

TABLE S4
THE ARCHITECTURE OF THE PROPOSED DEEP WF-CNN CLASSIFIER

| Layers | Type | No. of Neurons | Kernel size | Stride | No. of Filters |
|--------|--------------------------|----------------|-------------|--------|----------------|
| 0-1 | Conv | 400×3 | [3 3] | 1 | 16 |
| 1-2 | Max pool | 200×2 | [2 1] | 2 | |
| 2-3 | Conv. | 200×2 | [3 3] | 1 | 32 |
| 3-4 | Max pool | 100×1 | [2 2] | 2 | |
| 4-5 | Conv. | 100×1 | [3 3] | 1 | 48 |
| 5-6 | Max pool | 50×1 | [2 1] | 2 | |
| 6-7 | Conv. | 50×1 | [3 3] | 1 | 72 |
| 7-8 | Max pool | 25×1 | [2 1] | 2 | |
| 8-9 | Conv. | 25×1 | [3 3] | 1 | 96 |
| 9-10 | Max pool | 12×1 | [3 1] | 2 | |
| 10-11 | Conv. | 12×1 | [3 3] | 1 | 128 |
| 11-12 | Max pool | 6×1 | [2 1] | 2 | |
| 12-13 | Conv. | 6×1 | [3 3] | 1 | 256 |
| 13-14 | Max pool | 3×1 | [2 1] | 2 | |
| 15-17 | Fully connected | 1536 | | | |
| | Fully connected | 24 | | | |
| | Fully connected | 2 | | | |
| Output | Softmax & Classification | | | | |

TABLE S5
THE ARCHITECTURE OF THE PROPOSED DEEP 1D-CNN CLASSIFIER

| Layers | Type | No. of Neurons | Kernel size | Stride | No. of Filters |
|--------|--------------------------|----------------|-------------|--------|----------------|
| 0-1 | Conv | 400×1 | [7 1] | 1 | 4 |
| 1-2 | Max pool | 394×1 | [6 1] | 2 | |
| 2-3 | Conv. | 195×1 | [6 1] | 1 | 6 |
| 3-4 | Max pool | 190×1 | [4 1] | 2 | |
| 4-5 | Conv. | 94×1 | [5 1] | 1 | 8 |
| 5-6 | Max pool | 90×1 | [4 1] | 2 | |
| 6-7 | Conv. | 44×1 | [5 1] | 1 | 10 |
| 7-8 | Max pool | 40×1 | [2 1] | 2 | |
| 8-9 | Conv. | 20×1 | [3 1] | 1 | 12 |
| 9-10 | Max pool | 18×1 | [2 1] | 2 | |
| 10-11 | Conv. | 9×1 | [2 1] | 1 | 14 |
| 11-12 | Max pool | 8×1 | [2 1] | 2 | |
| 12-15 | Fully connected | 56 | | | |
| | Fully connected | 14 | | | |
| | Fully connected | 2 | | | |
| Output | Softmax & Classification | | | | |

RESULTS OF THE WAVELET SCALOGRAM CNN CLASSIFIER FOR SHARP IDENTIFICATION IN CLINICAL DATA (0-2HOURS)

[illegible]

98.51±0.89

RESULTS OF THE WAVELET SCALOGRAM CNN CLASSIFIER FOR SHARP IDENTIFICATION IN CLINICAL DATA (2-4HOURS)

| Trained and validated on infant No. | Patterns in Train/Validation | Tested on infant No. | Patterns in the Test-set | TP hits | TN hits | FP hits | FN hits | Sensitivity (%) | Selectivity (%) | Precision (%) | Accuracy (%) |
|--|---------------------------------|----------------------------|--------------------------------|---------|---------|---------|---------|--------------------|--------------------|------------------|-----------------|
| 7.9.11.14.17.20.22 | 4156 | 3 | 1134 | 561 | 565 | 2 | 6 | 98.9 | 99.6 | 99.6 | 99.3 |
| 3.9.11.14.17.20.22 | 4751 | 7 | 546 | 270 | 273 | 0 | 3 | 98.9 | 100 | 100 | 99.5 |
| 3.7.11.14.17.20.22 | 4460 | 9 | 830 | 409 | 413 | 2 | 6 | 98.6 | 99.5 | 99.5 | 99.0 |
| 3.7.9.14.17.20.22 | 4368 | 11 | 922 | 453 | 459 | 2 | 8 | 98.3 | 99.6 | 99.6 | 98.9 |
| 3.7.9.11.17.20.22 | 5032 | 14 | 258 | 128 | 128 | 1 | 1 | 99.2 | 99.2 | 99.2 | 99.2 |
| 3.7.9.11.14.20.22 | 5084 | 17 | 206 | 103 | 100 | 3 | 0 | 100 | 97.1 | 97.2 | 98.5 |
| 3.7.9.11.14.17.22 | 4930 | 20 | 360 | 178 | 179 | 1 | 2 | 98.9 | 99.4 | 99.4 | 99.2 |
| 3.7.9.11.14.17.20 | 4256 | 22 | 1034 | 516 | 510 | 7 | 1 | 99.8 | 98.6 | 98.7 | 99.2 |

