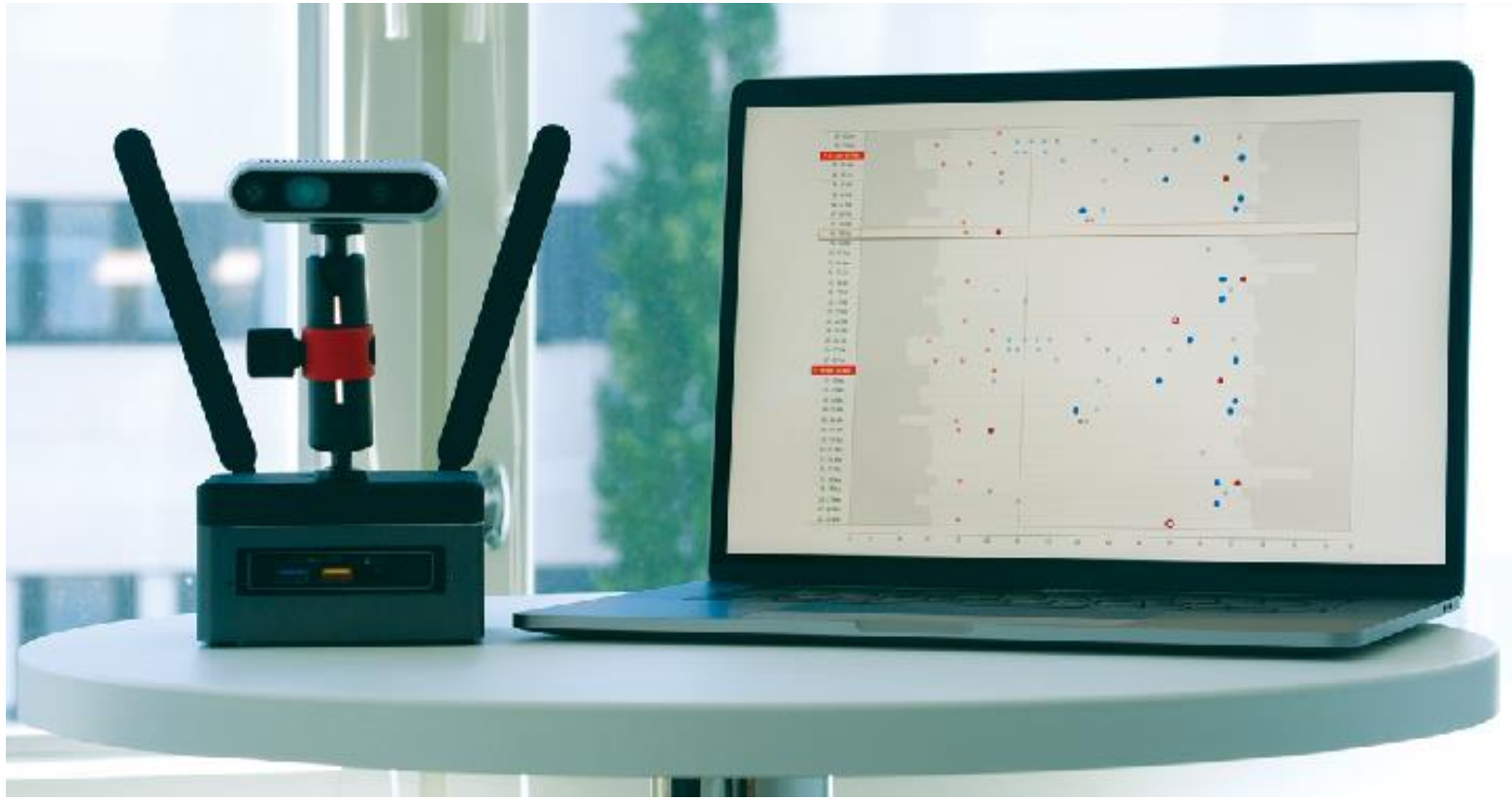
