

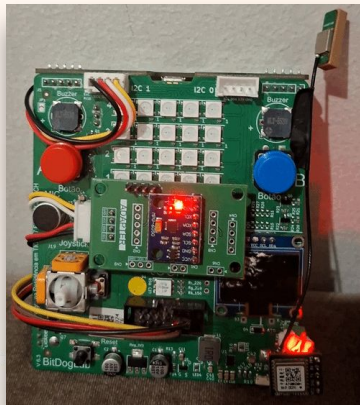
Idoso Seguro

Luana Menezes
Vinicius Caffeu

Embarcatech - Campinas
2025

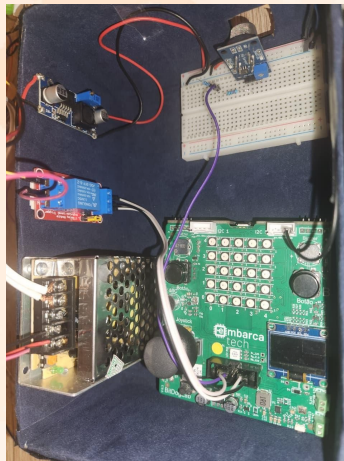


Introdução



Dispositivo Corporal

Detecção de Queda e Botão de Emergência com Localização



Dispositivo Domiciliar

Detecção de vazamento de gases



Cuidado Automatizado



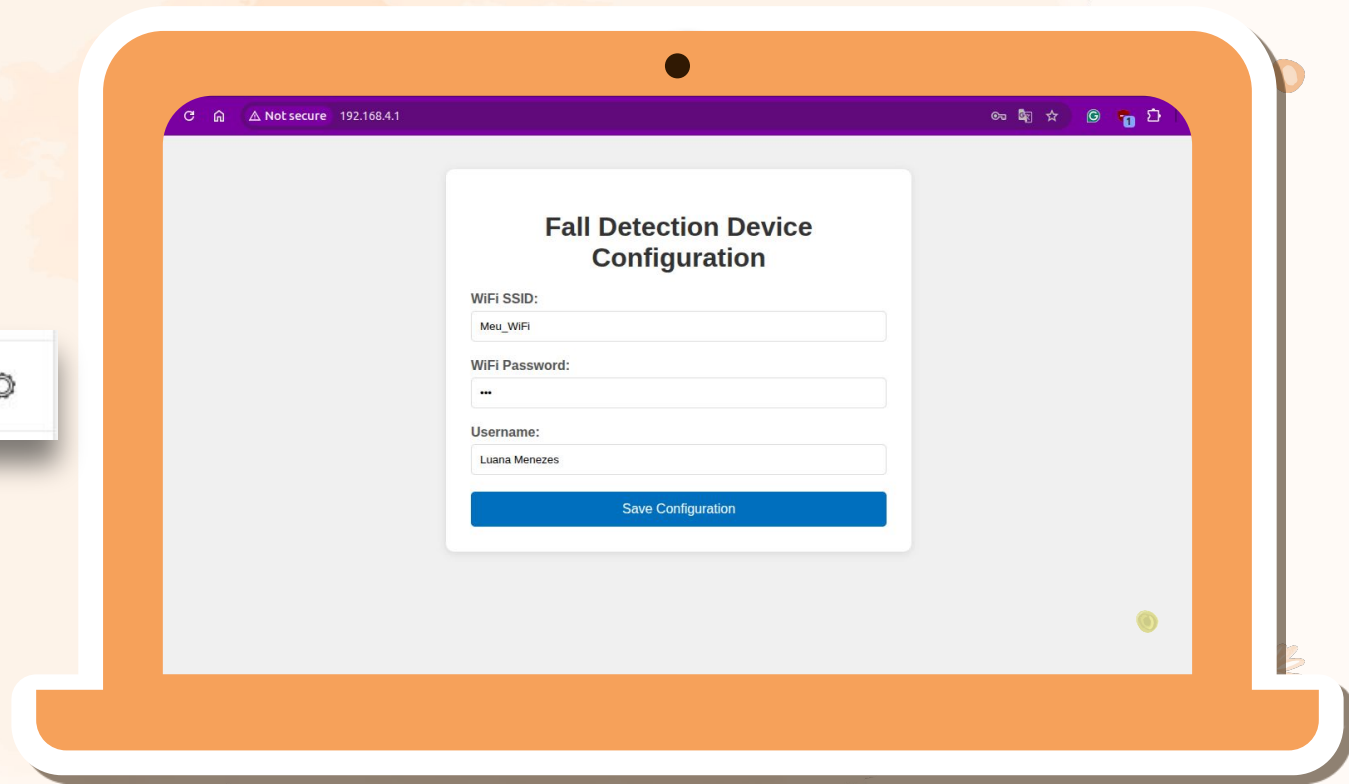
01

Dispositivo Corporal

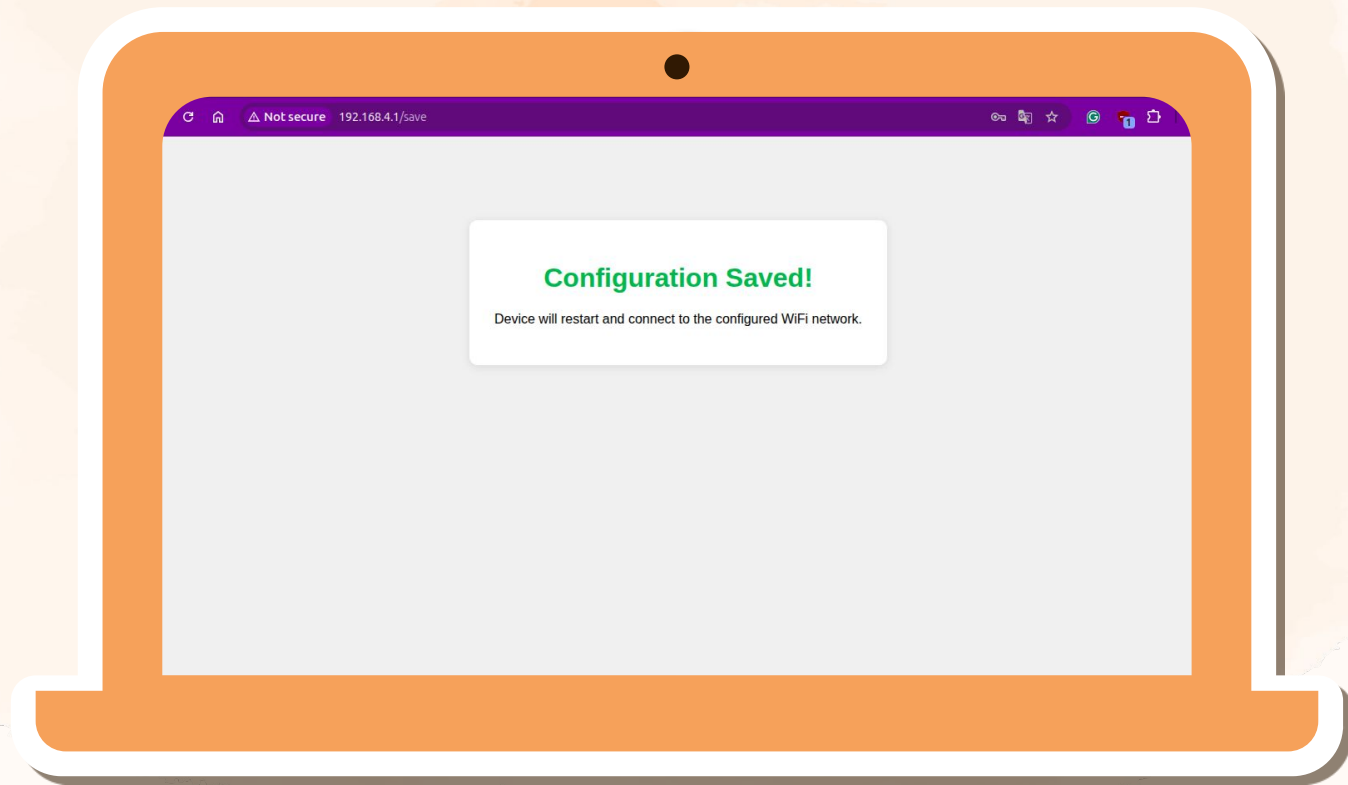
Detecção de Queda e Botão de Emergência
com Localização