99.10 \pm 0.14

RESULTS OF THE WAVELET SCALOGRAM CNN CLASSIFIER FOR SHARP IDENTIFICATION IN CLINICAL DATA (4-6HOURS)

| Trained and validated on infant No. | Patterns in Train/Validation | Tested on infant No. | Patterns in the Test-set | TP hits | TN hits | FP hits | FN hits | Sensitivity (%) | Selectivity (%) | Precision (%) | Accuracy (%) |
|--|---------------------------------|----------------------------|--------------------------------|---------|---------|---------|---------|--------------------|--------------------|------------------|-----------------|
| 7 9 11 14 17 20 22 | 4202 | 3 | 1428 | 706 | 713 | 1 | 8 | 98.9 | 99.9 | 99.9 | 99.4 |
| 3.9.11.14.17.20.22 | 5014 | 7 | 616 | 308 | 304 | 4 | 0 | 100 | 98.7 | 98.7 | 99.4 |
| 3.7.11.14.17.20.22 | 4882 | 9 | 748 | 364 | 373 | 1 | 10 | 97.3 | 99.7 | 99.7 | 98.5 |
| 3.7.9.14.17.20.22 | 4312 | 11 | 1318 | 646 | 659 | 0 | 13 | 98.0 | 100 | 100 | 99.0 |
| 3.7.9.11.17.20.22 | 5478 | 14 | 152 | 76 | 75 | 1 | 0 | 100 | 98.7 | 98.7 | 99.3 |
| 3.7.9.11.14.20.22 | 5452 | 17 | 178 | 89 | 89 | 0 | 0 | 100 | 100 | 100 | 100 |
| 3.7.9.11.14.17.22 | 4518 | 20 | 496 | 246 | 239 | 9 | 2 | 99.2 | 96.4 | 96.5 | 97.8 |
| 3.7.9.11.14.17.20 | 4936 | 22 | 694 | 341 | 346 | 1 | 6 | 98.3 | 99.7 | 99.7 | 99.0 |

99.05±0.31

RESULTS OF THE WAVELET SCALOGRAM CNN CLASSIFIER FOR SHARP IDENTIFICATION (ENTIRE 0-6 HOURS—13 LAYERS)

[illegible]

RESULTS OF THE WAVELET SCALOGRAM CNN CLASSIFIER FOR SHARP IDENTIFICATION (ENTIRE 0-6 HOURS—9 LAYERS)

[illegible]

RESULTS OF THE WAVELET SCALOGRAM CNN CLASSIFIER FOR SHARP IDENTIFICATION (ENTIRE 0-6 HOURS—7 LAYERS)

[illegible]

