

# **Cloud Computing** **Edge Computing Solution For The Automatic Detection Of Pets**

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Khalid Butt, Ramses Ntsinda Nde, Bernard Wenigenrath, Sebastian Wagner, Saman Solimany

## AGENDA

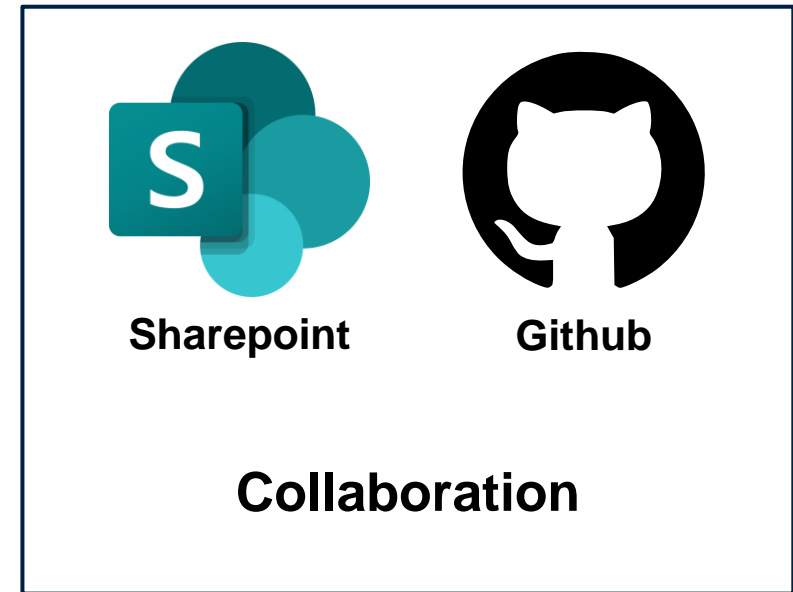
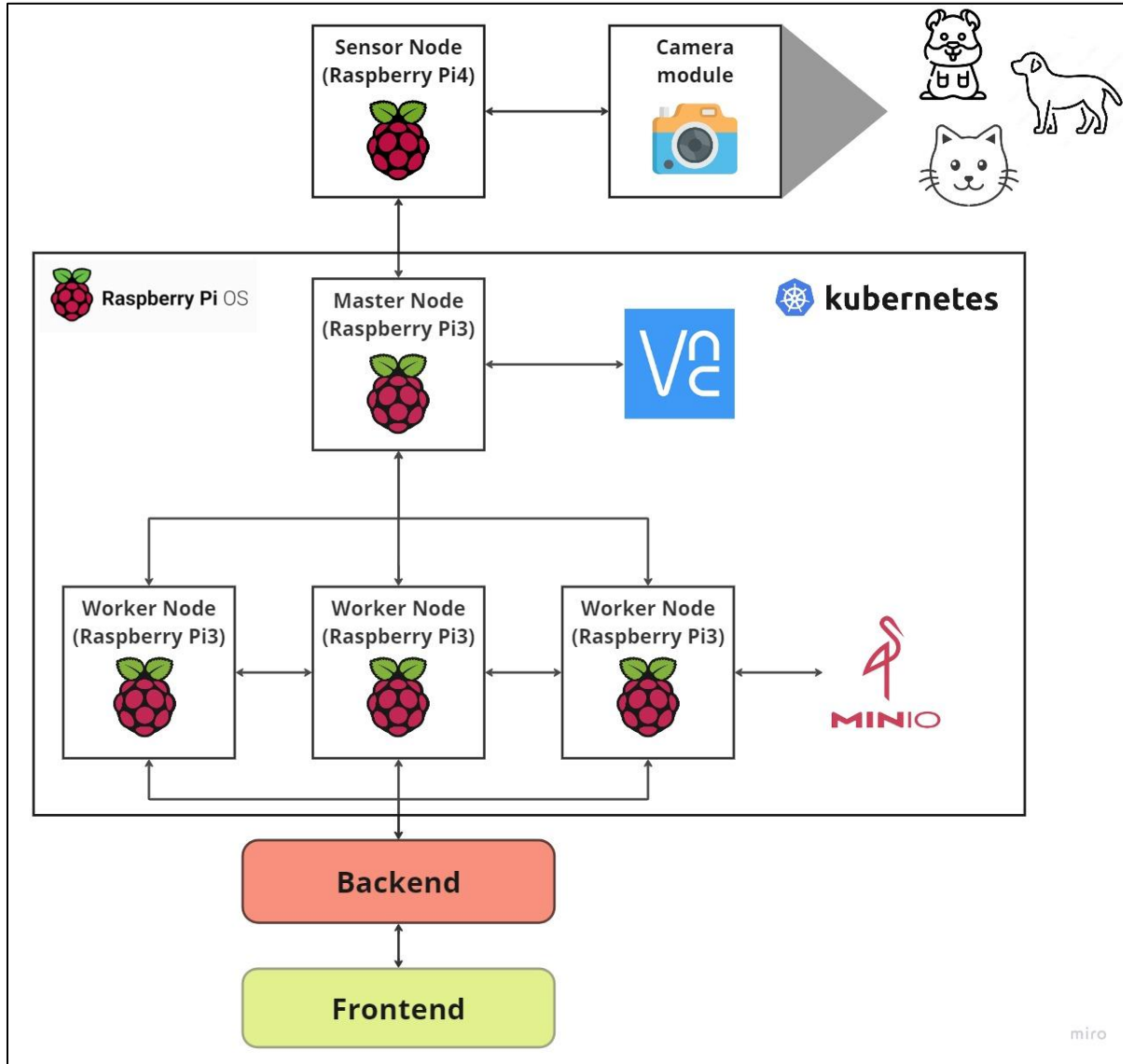
Introduction

