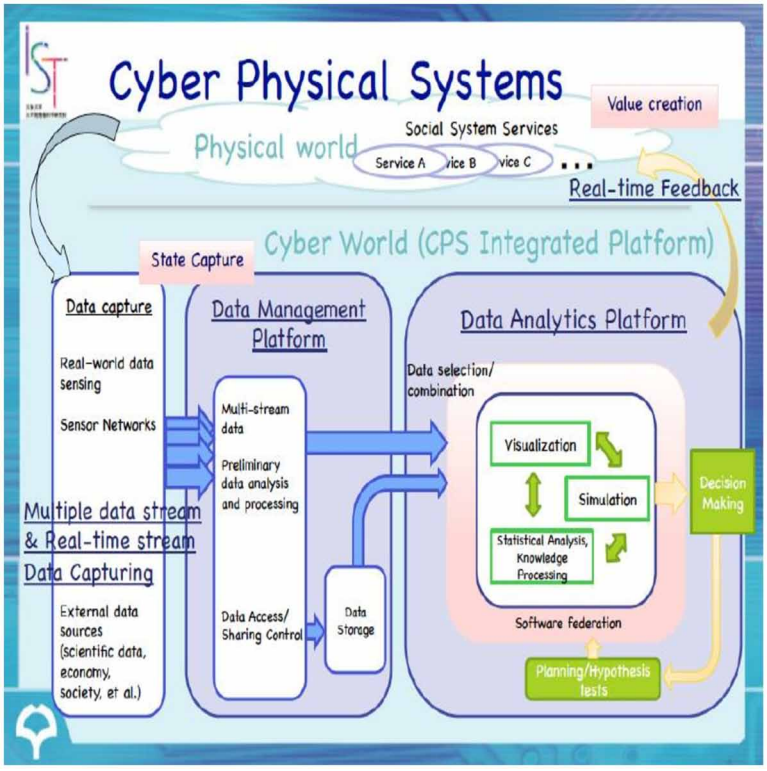
Figure 1 CPS SYSTTEM



- Monitor and control physical and hierarchical or business forms
- Be an extensive scale framework with various - and notwithstanding clashing - objectives crossing distinctive application spaces
- Require incorporation of various specialized orders and diverse application spaces
- Require a high level of constancy
- Involve generous client contribution/communication
- Continuously screen and advance its own execution
- Adapt and advance continually accordingly changes in nature, through constant (re)configuration, sending or (de)commissioning
- Require progressive choice frameworks with a high level of self-sufficiency on neighborhood, territorial, national, and worldwide dimension
- Be circulated and interconnected frameworks of frameworks

Example Application Domains

CPSs can be conveyed in a wide range of settings and application territories. Here are a few precedents:

- Improving productivity and security in homes and workplaces
- Supporting old individuals living alone.