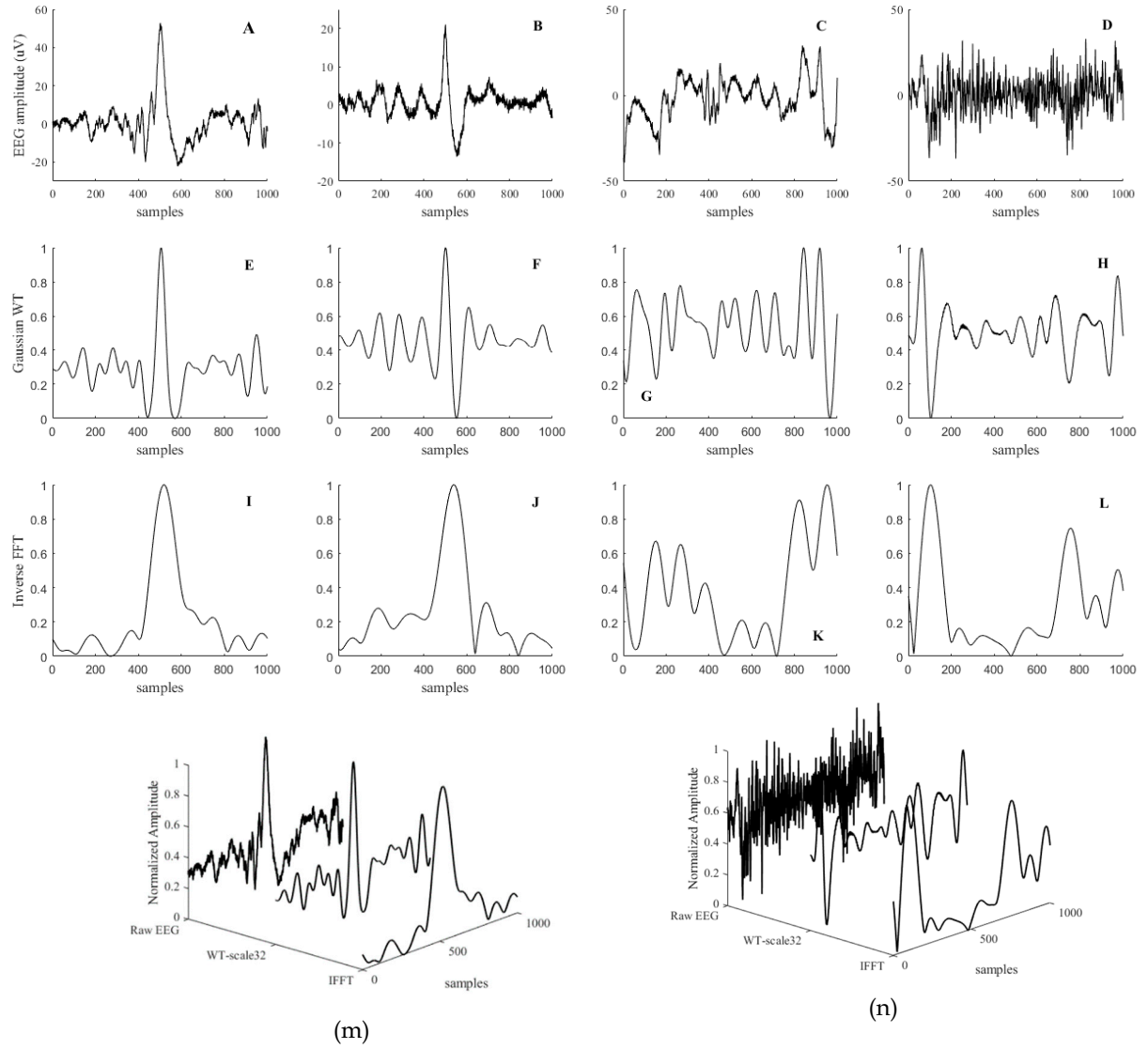


Figure S6. Examples of post-HI micro-scale EEG sharp waves (a, b) and non-sharp EEG background (c, d). The corresponding Gaussian 2 wavelet transforms of the sharps (e, f) and non-sharps (g, h) at scale 32. The corresponding inverse Fourier transforms of the sharps (i, j) and non-sharps (k, l) using band-pass filter 4-12.5Hz. The combination of these three time series (matrix of size $400 \times 1 \times 3$) was used for training and validation of the WF-CNN classifier (m, n).

TABLE S12
RESULTS OF THE WF-CNN CLASSIFIER FOR SHARP IDENTIFICATION IN CLINICAL DATA (ENTIRE 0-6 HOURS – 17 LAYERS)

[illegible]

TABLE S13
RESULTS OF THE WF-CNN CLASSIFIER FOR SHARP IDENTIFICATION IN CLINICAL DATA (ENTIRE 0-6 HOURS – 13 LAYERS)

[illegible]

TABLE S14
RESULTS OF THE WF-CNN CLASSIFIER FOR SHARP IDENTIFICATION IN CLINICAL DATA (ENTIRE 0-6 HOURS – 9 LAYERS)

[illegible]

