25th International Project Week 2023
08th – 13th May 2023

Lecturer: Diego Mendez

University/Company: Pontificia Universidad Javeriana

Country: Columbia

Scientific Use of Machine Learning Mechanism on Embedded Devices

Content:
The requirement of machine learning (ML) mechanism running on the edge is an up and coming area of study in the world of the Internet of Things (IoT). However, these algorithms are complex and difficult to implement, generally speaking. Nevertheless, recent hardware advancements have made these edge devices more powerful, being capable of running the required algorithms. The deployment of these ML algorithms running on low-power devices is now known as tiny machine learning, or TinyML. By combining these increasingly powerful embedded devices with the contributions of the growing TinyML community, it is now possible to easily design, test and deploy complex ML models running directly on the edge. This course is aligned with the efforts made by the Tiny Machine Learning Open Education Initiative - TinyMLedu (http://tinyml.seas.harvard.edu) in which my institution and myself are participants.

Methods:
The course will utilize different strategies:
- Problem-based learning in order to motivate and contextualize different ML application in the world of IoT.
- Collaborative learning to motivate the exchange of ideas between the students.
- Project-based learning to identify a problem, propose and design a solution, and deploy it.

The instructor will present the fundamental concepts of the course and guide the lab sessions.

Competences and skills to be acquired:

- Fundamentals on IoT and applications.
- Introduction to sensors, embedded devices and connectivity for IoT.
- Fundamentals on machine learning algorithms.
- Success cases and examples of machine learning algorithms running on the edge.
- Fundamentals of TinyML and Edge Impulse.
- Hands-on labs running on a smartphone (motion detection).

- Hands-on labs with the Arduino Tiny Machine Learning Kit (motion detection, keyword spotting and anomaly detection)

Prerequisites:
- Programming concepts - Computer systems
- Structures and algorithms (desirable)
- Fundamentals of electric circuits (desirable)

*Part of the course and some of these requirements could be adjusted.

Language of instruction:
English