Project presentation

DEMO

Challenges & Lessons Learned

# Architecture of the project



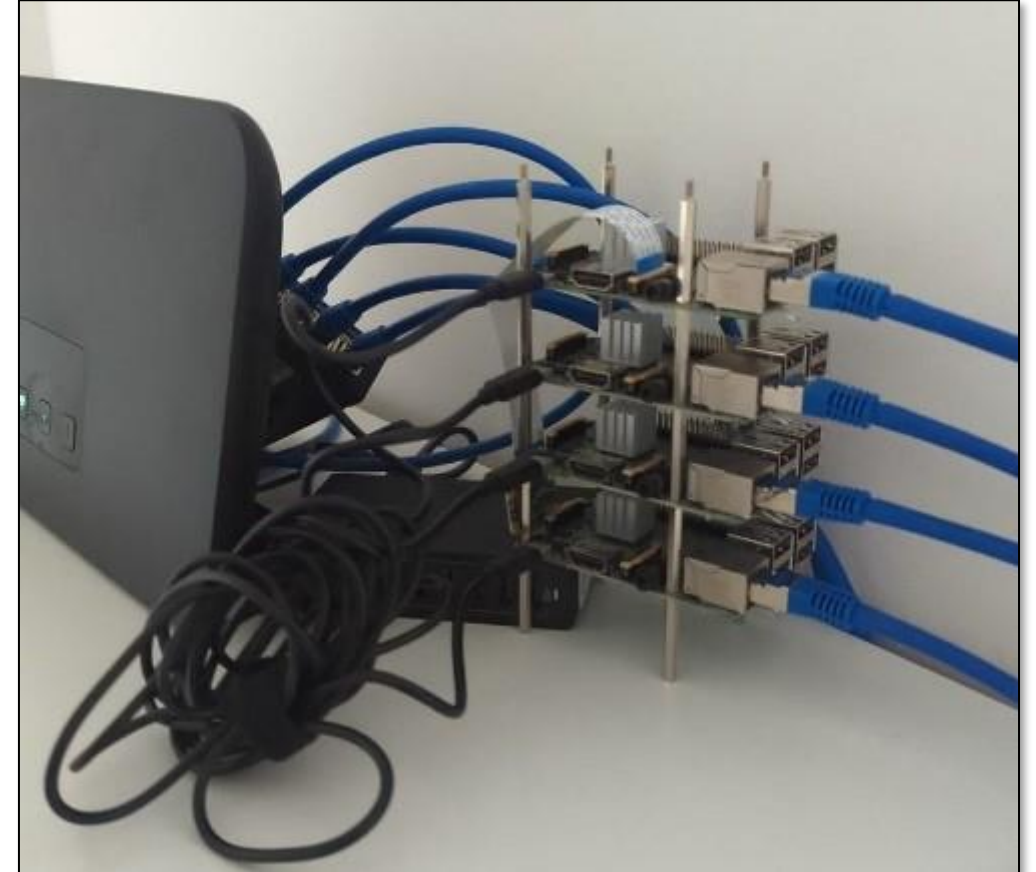
Physical setup of the **hardware** (wiring, switch etc.)