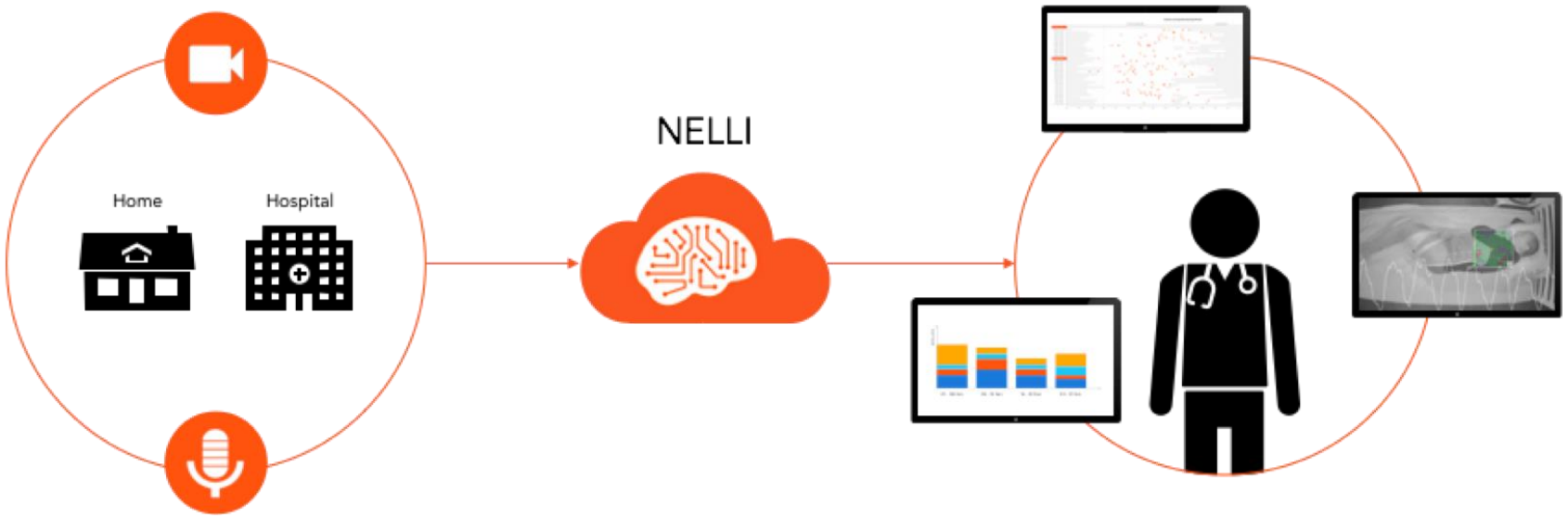


