Supplementary Materials

Table S1. Detailed architecture of the temporal mEar model

layer	details
input	input dimension = (n, 3) (sample length, acceleration x,y,z [m/s²])
TCN blocks	each block (number of blocks = 3) consists of: • conv1d layer: kernel size = 5, dilation = exponentially increasing (2^i for block i), padding = automatically calculated for input/output length matching • batch normalization: 1d normalization on 16 out channels • ReLU activation • dropout = 0.2
final classifier	conv1d layer: • input channels = 16 • output channels = 2 • kernel size = 1
activation	sigmoid activation applied to the output of the classifier
output	output dimension = 2 per sequence the model processes the input sequentially with temporal convolution, providing the same number of output steps as input, with a final binary classification per time step

Table S2. Detailed architecture of the two spatial mEar models

layer	details
input	input dimension = (n, 3) (sample length, acceleration x,y,z [m/s²])
TCN blocks	each block (number of blocks = 3) consists of: • conv1d layer: kernel size = 2, dilation = exponentially increasing (2^i for block i), padding = automatically calculated for input/output length matching • chomp1d: removes excess padding from output • ReLU activation • dropout = 0.2
residual connection	skip connection between input and output of each block if the input/output channels differ, downsampling is applied using a Conv1d layer.
global average pooling	adaptive average pooling over the temporal dimension, reducing the sequence length to 1
fully connected layer	linear layer that maps the final pooled output to the specified output size
output	output dimension = 1 (stride width / stride length)

Figure S1. Detailed graphs of (**A**) the temporal mEar model (example Sequence length = 320) and (**B**) the spatial mEar models (example Sequence length = 110)

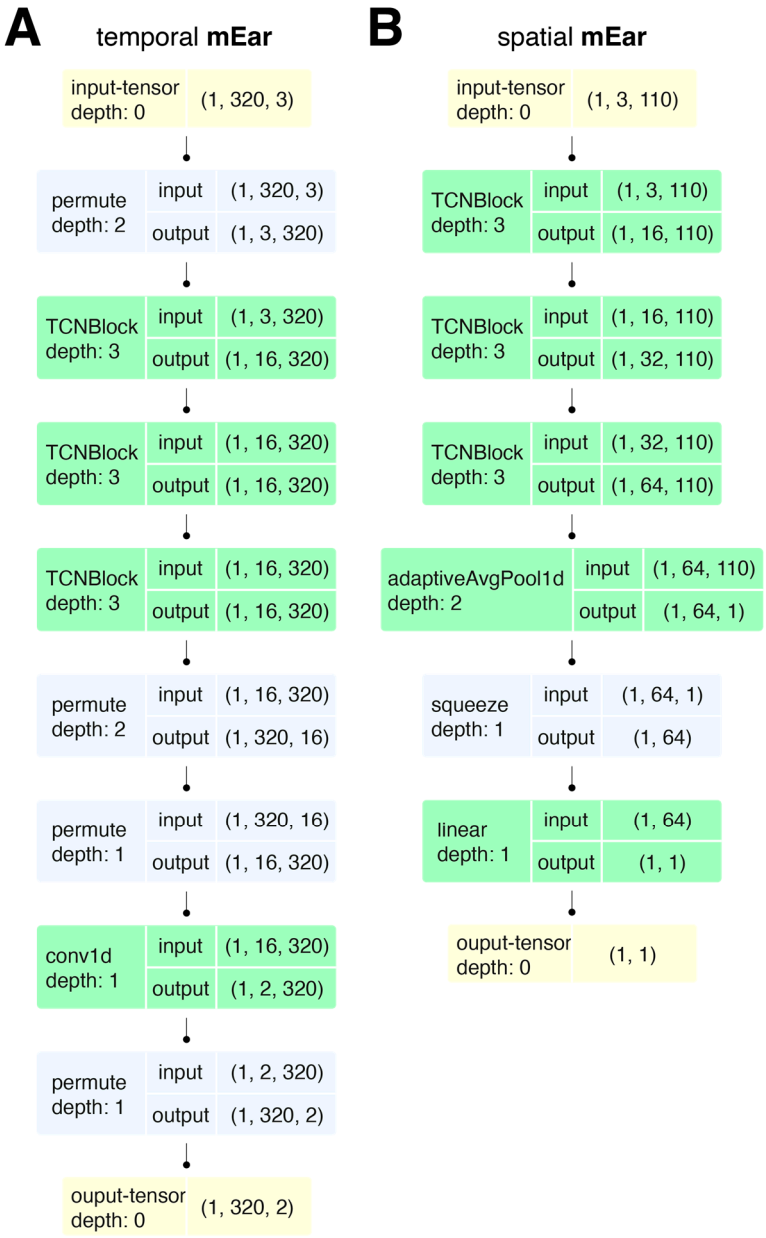


Table S3. Hyperparameter grid search

model	**temporal mEar**	**spatial mEar**
batch size options	[1, 4, 8, 12]	[1, 4, 8, 12]
learning rate options	[1e-3, 1e-4, 1e-5]	[1e-3, 1e-4, 1e-5]
epoch options	[15, 30, 75]	[10, 30, 75]
best results	batch size: 1 learning rate: 1e-03 epochs: 15	batch size: 12 learning rate: 0.001 epochs: 30