TABLE S15
RESULTS OF THE WF-CNN CLASSIFIER FOR SHARP IDENTIFICATION IN CLINICAL DATA (ENTIRE 0-6 HOURS – 7 LAYERS)

[illegible]

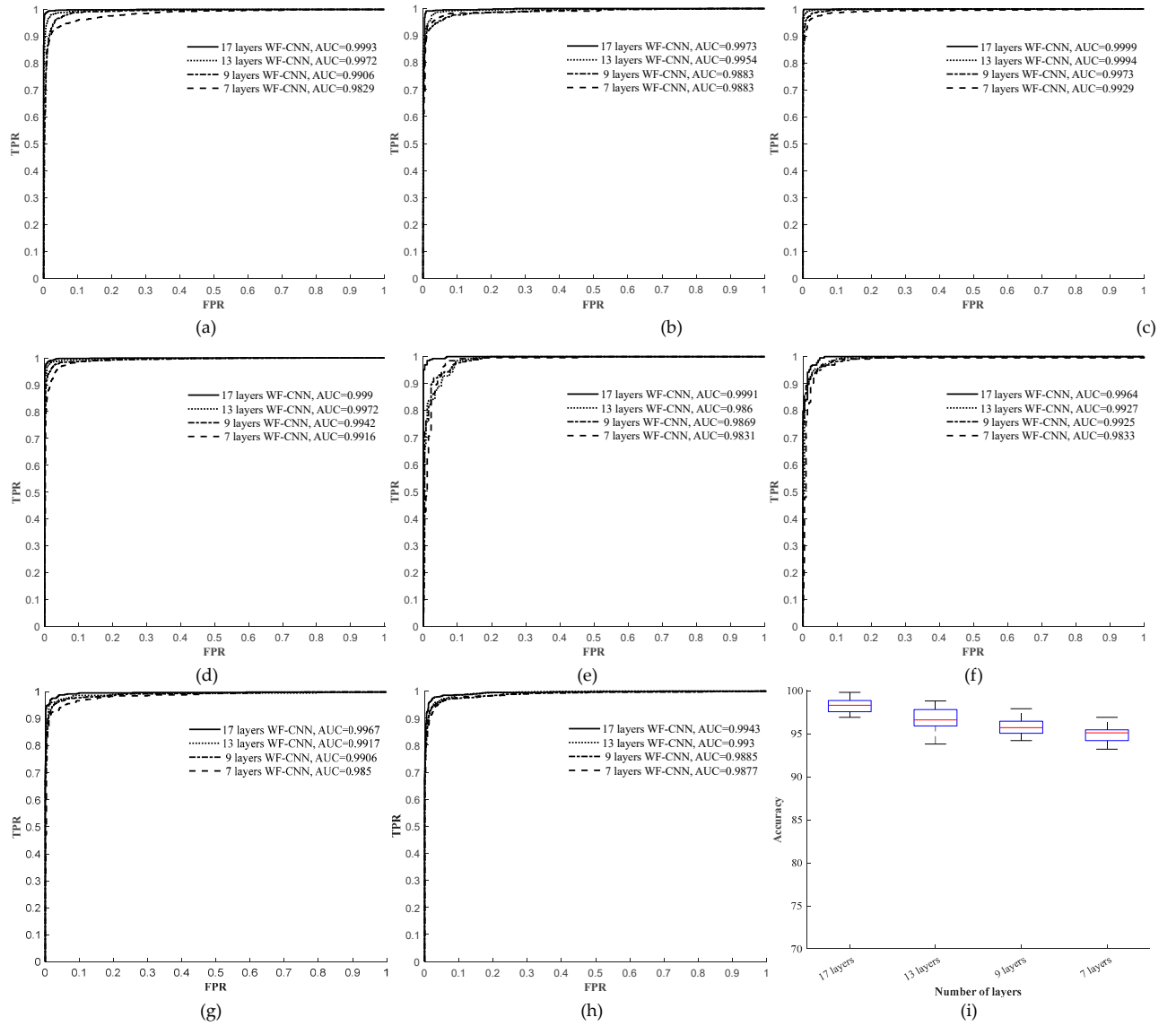


Figure S7. (a) to (h): ROC curves and the corresponding AUC values from 8-fold cross-validation of the results along 6 hours of 256Hz data across 8 babies (48 hours total) using 13, 11, 9 and 7 layers in the proposed WF-CNN classifier. The boxplot in (i) demonstrates how the overall accuracy of the net decreases with larger variations in the standard deviation for different number of layers.