Kaapo Annala
CEO

neuroeventlabs

Artificial Intelligence powered epilepsy diagnostics

Nelli processes video and audio inputs using AI/ML, leading to continuously growing library of annotated training data and AI-driven diagnostics and treatment of epilepsy.



Audio and video feed of patient in hospital or at home.

Machine learning algorithms translating the feed into signals, biomarkers and findings.

Providing doctors with actionable data for accurate diagnosis and adjusting treatment:

- Detected seizures on timeline
- Classification of seizure types
- Statistics on a monitoring diary
- Access to seizure videos for visual verification.

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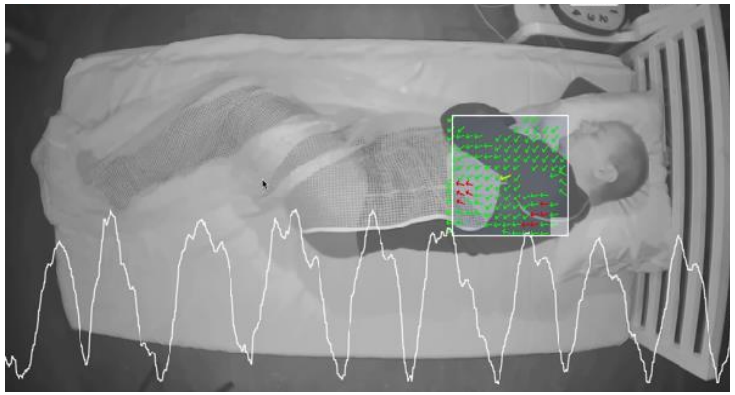
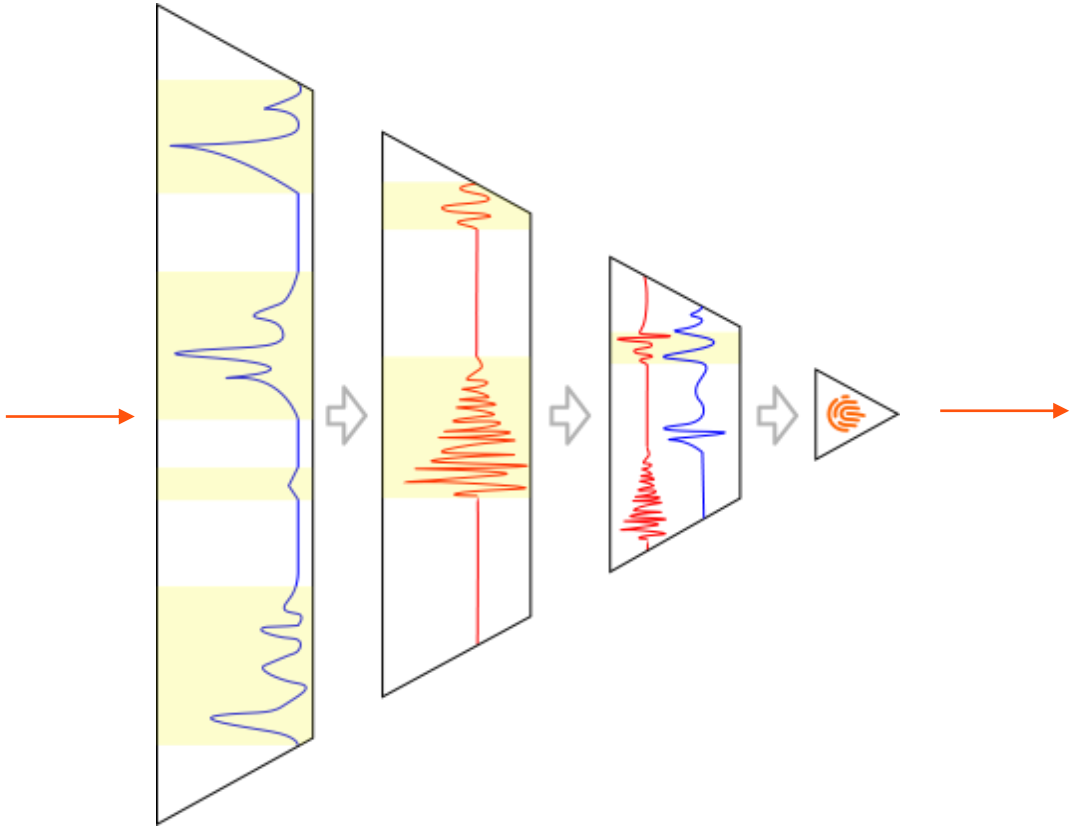
Usage of best-in-class technology to turn video and audio feed into biomarkers, events and findings.



