ML4IoT Implementation of different projects

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Introduction

Use Deep Learning to:

- Recognize sounds

- Classify images

Connect Devices as:

- Cloud Servers

- Sensors

- Smartphones

THE SENSORS ALLOW TO COOK
MORE EFFICIENTLY

WE CAN KEEP TRACK OF OUR
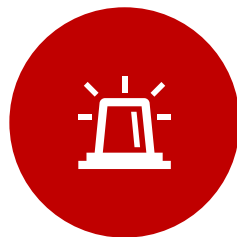NUTRITIONAL HABITS AND
TAILOR THEM IN CASE OF
NEEDS

WE CAN BE HELPED BY THE
SENSORS TO COOK BETTER

WE CAN KEEP TRACK OF OUR
WORKING ACTIVITY

WE UNDERSTAND WHEN WE
NEED A BREAKE TO PLAY
SOMETHING FUN

THE SENSORS WILL KEEP OUR
HOME SAFE WHEN WE ARE
OUT

Nutritional help

Activity tracking

Alarm systems

Sound Recognition

Train and tailor DL architecture. Then push them on the edge applying state of the art techniques as post training quantization and structured/sparse pruning
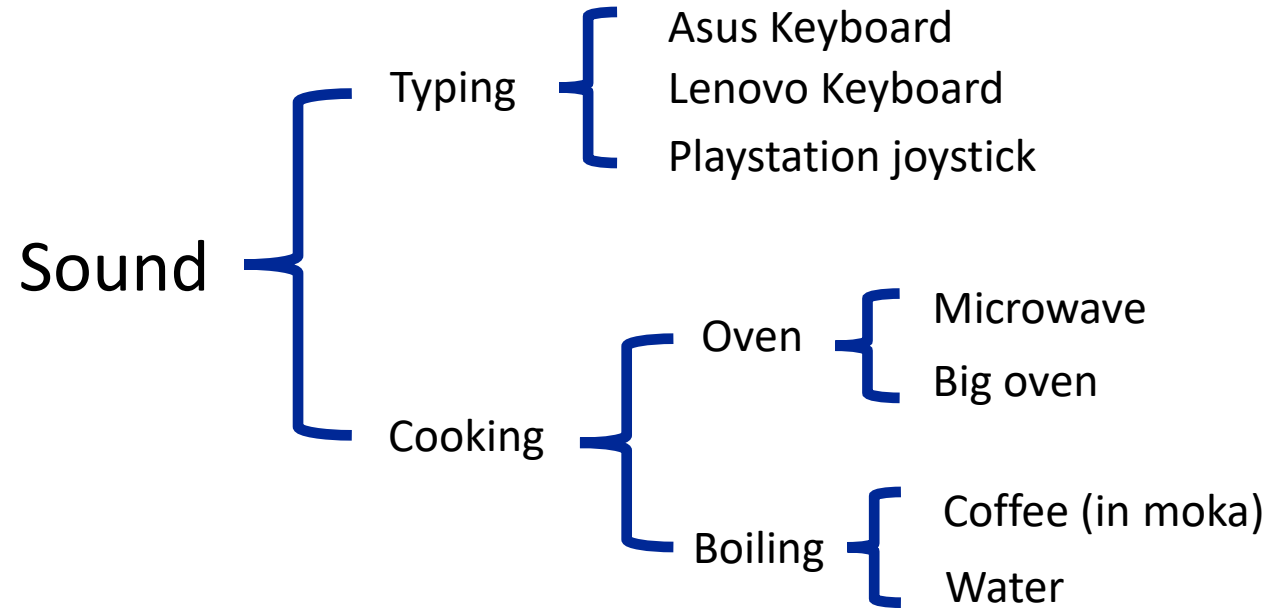
Image Classification

Sound
- Typing
  - Asus Keyboard
  - Lenovo Keyboard
  - Playstation joystick
- Cooking
  - Oven
    - Microwave
    - Big oven
  - Boiling
    - Coffee (in moka)
    - Water