Web Server de Configuração



Web Server de Configuração



Machine Learning: Dataset

Activities of Daily Living (ADL):

Code	Activity	Trials	Duration
D01	Walking slowly	1	100s
D02	Walking quickly	1	100s
D03	Jogging slowly	1	100s
D04	Jogging quickly	1	100s
D05	Walking upstairs and downstairs slowly	5	25s
D06	Walking upstairs and downstairs quickly	5	25s
D07	Slowly sit in a half height chair, wait a moment, and up slowly	5	12s
D08	Quickly sit in a half height chair, wait a moment, and up quickly	5	12s
D09	Slowly sit in a low height chair, wait a moment, and up slowly	5	12s

Falls:

Code	Activity	Trials	Duration
F01	Fall forward while walking caused by a slip	5	15s
F02	Fall backward while walking caused by a slip	5	15s
F03	Lateral fall while walking caused by a slip	5	15s
F04	Fall forward while walking caused by a trip	5	15s
F05	Fall forward while jogging caused by a trip	5	15s
F06	Vertical fall while walking caused by fainting	5	15s
F07	Fall while walking, with use of hands in a table to dampen fall, caused by fainting	5	15s
F08	Fall forward when trying to get up	5	15s
F09	Lateral fall when trying to get up	5	15s
F10	Fall forward when trying to sit down	5	15s
F11	Fall backward when trying to sit down	5	15s
F12	Lateral fall when trying to sit down	5	15s
F13	Fall forward while sitting, caused by fainting or falling asleep	5	15s
F14	Fall backward while sitting, caused by fainting or falling asleep	5	15s
F15	Lateral fall while sitting, caused by fainting or falling asleep	5	15s

SA: Adults subjects between 19 and 30 years old
SE: Elderly people between 60 and 75 years old

Open D01_SA01_R01.txt
~\Document... ataset\SA01

```

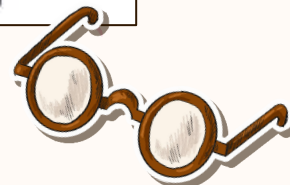
17,-179, -99, -18,-504,-352, 76,-697,-279;
15,-174, -90, -53,-568,-306, 48,-675,-254;
1,-176, -81, -84,-613,-271, -2,-668,-221;
-10,-180, -77,-104,-647,-227, -34,-697,-175;
-21,-191, -741,-133;
-37,-225, -840,-103;
36,243, 948,75.

```

ADXL345:
Resolution: 13 bits
Range: +-16g

ITG3200
Resolution: 16 bits
Range: +-2000°/s

MMA8451Q:
Resolution: 14 bits
Range: +-8g



Machine Learning: Plataforma



EDGE IMPULSE



Model

Model version: ?

Quantized (int8) ▾

Last training performance (validation set)



ACCURACY

91.1%



LOSS

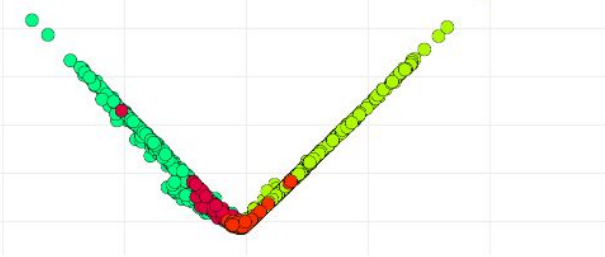
0.34

Confusion matrix (validation set)

	DAILY	FALL
DAILY	91.0%	9.0%
FALL	8.7%	91.3%
F1 SCORE	0.93	0.88

Data explorer (full training set) ?

- Daily - correct
- Fall - correct
- Daily - incorrect
- Fall - incorrect



On-device performance ?

Engine: ?

EON™ Compiler ▾



INFERENCE...

3 ms.



PEAK RAM ...