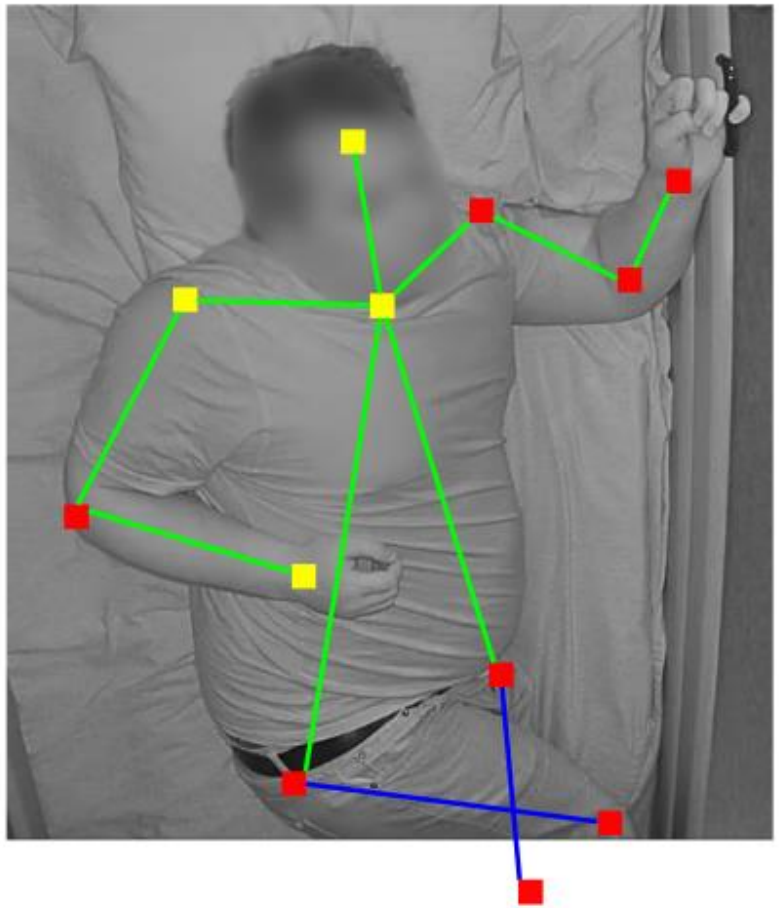


Biomarkers

- Respiration
- Clonic movement
- Seizure audio fingerprint
- Tonic posture
- Pose estimation
- Joint velocity
- Spasm
- Twitches
- Symmetricity
- Eyes open, deviation
- Lip smacking
- Hand orientation

Each use of the service contributes to the continuously growing library of annotated dataset used in training and improving the AI/ML Models.

Pose estimation is a computer vision tool which can determine the keypoints of a skeleton (typically, a human) from an image.

