Workshop on TinyML for Sustainable Development

No name, yet

Help me :)

Moises M.

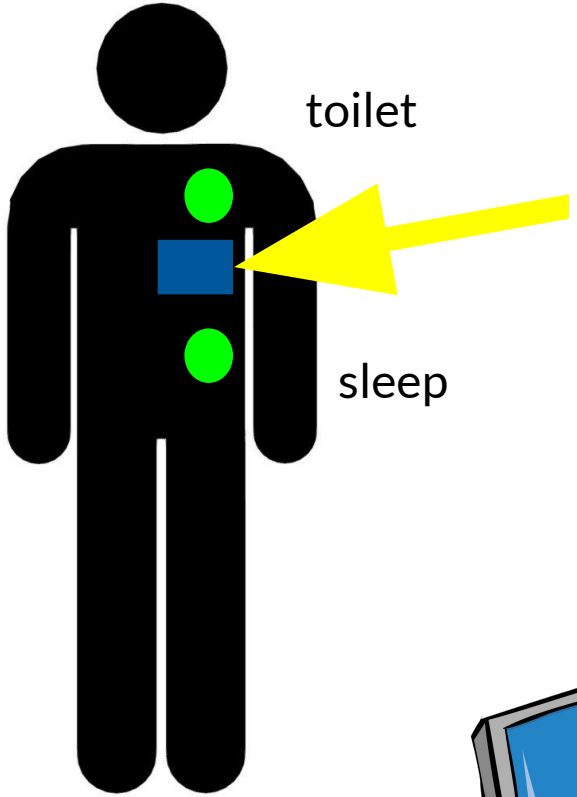
Exercise

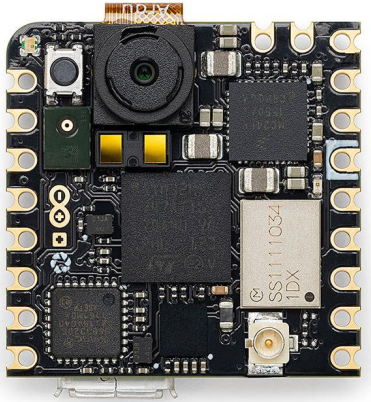
I want to do an experiment for 2 minutes, please everyone close your eyes, close your mouth, close your hands and try to communicate.

How do people who are deafblind communicate?

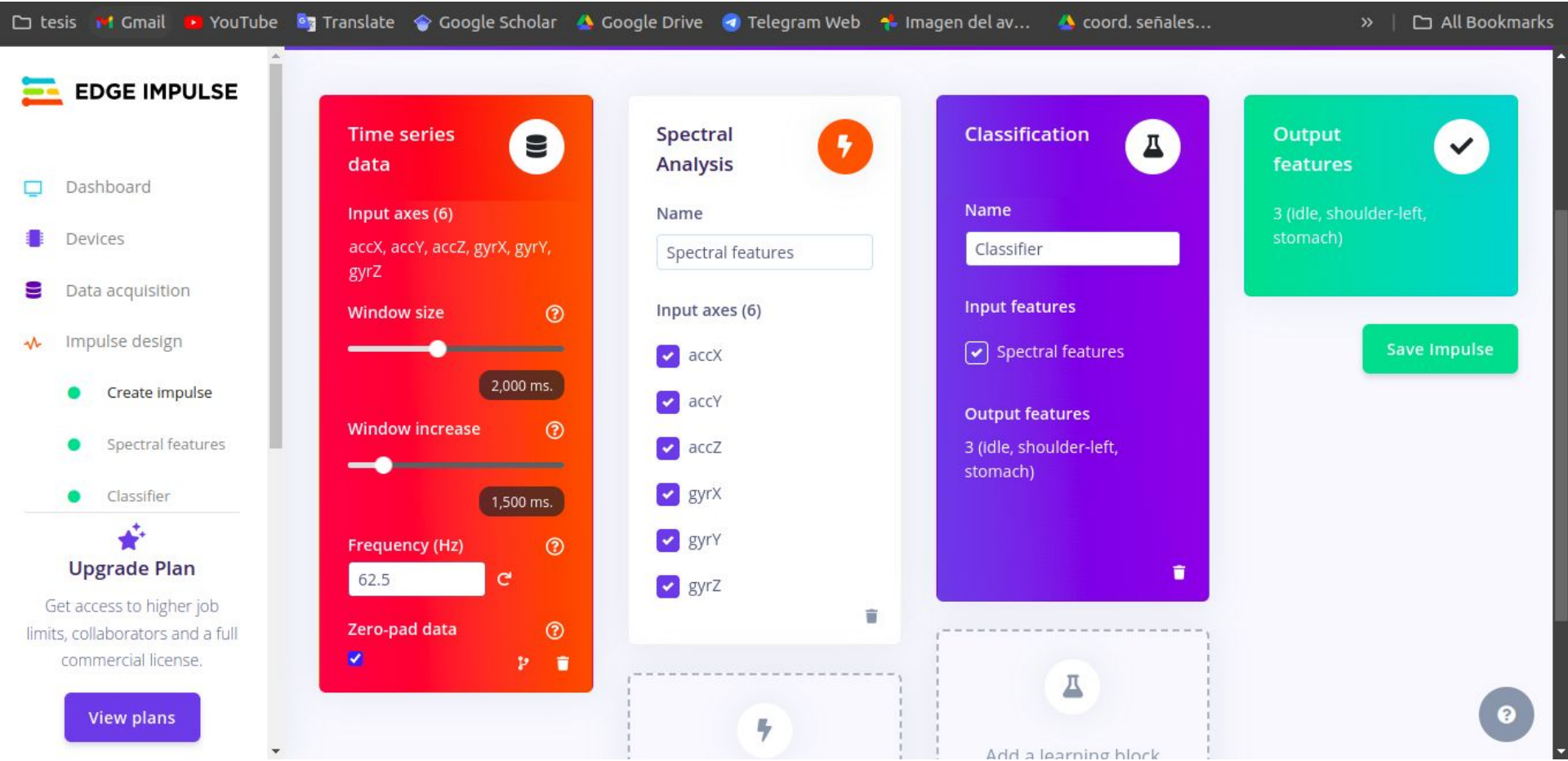
Some of the most common ways people who are deafblind communicate in