Image
- Food
  - Fruit
    - Banana
    - Apple
    - Orange
  - Pasta
    - Spaghetti
    - Penne
    - Conchiglie
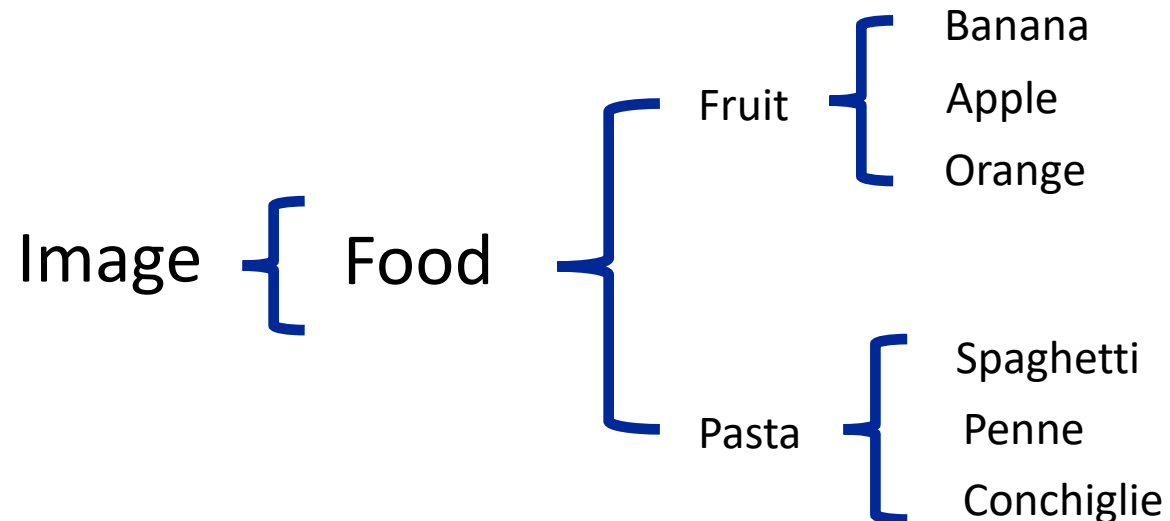