Bachelor Thesis

Title: Implementation of Cloud-based Vision System with focus on Internet of Things, Web Technology, Machine Learning and Cyber Security

USN supervisor: Hans-Petter Halvorsen, Maths Halstensen and Robert Immerstein

External partner: Grenland Biljardklubb

Task background:

This research and development project will combine and use many of the central topics learned in the IIA Master study program. You will combine topics like Internet of Things, Database Systems, Software Engineering, Web Technology, Sensor Technology and Machine Learning and issues regarding Cyber Security. You will get a wider theoretical view of many of these topics combined with practical implementation and realization.

See Figure 1 for a suggested system overview. You are relatively free to choose which parts you want to focus on, what type of technology you want to use, etc.
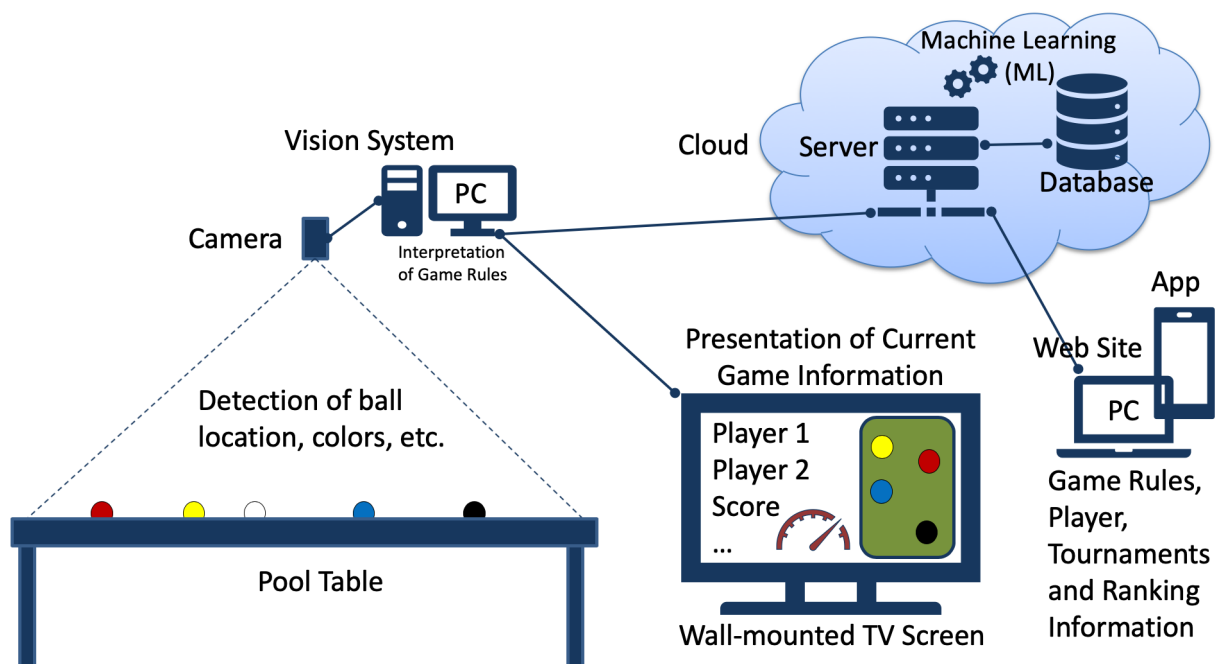

Figure 1: System Overview

Task description:

In this research and development project we will implement a prototype of a **Cloud-based** pool table computer vision competition system with focus on **IoT**, **Web** Technology, **Machine Learning (ML)**, **Cyber Security**, **Smart Sensors** and **Vision** Technology.

Suggested Project Activities

The following activities are relevant in this project:

- Give an overview of vision systems in general and implement a functional prototype that can be used to detect the positions of the balls, the colours of the balls, etc. An important part of the research and development project is to test out different hardware and software and compare the results achieved
- Vision software: Get an overview of different approach and possibilities when it comes to vision software and programming languages, such as NI Vision Development Software for LabVIEW and C#. Other alternatives may be use of Python.
- Explore different hardware used for the vision system, both different types of cameras, and different types of hardware and operating systems where the software is running, like ordinary PCs, Raspberry Pi, NUC computers, etc.
- Development of vision application prototype.
- Development of application(s) prototype(s) for management and presentation of pool games, results, player information, tournaments Information, ranking Information, etc.
- A Cloud-based Database system should also be design and implemented, e.g. using the Microsoft Azure platform.
- Get an overview of Data Security, GDPR and Cyber Security Threats for such systems. Implement some use cases regarding this.
- See how Machine Learning (ML) can extend the system and implement some use cases regarding this.
- Installation and deployment of prototype at USN and Grenland Biljardklubb

When the project starts, we can together select a proper number of tasks that should be part of this project.

Student category:

IA students

Practical arrangements:

All necessary facilities and equipment will be available at USN. A separate room at USN with all necessary equipment (including a Pool table, different Vision hardware and software, etc.) will be provided.

Signatures:

Supervisor (date and signature):

Students (date and signature):