Installing the **operating system**

- Raspberry Pi 3 (Raspberry Debian 64 Bit without desktop)
- Raspberry Pi 4 (Raspberry Debian 64 Bit with Desktop)

Activation of **SSH & VNC** so that Terminal can be executed via console + Remote Control via VNC

- Setting up Static IP addresses




```
gruppe6@master: ~  
gruppe6@master:~ $ sudo k3s kubectl get nodes  
NAME          STATUS    ROLES          AGE    VERSION  
master        Ready    control-plane,master  64d    v1.26.4+k3s1  
node2         Ready    <none>         64d    v1.26.4+k3s1  
node3         Ready    <none>         64d    v1.26.4+k3s1  
node1         Ready    <none>         64d    v1.26.4+k3s1  
gruppe6@master:~ $ █
```

- Remote access via Putty

```
gruppe6@master: ~  
gruppe6@master:~ $ sudo k3s kubectl get nodes  
NAME          STATUS    ROLES          AGE    VERSION  
master        Ready    control-plane,master    64d    v1.26.4+k3s1  
node2         Ready    <none>         64d    v1.26.4+k3s1  
node3         Ready    <none>         64d    v1.26.4+k3s1  
node1         Ready    <none>         64d    v1.26.4+k3s1  
gruppe6@master:~ $ sudo kubectl get pods -n minio-dev  
NAME        READY   STATUS    RESTARTS   AGE  
minio       1/1     Running   7 (5m32s ago)    64d  
gruppe6@master:~ $ █
```

- Installation was based on the official documentation
- Deploying of the YAML-file on the cluster

← → ↻ ⚠ Nicht sicher | 192.168.178.66:9090/browser



**OBJECT STORE**  
AGPL LICENSE

User

- Object Browser
- Access Keys
- Documentation

Administrator

- Buckets
- Policies
- Identity
- Monitoring
- Events
- Tiering
- Site Replication
- Settings

Subscription

- License

### Object Browser

Filter Buckets

| Name           | Objects | Size      | Access |
|----------------|---------|-----------|--------|
| cloudcomputing | 0       | 0.0 B     | R/W    |
| detections     | 5       | 321.1 KiB | R/W    |



**roboflow**

Gather annotated  
images



python

Format labels



Train YoloV5



### Confusion Matrix

|        |                | Predicted      |            |            |
|--------|----------------|----------------|------------|------------|
|        |                | Golden Hamster | Dog        | Cat        |
| Actual | Golden Hamster | <b>93%</b>     | 0          | 1%         |
|        | Dog            | -              | <b>72%</b> | 0          |
|        | Cat            | 1%             | 6%         | <b>58%</b> |