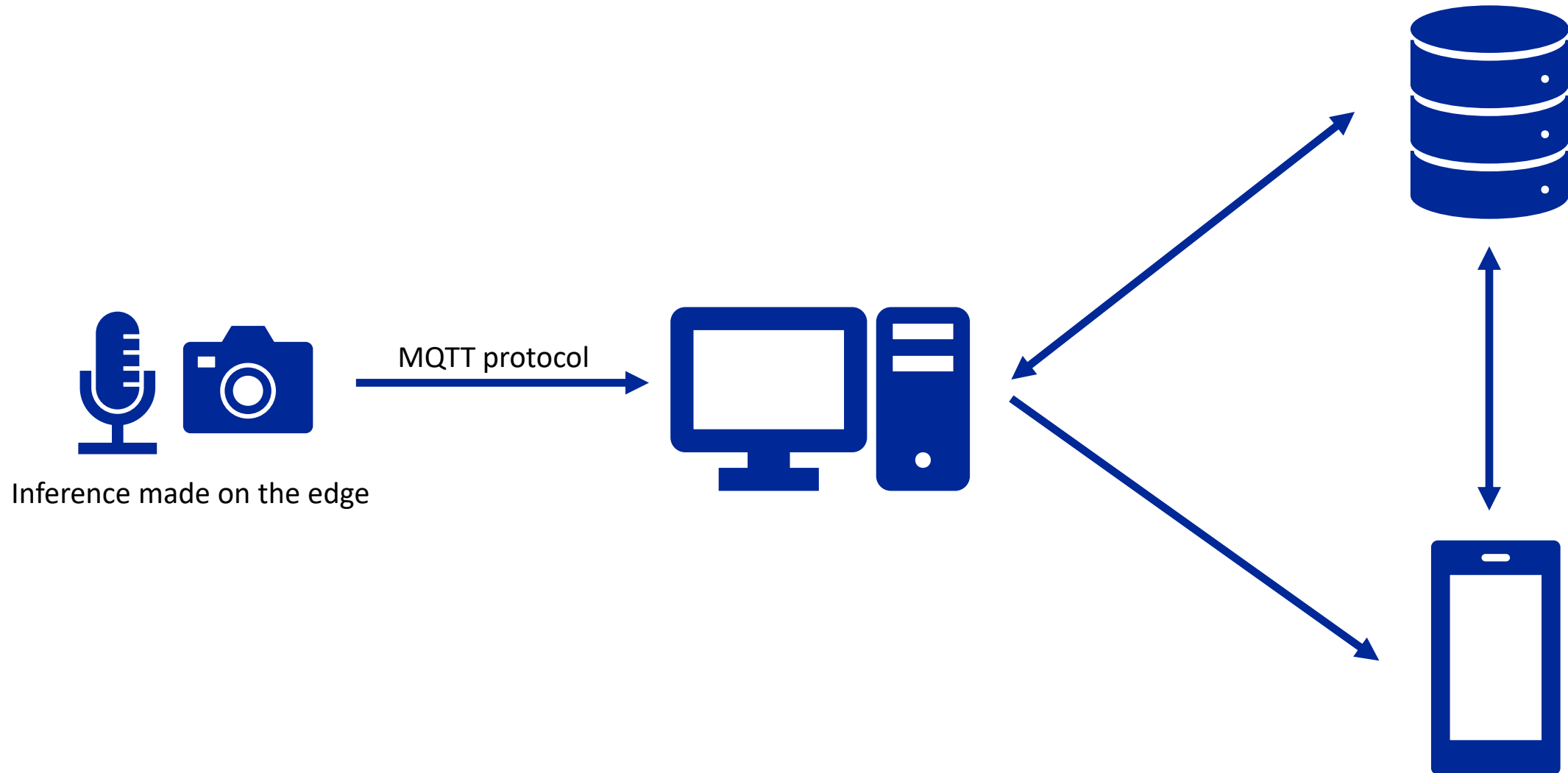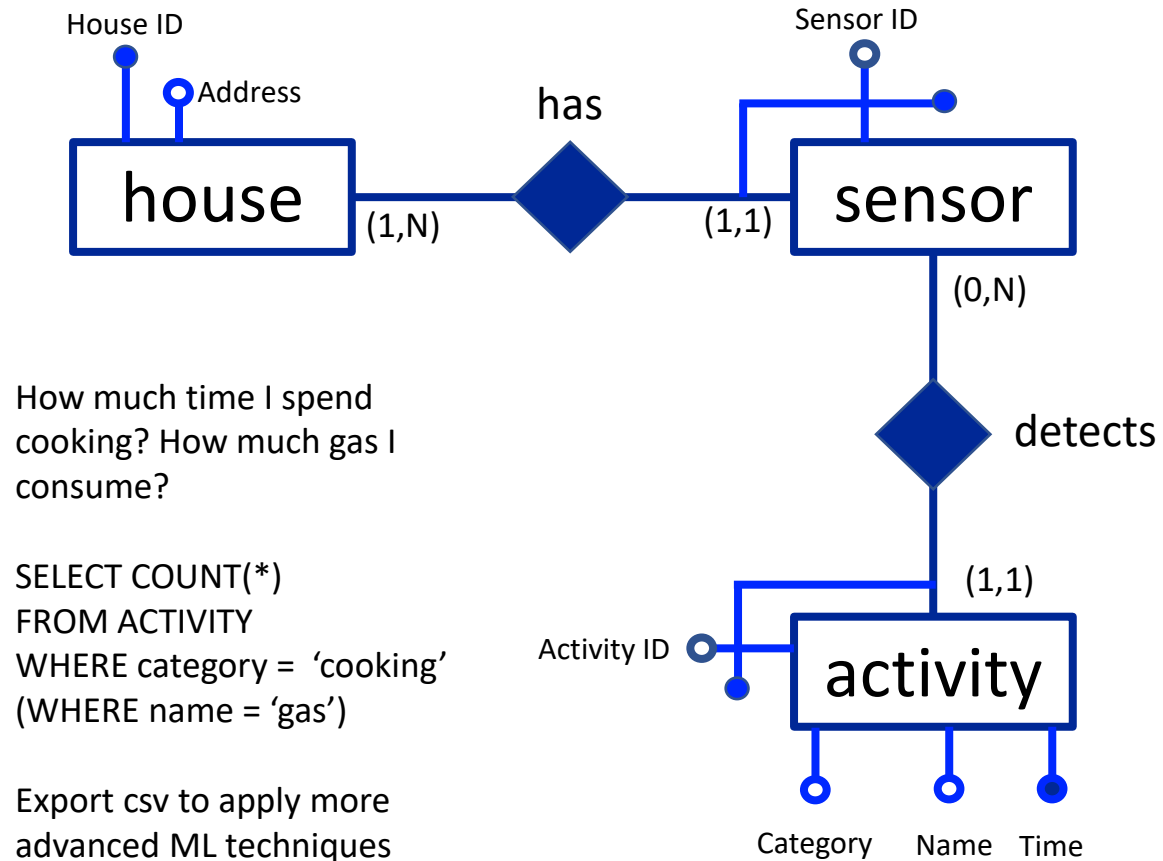
System interaction between sensors, servers and smartphone

