

ICT PHD

Research project for a PhD curriculum in ICT – Computer Engineering and Science

Tutor:

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Proposed Title of the research:

Cybersecurity for Cyber-Physical systems

Keywords – (5)

Cybersecurity, Cyber-physical systems, Operational Technology, IoT, Automotive

Research objectives: – (max 10 rows)

The main goal of this research activity is to analyze and tackle cybersecurity issues associated to cyber-physical systems (CPS). Cyber-physical systems are controlled by software and communicate through heterogeneous network technologies; hence they inherit all the cybersecurity issues of typical IT systems. Moreover, a CPS can act on the surrounding physical world, hence consequences of cyberattacks are not only limited to violations of data confidentiality, integrity, and availability, as attacks can also jeopardize physical safety.

Proposed research activity – (max 10 rows)

This research activities will focus on the development of novel approaches for improving the cybersecurity of complex cyber-physical systems characterized by the interaction of a multitude of connected and “smart” components. Relevant application scenarios are: Smart Manufacturing, featuring connected machines that interoperate in production lines; modern passengers and commercial vehicles, equipped with tens of interconnected electronic control units that manage virtually all vehicle subsystems; IoT scenarios composed by several cooperating sensors, actuators, and computational nodes. All these application domains have unique safety and security constraints, which prevent the applicability of many standard security solutions that are widespread in the IT domain.

The proposed research activity will model these diverse application scenarios and devise novel approaches for guaranteeing strong authentication (possibly leveraging recent lightweight crypto algorithms and protocols), analyze the security and safety posture, detect cyber attacks and automate to the highest possible extent automatic reactions designed to bring the CPS to a “safe and secure” state.

Supporting research projects (and Department)

This project will be carried out at the Department of Engineering “Enzo Ferrari” and will be supported by research funds provided by Prof. M. Marchetti.

Possible connections with research groups, companies, universities.

The research may involve the undergoing collaborations with research groups at:

- University of Catania (Prof. Giampaolo Bella)
- University of Padova (Prof. Mauro Conti)
- CNR Pisa (Dott. Ilaria Matteucci and Dott. Giampiero Costantino)