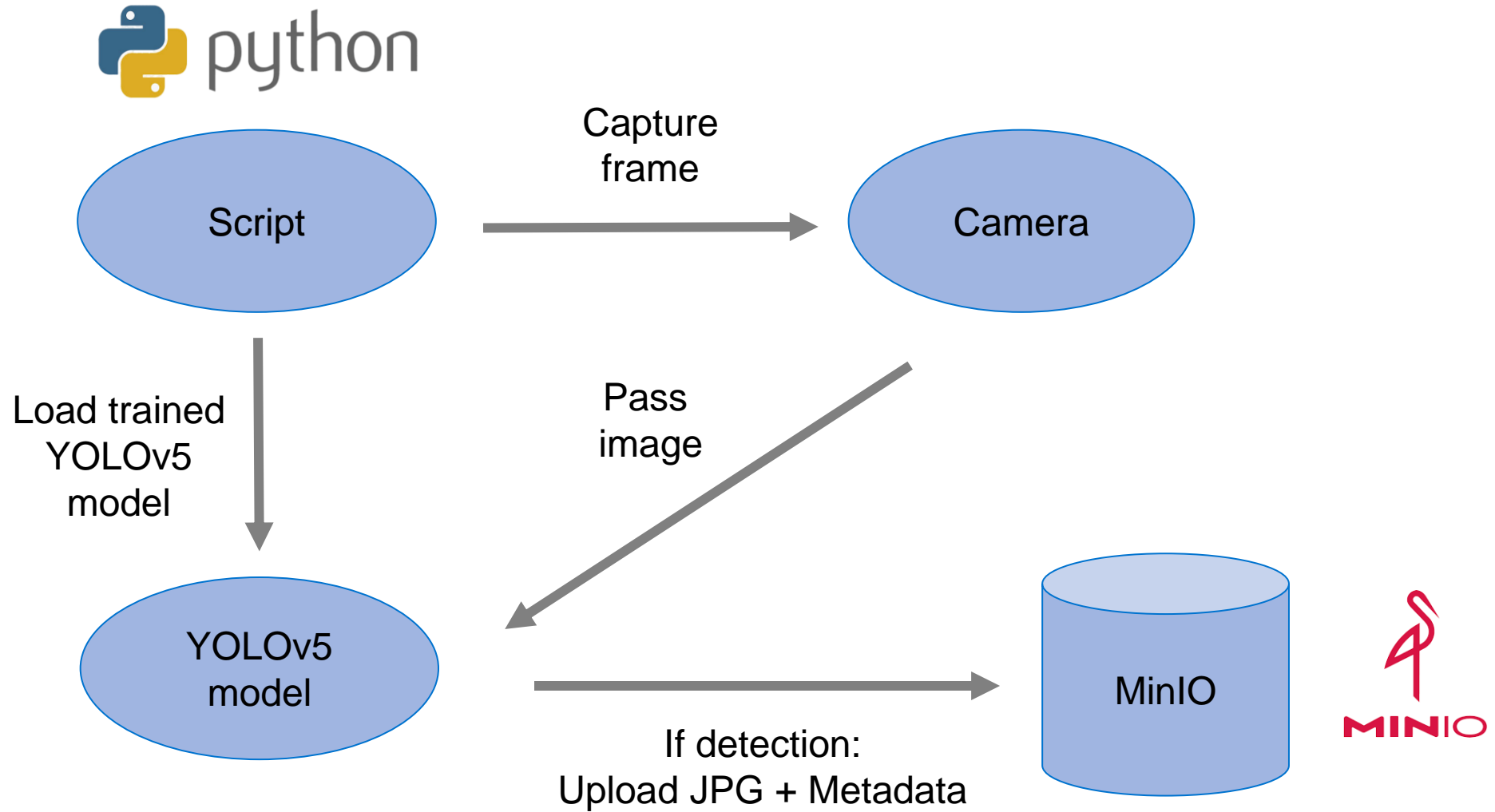
**Imbalance due to unevenly distributed images**