To store data and perform analysis a DBMS is created

House ID

Address

has

Sensor ID

house (1,N) ◆ (1,1) **sensor**

(0,N)

How much time I spend cooking? How much gas I consume?

SELECT COUNT(*)
FROM ACTIVITY
WHERE category = 'cooking'
(WHERE name = 'gas')

Export csv to apply more advanced ML techniques

◆ detects

(1,1)

Activity ID

activity

Category   Name   Time

| aid	name	category	time	sid	hid
2111	microwave_oven	cooking	1640877987	1	1
2112	microwave_oven	cooking	1640877990	1	1
2113	microwave_oven	cooking	1640877992	1	1
2114	microwave_oven	cooking	1640877996	1	1
2115	silence_kitchen	NULL	1640877998	1	1
2116	silence_kitchen	NULL	1640878001	1	1
2117	silence_kitchen	NULL	1640878004	1	1
2118	silence_kitchen	NULL	1640878006	1	1
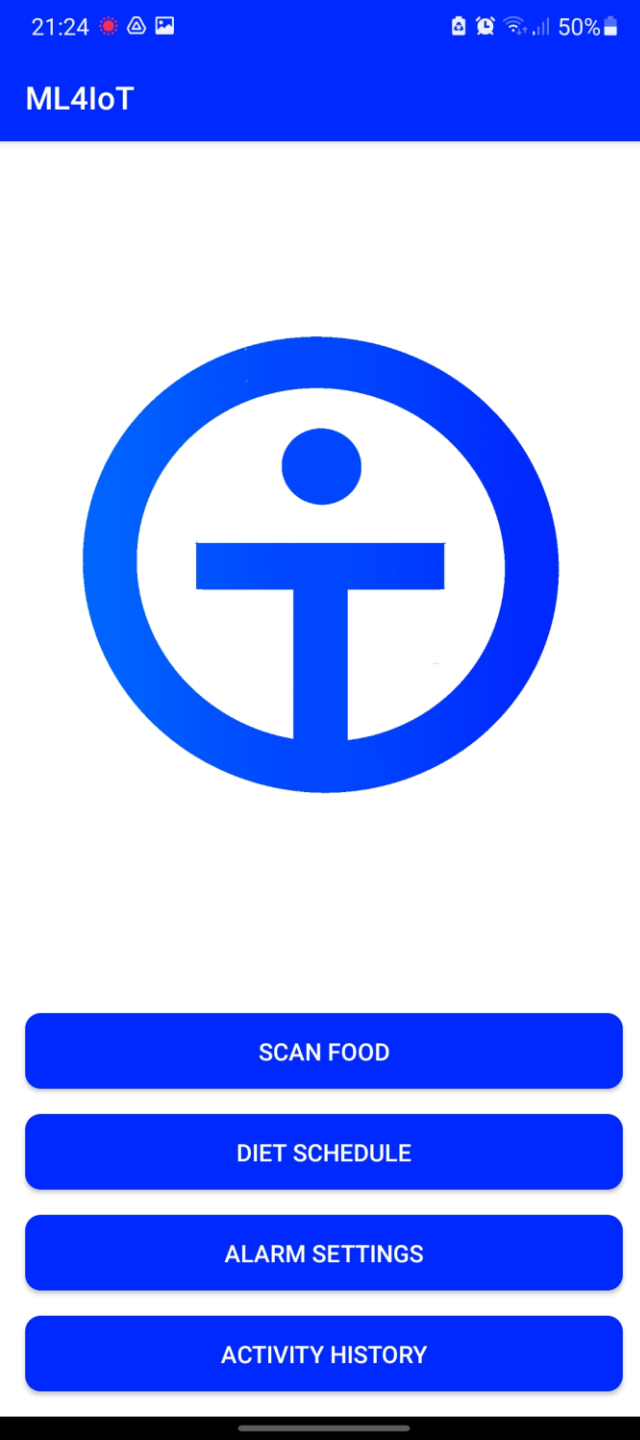
User experience is the core of our business