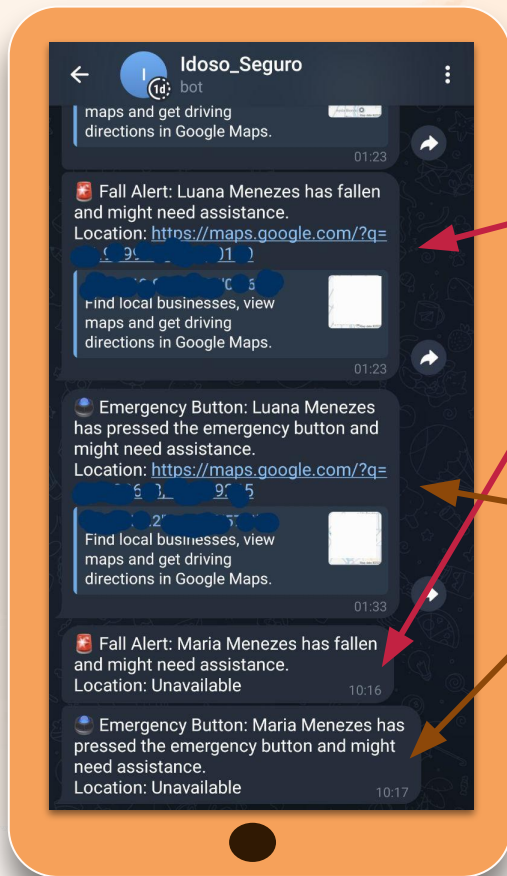
3.1K



FLASH US...

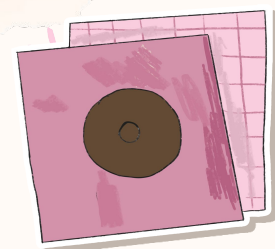
74.3K

Notificação por telegram



Notificação de queda: com localização GPS ou Indisponível

Notificação de botão de emergência: com localização GPS ou Indisponível



Watchdog Task e Estados LED

free **RTOS**

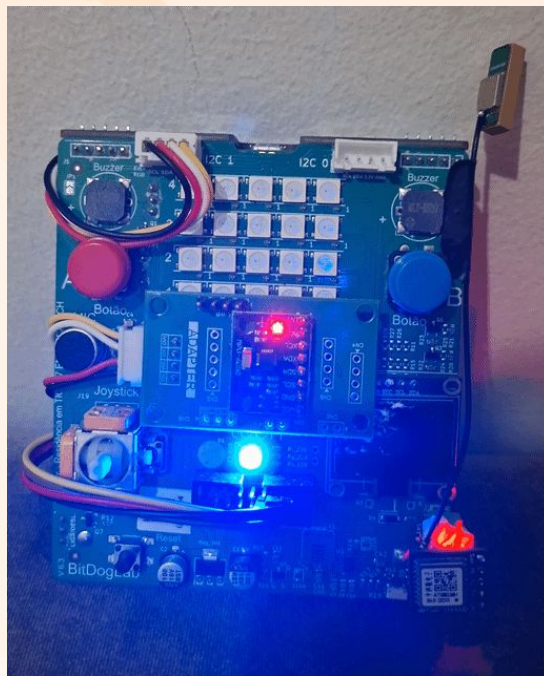
 **WatchdogMonitor**
 **LEDStatus**
 **WiFilnit**