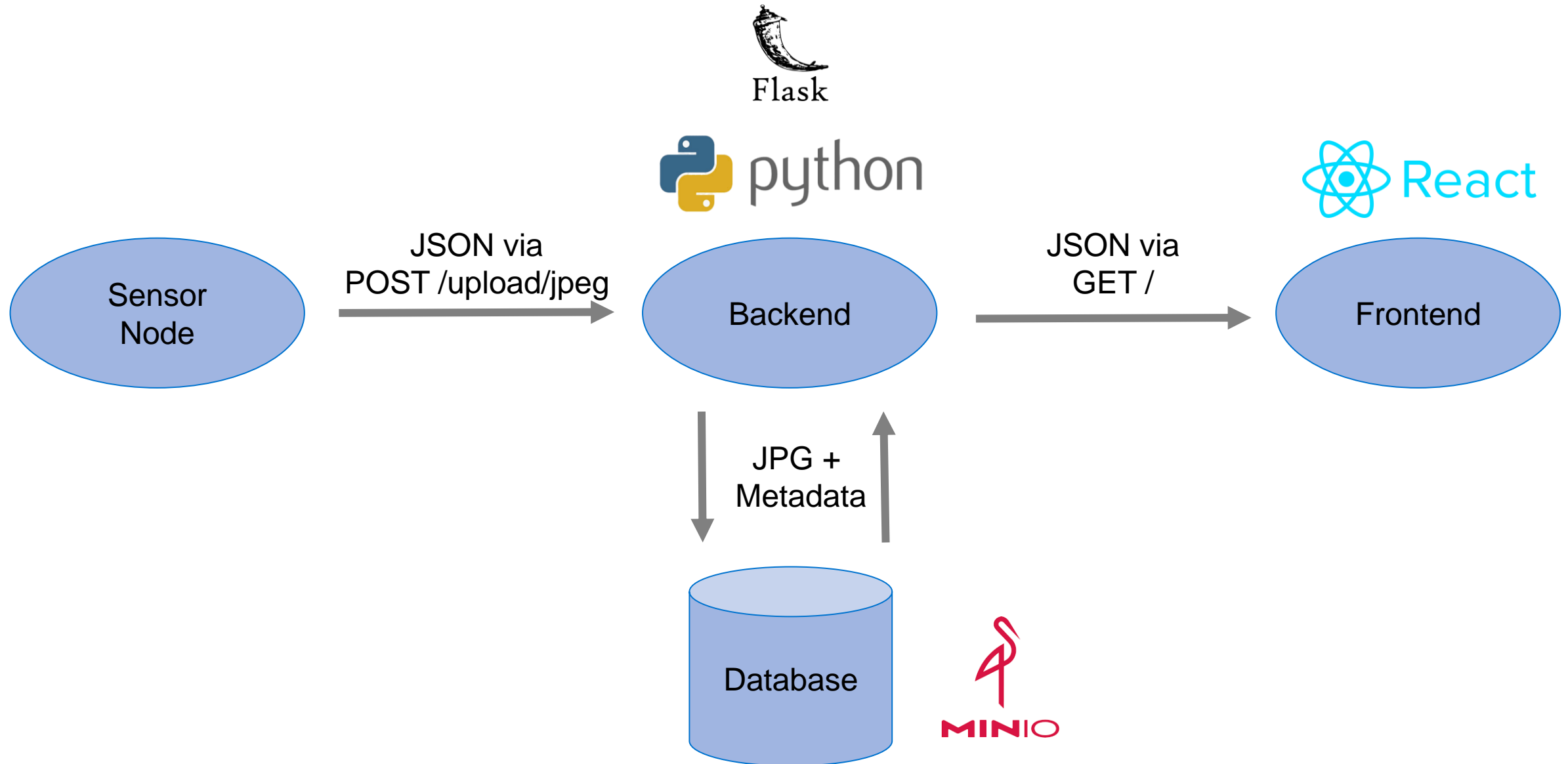
Golden Hamster: ~ 1000

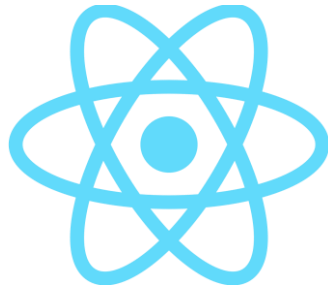
Cat: ~400

Dog: ~150

# Architecture of the sensor node







**React**





**Vite.js**

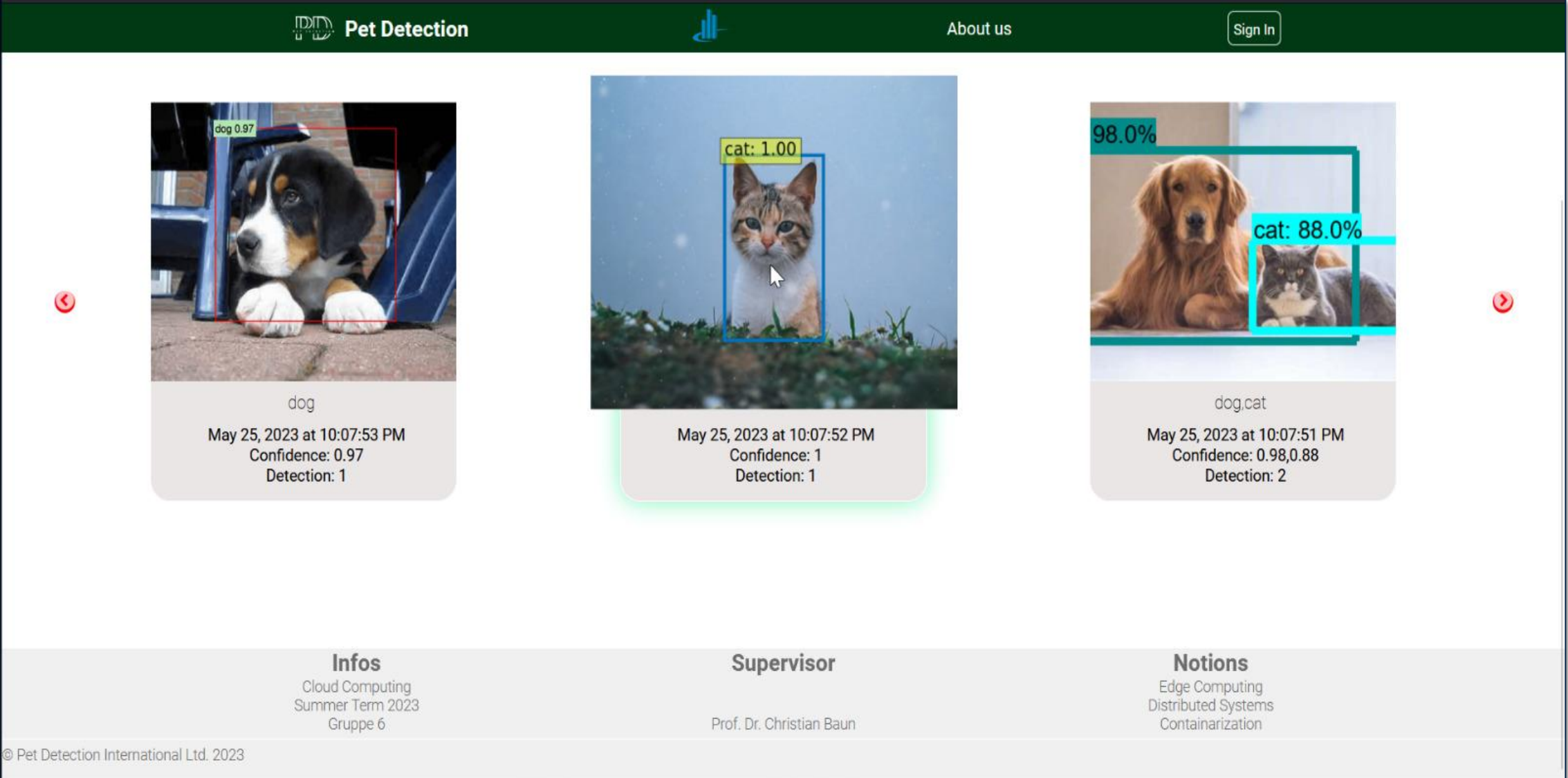


**Docker**




**REST API**

 **Pet Detection**  [About us](#) [Sign In](#)




The screenshot displays the Pet Detection application interface. At the top, there is a dark green header with the 'Pet Detection' logo, a bar chart icon, and navigation links for 'About us' and 'Sign In'. Below the header, three pet detection results are shown in a row, separated by red circular arrows. Each result consists of a photo of a pet with a bounding box and a confidence score, and a metadata box below it. The first result shows a dog with a confidence of 0.97. The second result shows a cat with a confidence of 1.00. The third result shows a dog and a cat together, with a confidence of 98.0% and a detection count of 2. At the bottom of the interface, there are three columns: 'Infos' (Cloud Computing, Summer Term 2023, Gruppe 6), 'Supervisor' (Prof. Dr. Christian Baun), and 'Notions' (Edge Computing, Distributed Systems, Containerization). A copyright notice '© Pet Detection International Ltd. 2023' is located at the bottom left.