- Irish Sign Language (ISL),
- Lámh,
- Hand-under- hand/ tactile sign language
- Tactile Fingerspelling
- PECs or Pictures,
- Objects of Reference / Concrete Symbols,
- Swell Symbols,
- Braille,
- Haptic signs,
- Tadoma,
- Technological communication aids





IMU


tesis
Gmail
YouTube
Translate
Google Scholar
Google Drive
Telegram Web
Imagen del av...
coord. señales...
All Bookmarks
EDGE IMPULSE
Dashboard
Devices
Data acquisition
Impulse design
Create impulse
Spectral features
Classifier
Upgrade Plan
Get access to higher job limits, collaborators and a full commercial license.
View plans
Time series data
Input axes (6)
accX, accY, accZ, gyrX, gyrY, gyrZ
Window size
2,000 ms.
Window increase
1,500 ms.
Frequency (Hz)
62.5
Zero-pad data
Spectral Analysis
Name
Spectral features
Input axes (6)
accX
accY
accZ
gyrX
gyrY
gyrZ
Classification
Name
Classifier
Input features
Spectral features
Output features
3 (idle, shoulder-left, stomach)
Output features
3 (idle, shoulder-left, stomach)
Save Impulse
Add a learning block

EDGE IMPULSE

- Dashboard
- Devices
- Data acquisition
- Impulse design
  - Create impulse
  - Spectral features
  - Classifier
- EON Tuner
- Retrain model
- Live classification
- Model testing

Upgrade Plan

Get access to higher job limits, collaborators and a full commercial license.

View plans

Raw features

```
-8.8946, 2.2065, -3.2754, 0.8385, -0.0043, 0.0150, -8.9044, 2.1673, -3.226…
```

Label

idle

Parameters

Autotune parameters

Filter

Scale axes	1
Input decimation ratio	1
Type	none

Analysis

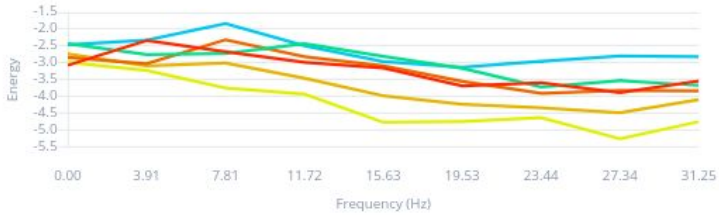
Type	FFT
FFT length	16
Take log of spectrum?	☑
Overlap FFT frames?	☑
Improve low frequency resolution?	☐

Save parameters

DSP result

After filter

Spectral power (log)



Processed features

```
0.0222, -0.0667, -0.6973, 1.7438, 1.8190, -2.3386, -2.6720, -2.9857, -3.1529, -3.6765, -3.590…
```

Neural Network settings

Training settings

Number of training cycles: 30

Use learned optimizer:

Learning rate: 0.0005

Training processor: CPU

Advanced training settings

Neural network architecture

Input layer (78 features)

Dense layer (20 neurons)

Dense layer (10 neurons)

Add an extra layer

Output layer (3 classes)

Start training

Training output

(0)

Model

Model version: Quantized (int8)

Last training performance (validation set)

ACCURACY
90.5%

LOSS
0.29

Confusion matrix (validation set)

	IDLE	SHOULDER-LEFT	STOMACH
IDLE	100%	0%	0%
SHOULDER-LEFT	0%	90%	10%
STOMACH	0%	20%	80%
F1 SCORE	1.00	0.90	0.80

Metrics (validation set)

METRIC	VALUE
Area under ROC Curve	0.99
Weighted average Precision	0.90
Weighted average Recall	0.90
Weighted average F1 score	0.90

Data explorer (full training set)

How Can I replicate this project?

1. Acquire data and upload to edge-impulse:
   a. You can clone this project: https://studio.edgeimpulse.com/public/494730/live
   b. You must fix wifi firmware In arduino using:
2. Develop your code in python
   a. MQTT: paho-mqtt https://pypi.org/project/paho-mqtt/
   b. Text to speech: gtts https://www.geeksforgeeks.org/convert-text-speech-python/