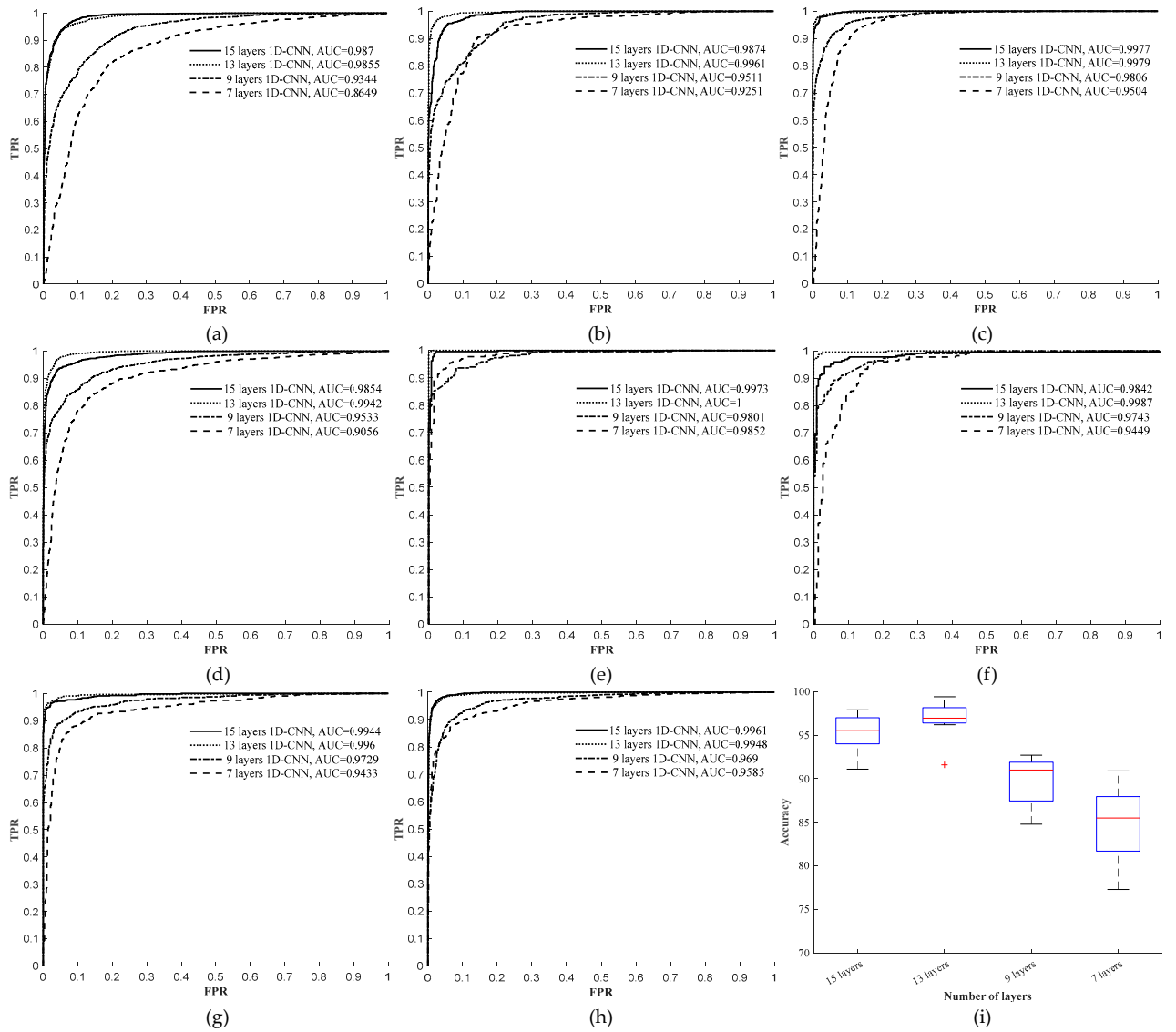


Figure S8. (a) to (h): ROC curves and the corresponding AUC values from 8-fold cross-validation of the results along 6 hours of 256Hz data across 8 babies (48 hours total) using 13, 11, 9 and 7 layers in the proposed 1D-CNN classifier. The boxplot in (i) demonstrates how the overall accuracy of the net decreases with larger variations in the standard deviation for different number of layers.