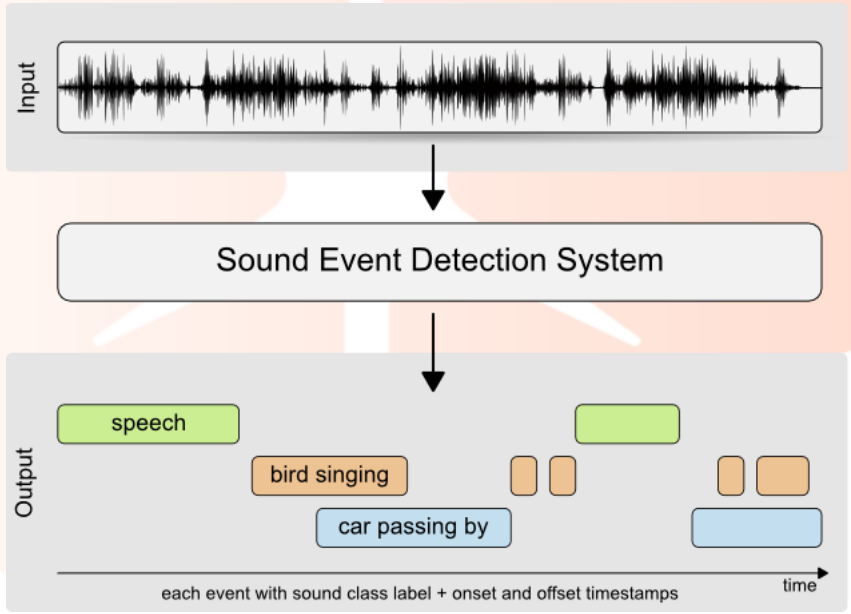


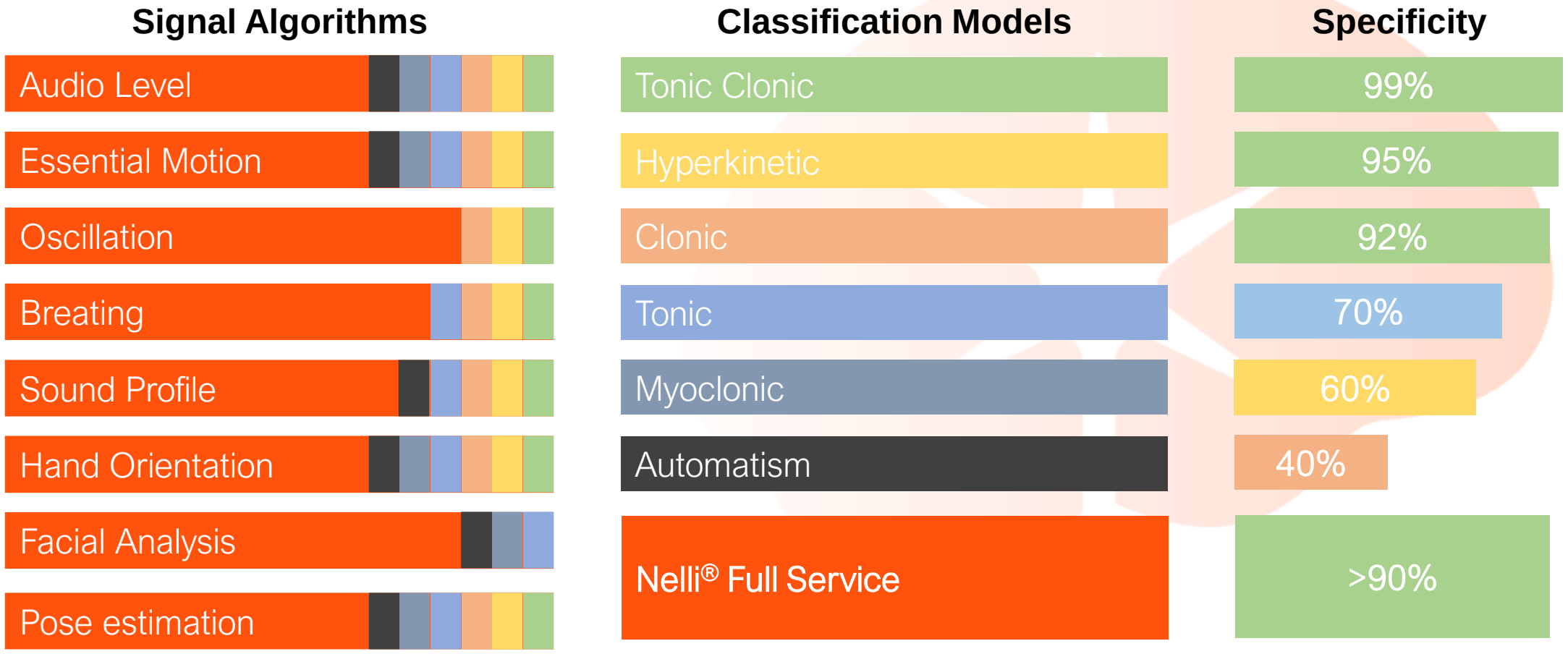
We can analyze the pose to:

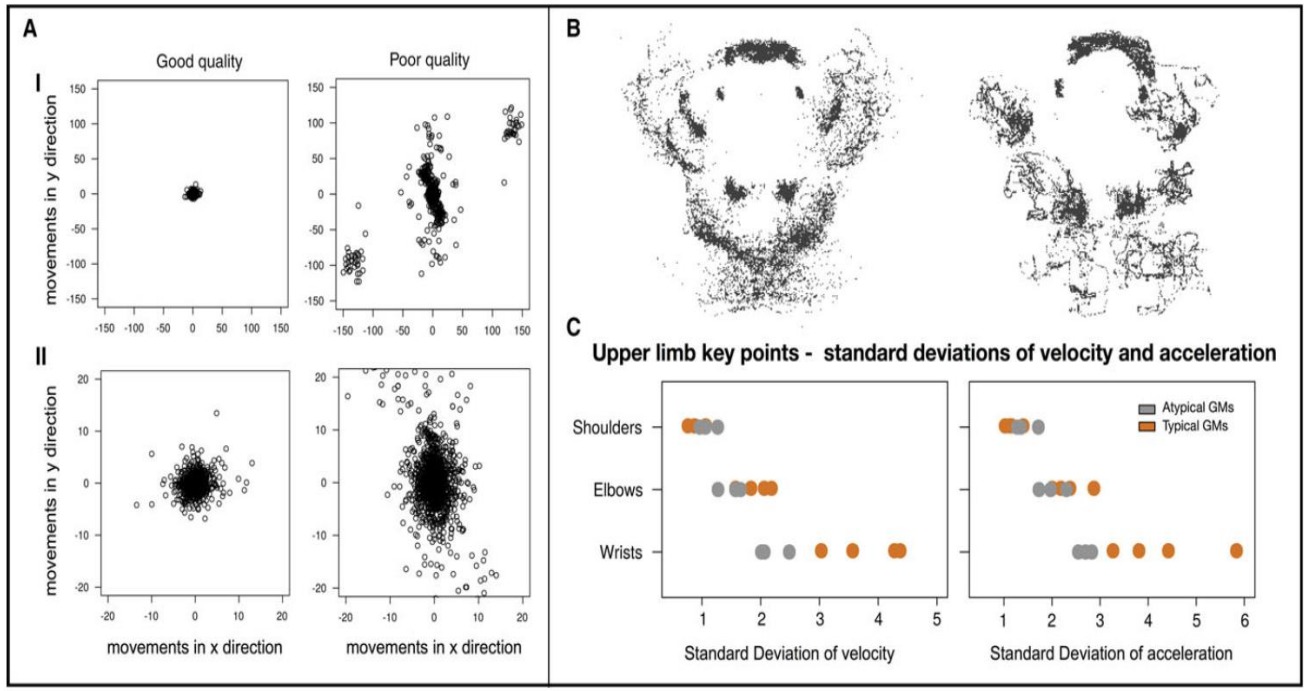
- Establish gaze direction and eye openness
- Detect semiological signs, e.g. head deviation or “sign of four”
- Localize repetitive motion phenomena, e.g. fumbling or mastication

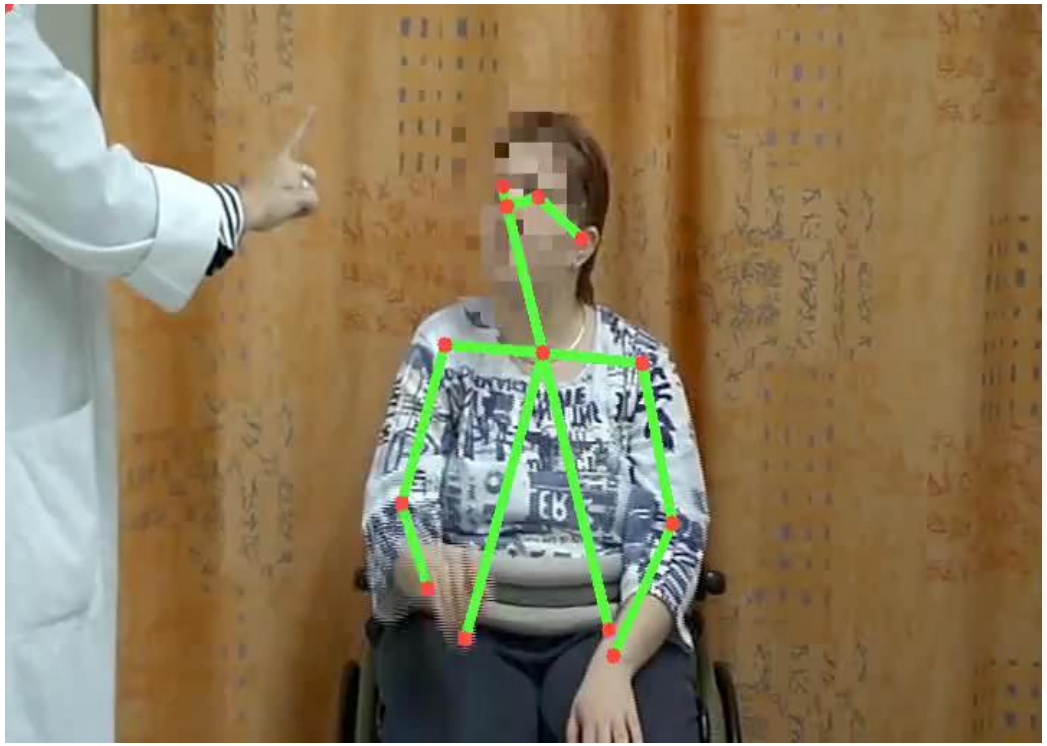
Through a collaboration with the TUT audio research group [0], we trained a **model to detect screams** and other sounds in epilepsy recordings.