Mobile Application

The app makes the system user friendly. The customers can easily keep track of their activity
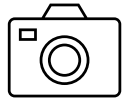
Notification System

The notification alerting feature makes the application quickly interact with the user in case of need
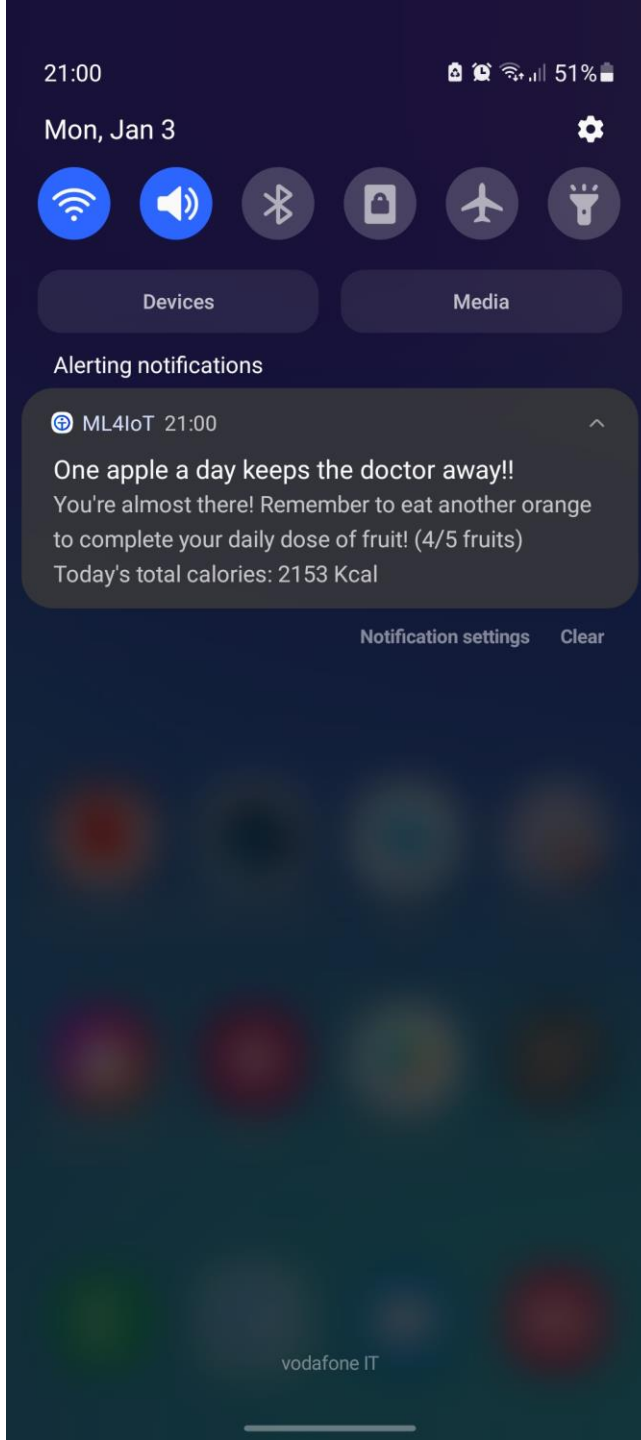
Example of enhanced cooking

The microphone monitors the state of the water and as soon as the water is boiling a notification is sent to the user.

The camera sees the type of pasta and consequently how much time it should cook. After the correct cooking time is ended, a notification is sent to the user.

Penne 9 min.

Conchiglie 8 min.

silence
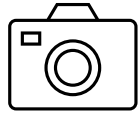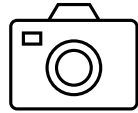
gas

boiling water *

boiling water

READY TO EAT! *

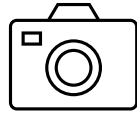* = a notification is sent to the user
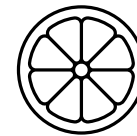
Example of food schedule and alerting

Apple, 08:30
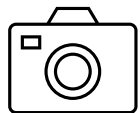
Banana, 10:30

Apple, 13:30

Orange, 17:30

H 21:00 and 4/5 fruits.

Notification:
You are almost there! Eat just another orange to reach the optimal daily dose of fruit.

