Supplementary Material

Obstructive Sleep Apnea Event Detection using Explainable Deep Learning Models for a Portable Monitor

Ángel Serrano Alarcón1,3\*, Natividad Martínez Madrid1, Ralf Seepold2, Juan Antonio Ortega Ramírez3

1 Reutlingen University, Alteburgstr. 150, 72762 Reutlingen, Germany

2 HTWG Konstanz, Alfred-Wachtel-Str. 8, 78462 Konstanz, Germany

3 University of Seville, San Fernando 4, 41004 Sevilla, Spain

**\* Correspondence:**

**Corresponding Author/a**

Angel.serrano\_alarcon@reutlingen-university.de

# Supplementary Data

Supplementary Material should be uploaded separately on submission. Please include any supplementary data, figures and/or tables.

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# Supplementary Figures and Tables

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## Supplementary Tables

|  |  |
| --- | --- |
| **Tuner** | Hyperband |
| **Number of hidden layers** | 4 |
| **Feature map – 1st hidden layer** | 96 |
| **Kernel size – 1st hidden layer** | 3 |
| **Dropout – 1st hidden layer** | 0.1 |
| **Feature map – 2nd hidden layer** | 128 |
| **Kernel size – 2nd hidden layer** | 9 |
| **Dropout – 2nd hidden layer** | 0.5 |
| **Feature map – 3rd hidden layer** | 64 |
| **Kernel size – 3rd hidden layer** | 9 |
| **Dropout – 3rd hidden layer** | 0.3 |
| **Feature map – 4th hidden layer** | 256 |
| **Kernel size – 4th hidden layer** | 11 |
| **Dropout – 4th hidden layer** | 0.4 |
| **Layer Activation (all convolutional layers)** | ReLU |
| **Last-layer activation** | Sigmoid |
| **Learning rate** | 0.001 |
| **Optimizer** | Adam |
| **Loss** | Binary Crossentropy |

Table 1. Set of the best hyperparameters of the Model 1.

|  |  |
| --- | --- |
| **Tuner** | Hyperband |
| **Number of hidden layers** | 4 |
| **Feature map – 1st hidden layer** | 96 |
| **Kernel size – 1st hidden layer** | 3 |
| **Dropout – 1st hidden layer** | 0.3 |
| **Feature map – 2nd hidden layer** | 128 |
| **Kernel size – 2nd hidden layer** | 9 |
| **Dropout – 2nd hidden layer** | 0.4 |
| **Feature map – 3rd hidden layer** | 160 |
| **Kernel size – 3rd hidden layer** | 7 |
| **Dropout – 3rd hidden layer** | 0.2 |
| **Feature map – 4th hidden layer** | 96 |
| **Kernel size – 4th hidden layer** | 7 |
| **Dropout – 4th hidden layer** | 0.2 |
| **Layer Activation (all convolutional layers)** | ReLU |
| **Last-layer activation** | Sigmoid |
| **Learning rate** | 0.0001 |
| **Optimizer** | Adam |
| **Loss** | Binary Crossentropy |

Table 2. Set of the best hyperparameters of the Model 2.

|  |  |
| --- | --- |
| **Tuner** | Hyperband |
| **Number of hidden layers** | 4 |
| **Feature map – 1st hidden layer** | 192 |
| **Kernel size – 1st hidden layer** | 11 |
| **Dropout – 1st hidden layer** | 0.2 |
| **Feature map – 2nd hidden layer** | 128 |
| **Kernel size – 2nd hidden layer** | 9 |
| **Dropout – 2nd hidden layer** | 0.5 |
| **Feature map – 3rd hidden layer** | 160 |
| **Kernel size – 3rd hidden layer** | 9 |
| **Dropout – 3rd hidden layer** | 0.5 |
| **Feature map – 4th hidden layer** | 192 |
| **Kernel size – 4th hidden layer** | 7 |
| **Dropout – 4th hidden layer** | 0.5 |
| **Layer Activation (all convolutional layers)** | ReLU |
| **Last-layer activation** | Sigmoid |
| **Learning rate** | 0.01 |
| **Optimizer** | Adam |
| **Loss** | Binary Crossentropy |

Table 3. Set of the best hyperparameters of the Model 3.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Model 1** | | | **Model 2** | | | **Model 3** | | | **Model 4** | | |
| **Dataset** | **SHHS2** | **SHHS1** | **MESA** | **SHHS2** | **SHHS1** | **MESA** | **SHHS2** | **SHHS1** | **MESA** | **SHHS2** | **SHHS1** | **MESA** |
| Accuracy | 80.50 | 68.6 | 77.9 | 52.8 | 56.1 | 47.3 | 84.7 | 74.16 | 74.1 | 84.5 | 73.9 | 73.2 |
| Loss | 0.43 | 0.70 | 0.50 | 0.77 | 0.74 | 0.95 | 0.36 | 0.60 | 0.73 | 0.36 | 0.58 | 0.74 |
| Sensitivity | 36.5 | 24.9 | 29.3 | 87.6 | 74.0 | 83.7 | 82.7 | 51.6 | 76.3 | 83.6 | 53.2 | 77.0 |
| Specificity | 97.0 | 95.3 | 91.2 | 39.7 | 45.5 | 37.39 | 85.5 | 87.9 | 73.5 | 84.8 | 86.5 | 72.1 |
| Precision | 82.5 | 76.2 | 47.7 | 35.4 | 45.3 | 26.8 | 68.24 | 72.3 | 44.0 | 67.4 | 70.7 | 43.0 |
| AUC | 84.9 | 71.6 | 75.6 | 77.7 | 67.9 | 69.5 | 92.1 | 77.5 | 81.6 | 92.1 | 77.7 | 80.8 |

Table 4. Overall results to evaluate the different 1D-CNN models trained on the unbalanced test datasets (SHHS1, SHHS2 and MESA).