 **ReadAccelGyro**
 **FallDetection**
 **GPSLocation**

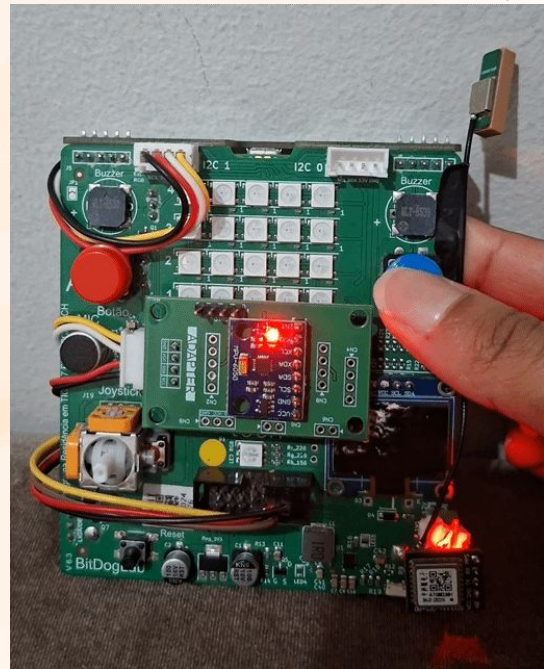
 **EmergencyButton**
 **Buzzer**

 **Network**
 **ConfigWebServer**

Modo Normal



Modo Config



02

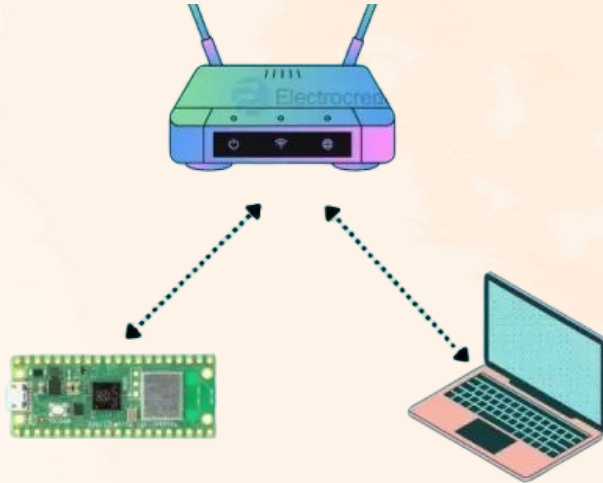
Dispositivo Domiciliar

Detecção de vazamento de gases

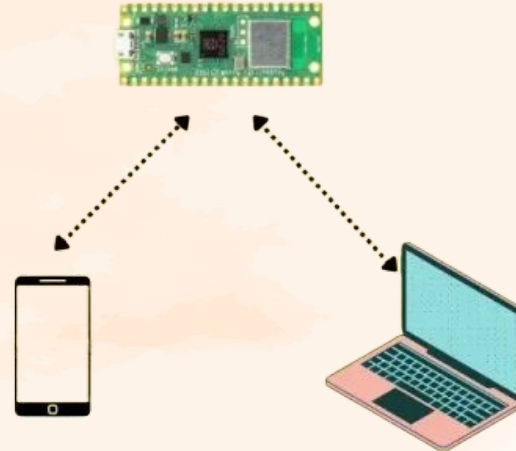


Configuração vs. Operação

STATION MODE (STA)



ACCESS POINT MODE (AP)





AP

X

STA

- Ativado se nenhuma configuração for encontrada na memória flash.

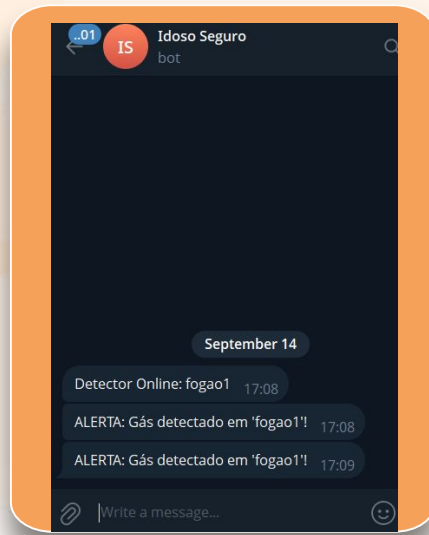
- PicoW cria a rede *"PicoGasSetup"*

- Acesso à página web no IP fixo 192.168.4.1

Ativado após a configuração ser salva com sucesso na Flash

cyw43_arch_wifi_connect_timeout_ms():
conectar ao Wi-Fi local, usando as credenciais da Flash.

The image shows a web browser interface for configuring a Pico Gas device. The title is "Configuração Pico Gas". There are three input fields: "Nome do WiFi (SSID)", "Senha do WiFi", and "ID do Dispositivo". Below these fields is a blue button labeled "Salvar e Reiniciar".