TABLE S20
RESULTS OF THE WAVELET-TYPE-II-FLC CLASSIFIER FOR SHARP IDENTIFICATION IN CLINICAL DATA (ENTIRE 6 HOURS)

| Trained and validated on infant No. | No. of patterns in the Train-set | Tested on infant No. | No. of patterns in the Test-set | TP hits | FP hits | FN hits | Sensitivity (%) | Selectivity (%) | Accuracy (%) |
|--|--|----------------------------|---------------------------------------|---------|---------|---------|--------------------|--------------------|-----------------|
| 7.9.11.14.17.20.22 | 5191 | 3 | 1621 | 1547 | 1014 | 74 | 95.43 | 60.41 | 77.97 |
| 3.9.11.14.17.20.22 | 6137 | 7 | 675 | 633 | 594 | 42 | 93.78 | 51.59 | 72.68 |
| 3.7.11.14.17.20.22 | 5807 | 9 | 1005 | 927 | 529 | 48 | 92.24 | 63.67 | 77.95 |
| 3.7.9.14.17.20.22 | 5409 | 11 | 1403 | 1269 | 648 | 134 | 90.45 | 66.20 | 78.32 |
| 3.7.9.11.17.20.22 | 6547 | 14 | 265 | 239 | 236 | 26 | 90.19 | 50.32 | 70.25 |
| 3.7.9.11.14.20.22 | 6588 | 17 | 224 | 202 | 296 | 22 | 90.18 | 40.56 | 65.35 |
| 3.7.9.11.14.17.22 | 6254 | 20 | 558 | 531 | 265 | 27 | 95.16 | 66.71 | 80.93 |
| 3.7.9.11.14.17.20 | 5751 | 22 | 1061 | 1027 | 515 | 34 | 96.80 | 66.60 | 81.70 |
| Overall performance of the wavelet type-II FLC in the entire 0-6 hours | | | | | | | | | 75.64±5.31 |

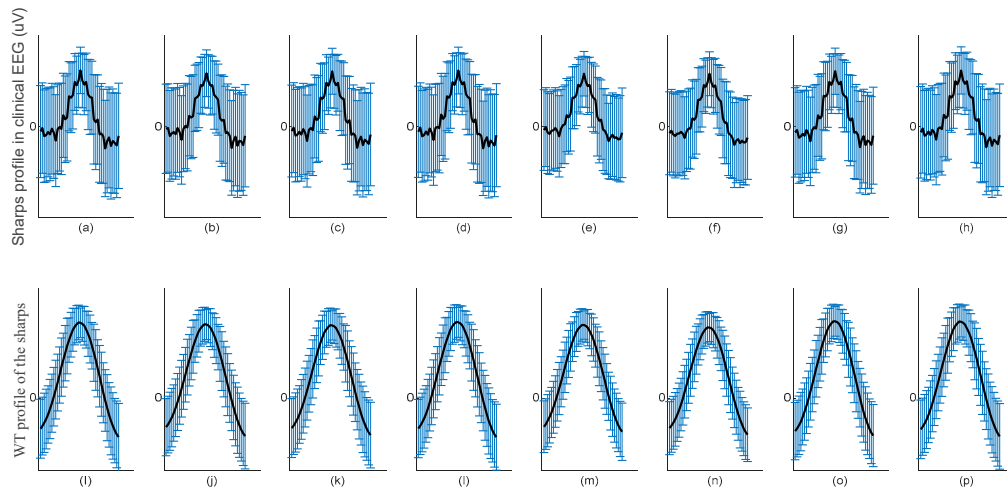


Figure S9. (a) to (h): The variations in the actual sharp profiles in different sets from 8 babies excluding one in the entire dataset; (i) to (p): Wavelet transformed footprint of uncertainties (FOU) of the patterns in a-h, respectively, used in the WT-Type-II-FLC approach. Profiles have been created using Gaus2 mother wavelet at scale 16 to generate compact “Footprint of Uncertainty” which were then used in the classifier. Gaussian 2 basis wavelet at scale 16 corresponds to a pseudo-frequency of 4Hz (250ms), which stands for the lower spectral range of a typical clinical HI sharp wave recorded at the sampling frequency of 256Hz.