



IIParis HPDA/PDS Master projects 2023-2024  
**Elevating Smart Environments with AI-Optimized  
IoT Infrastructure Placement**  
September 13, 2023

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## Project Description

With the rise of the Internet of Things (IoT), our urban spaces have been transforming into intelligent environments, offering services ranging from social distancing monitoring to advanced video surveillance systems. The foundation of these services is a complex array of IoT applications harnessing a plethora of devices, data exchange systems, and data processing nodes. Ensuring these systems are placed optimally for efficiency and effectiveness becomes a task of utmost importance, referred to as “IoT infrastructures planning.”

Historically, infrastructure planning has been manual, grounded in expertise and intuition, a method both time-consuming and susceptible to errors. Our initiative is geared towards leveraging artificial intelligence to refine and expedite this process, making automated, optimal decisions grounded in data. We aim to establish a universal, AI-powered methodology to design and deploy IoT systems within smart spaces, taking into account constraints ranging from budgetary considerations to Quality of Service demands. Specifically, given a set of applications to be deployed in a smart environment, the following questions must be addressed: (i) How to select the sensors and virtual sensors needed by the applications given budget and QoS constraints? (ii) How to decide in which locations sensors should be deployed given specific coverage constraints? (iii) How to decide on which processing nodes virtual sensors should be deployed?

## Project Objectives

This project is dedicated to revolutionizing the IoT infrastructure planning process through AI. Key objectives are:

- Developing domain models that enable effective selection, placement, and deployment of IoT components irrespective of their application domain.
- Defining specific sensors, virtual sensors, and their unique properties, catering to different domains. This includes understanding energy consumption, accuracy, and other inherent characteristics.
- Using AI analytics to determine both static and operational costs of these deployments, with static costs associated with device selection and QoS requirements and operational costs related to energy consumption.

## Skills & qualities

- Fluent in English
- Familiarity with data modeling
- Comprehensive understanding of IoT, network systems, and AI/ML principles.
- Robust analytical and algorithmic problem-solving skills.

## Supervisors

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