**dog 0.97**



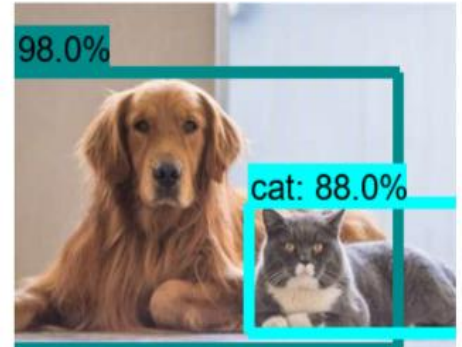
dog  
May 25, 2023 at 10:07:53 PM  
Confidence: 0.97  
Detection: 1

**cat: 1.00**



May 25, 2023 at 10:07:52 PM  
Confidence: 1  
Detection: 1

**98.0%**



**cat: 88.0%**

dog,cat  
May 25, 2023 at 10:07:51 PM  
Confidence: 0.98,0.88  
Detection: 2

**Infos**  
Cloud Computing  
Summer Term 2023  
Gruppe 6

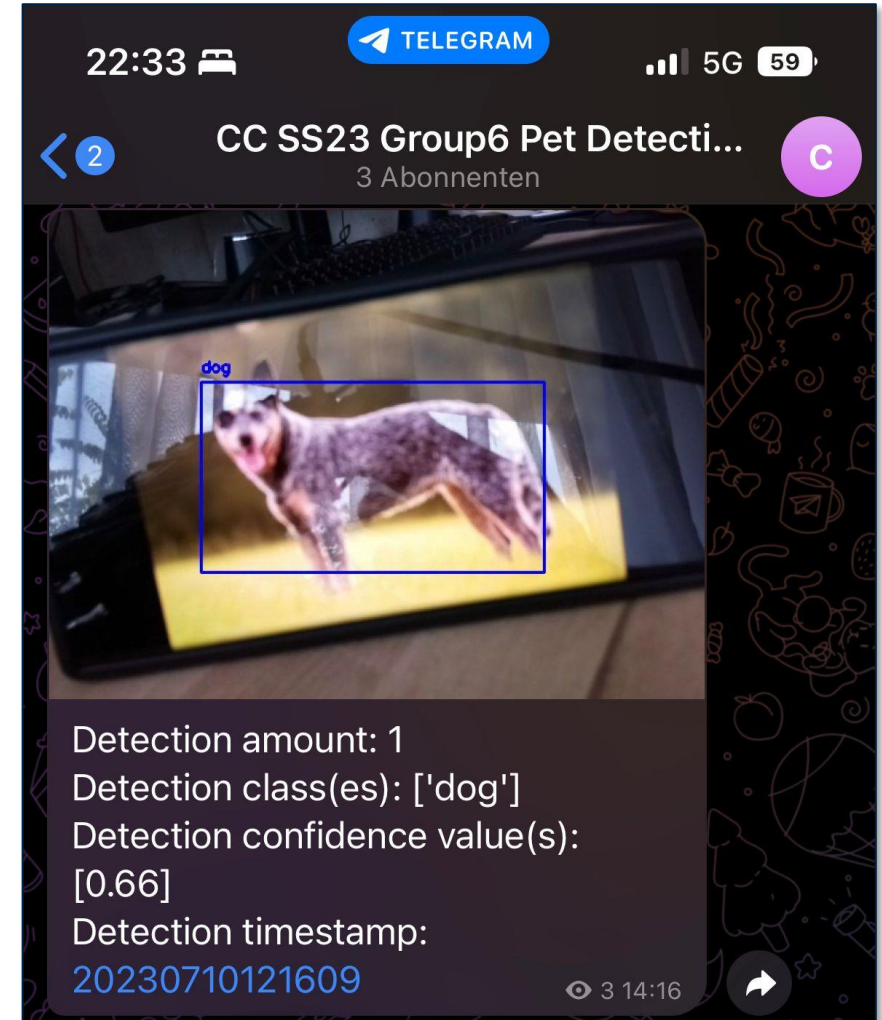
**Supervisor**  
Prof. Dr. Christian Baun

**Notions**  
Edge Computing  
Distributed Systems  
Containerization

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Telegram Bot



**DEMO**  
**(Recording)**

## Challenges & Lessons Learned

- Setting up the hardware
- That only one person has the hardware
- Hardware performance issues
- ChatGPT is not always the best solution
- Portability from the development environment to the production environment (requirements & dependencies)



Thank you for your attention.