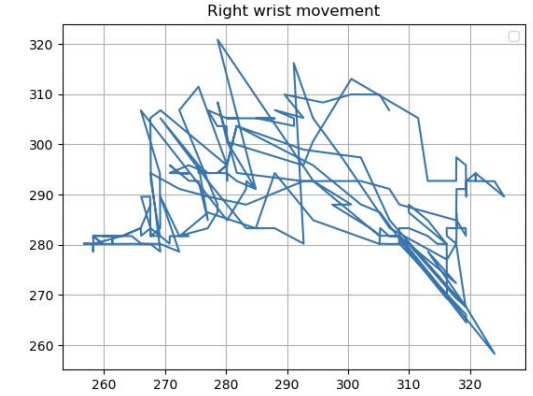
It outperforms our earlier sound amplitude model remarkably (<1 FDR/night).

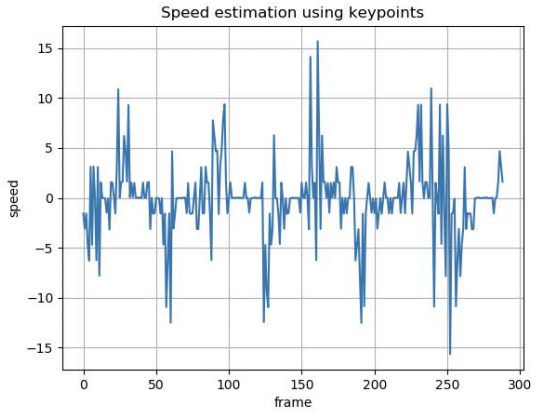


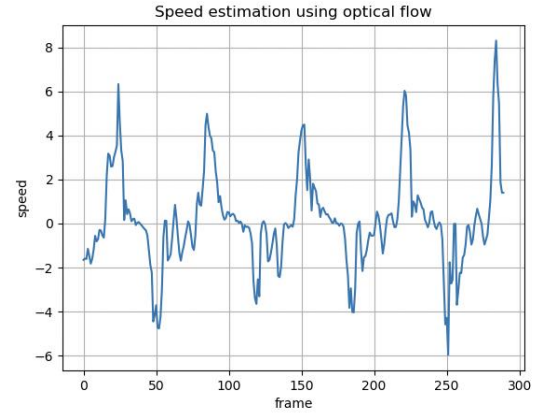

Signal Algorithms
Classification Models
Specificity
Audio Level
Essential Motion
Oscillation
Breating
Sound Profile
Hand Orientation
Facial Analysis
Pose estimation
Tonic Clonic
Hyperkinetic
Clonic
Tonic
Myoclonic
Automatism
Nelli® Full Service
99%
95%
92%
70%
60%
40%
>90%