FREE RTOS



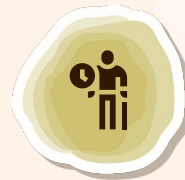
setup_mode_task

Inicialização do modo de configuração (AP, DHCP, Servidor Web)



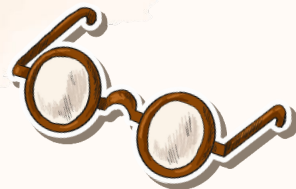
gas_sensor_task

Tarefa de baixa prioridade dedicada ao hardware (ler sensor, controlar relé e buzzer).



mongoose_task

Tarefa de alta, gerencia a conexão Wi-Fi e aguarda eventos da gas_sensor_task para enviar notificações ao Telegram.



Hardware e Lógica "Fail-Safe"

SENSOR DE GÁS MQ-02

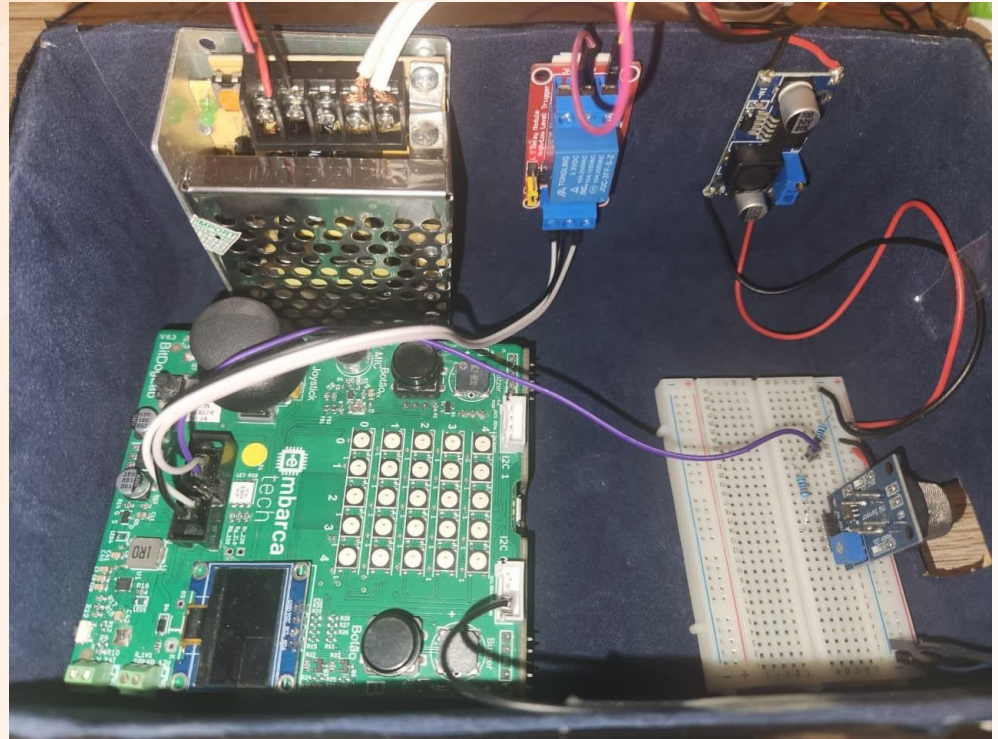
- Saída digital (ajuste via trimpot)
- Nível baixo ao detectar gases
- Divisor de tensão

RELÉ E SOLENÓIDE

- Solenóide tipo NF
- Conectada ao NA do relé
- Lógica "Fail-Active"

BUZZER PASSIVO

- Configurado via PWM



Próximos passos:

Versão final

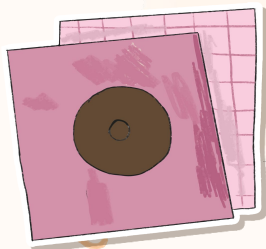
Chegar a um produto final dos MVP's apresentados

Mapeamento

Mapear as dificuldades tanto dos **idosos** quanto dos familiares, seja em casa ou em casas de repouso.

Ecosistema “Idoso Seguro”

A partir do passo anterior, adicionar **novos dispositivos IoT** capazes de proporcionar **bem-estar e segurança** para o **idoso** e para **pessoas próximas**.



Obrigado!