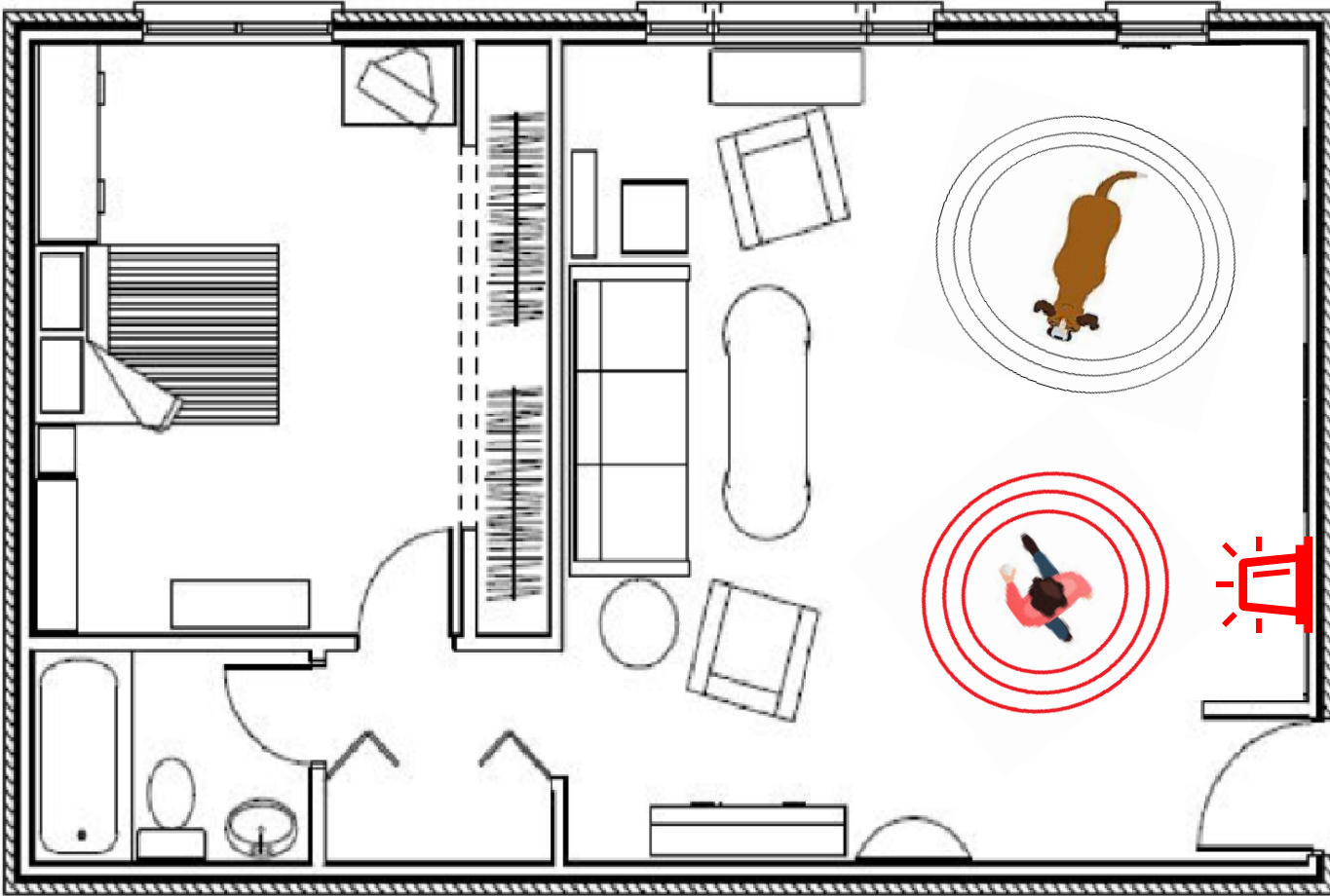Apple, 09:05

Banana, 09:10

Apple, 09:15

Apple, 09:20

H 09:15:01.

Notification Warning.
Do not eat other fruits, your level of glucose could exceed the safe threshold.
Or: need another dose of insulin.

During a working day, you can turn on the alarm and the microphone will detect the sounds of the dogs as normal.

Instead, the walking noise of a thief/intruder and sounds like closing and opening doors will be identified as anomalies and the system will immediately send a notification to the user or directly to the competent authority.

Thank you for your attention