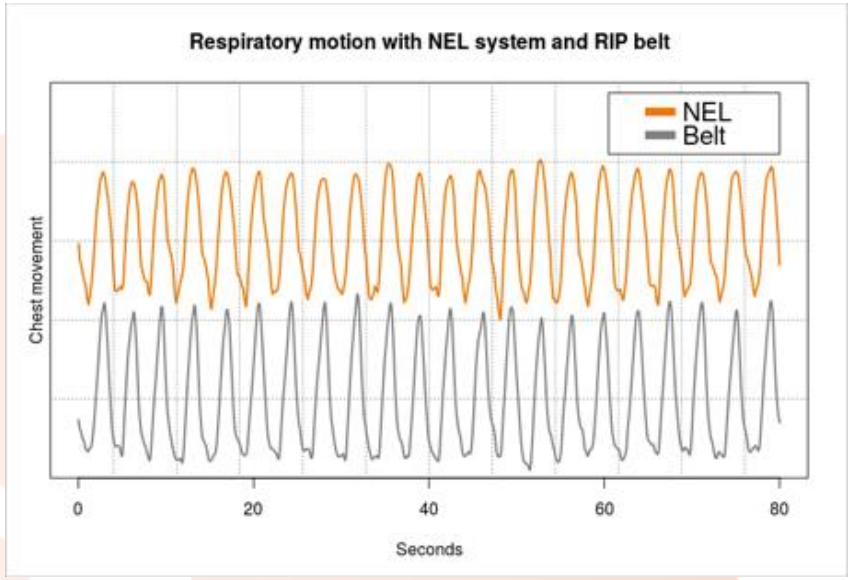

A
Good quality
Poor quality
I
movements in y direction
II
movements in y direction
movements in x direction
movements in x direction
B
C
Upper limb key points - standard deviations of velocity and acceleration
Shoulders
Elbows
Wrists
Atypical GMs
Typical GMs
Standard Deviation of velocity
Standard Deviation of acceleration

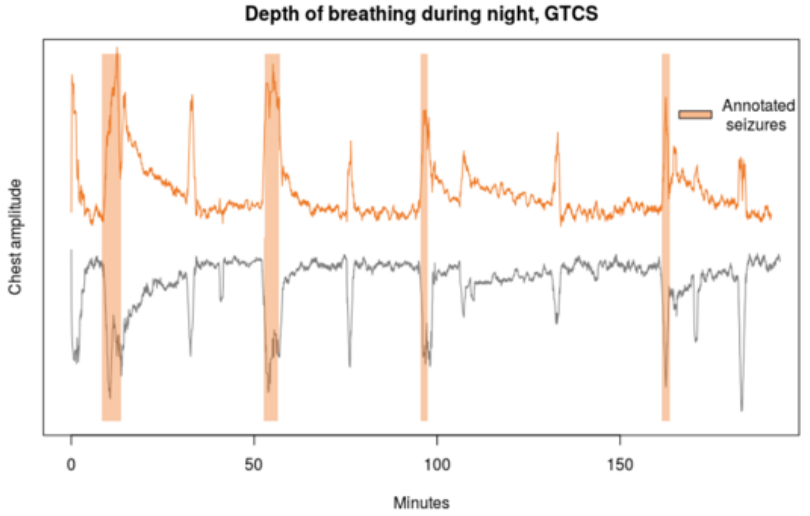



Right wrist movement
320
310
300
290
280
270
260
260
270
280
290
300
310
320


Speed estimation using keypoints
speed
15
10
5
0
−5
−10
−15
0
50
100
150
200
250
300
frame


Speed estimation using optical flow
speed
8
6
4
2
0
−2
−4
−6
0
50
100
150
200
250
300
frame


Respiratory motion with NEL system and RIP belt
NEL
Belt
Chest movement
0
20
40
60
80
Seconds


Depth of breathing during night, GTCS
Annotated seizures
Chest amplitude
0
50
100
150
Minutes

Lots of possibilities to utilise AI in healthcare

Thank you!

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