Application of recurrent neural network for the prediction of target non-apneic arousal regions in physiological signals

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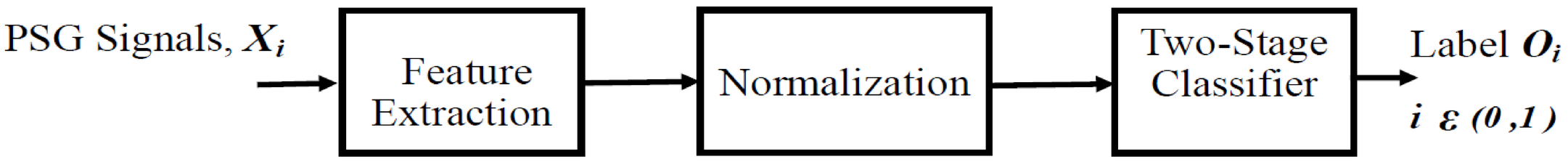
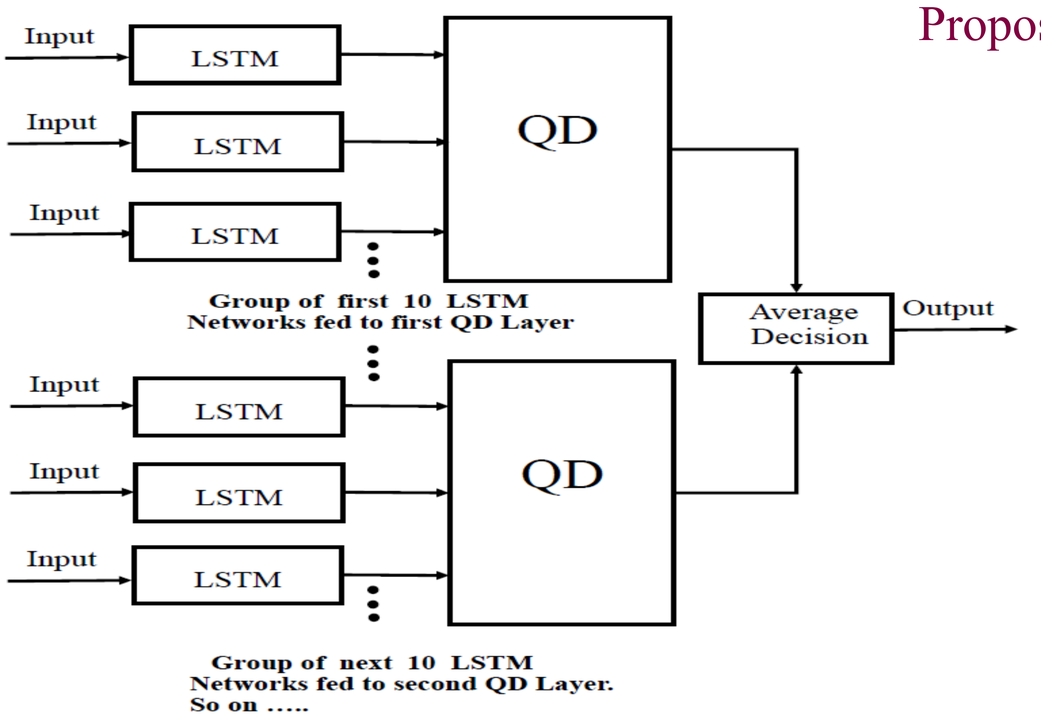
COMPUTING IN CARDIOLOGY

You Snooze, You Win: Physio Net/Computing in Cardiology Challenge 2018

Proposed solution



Proposed two-stage architecture

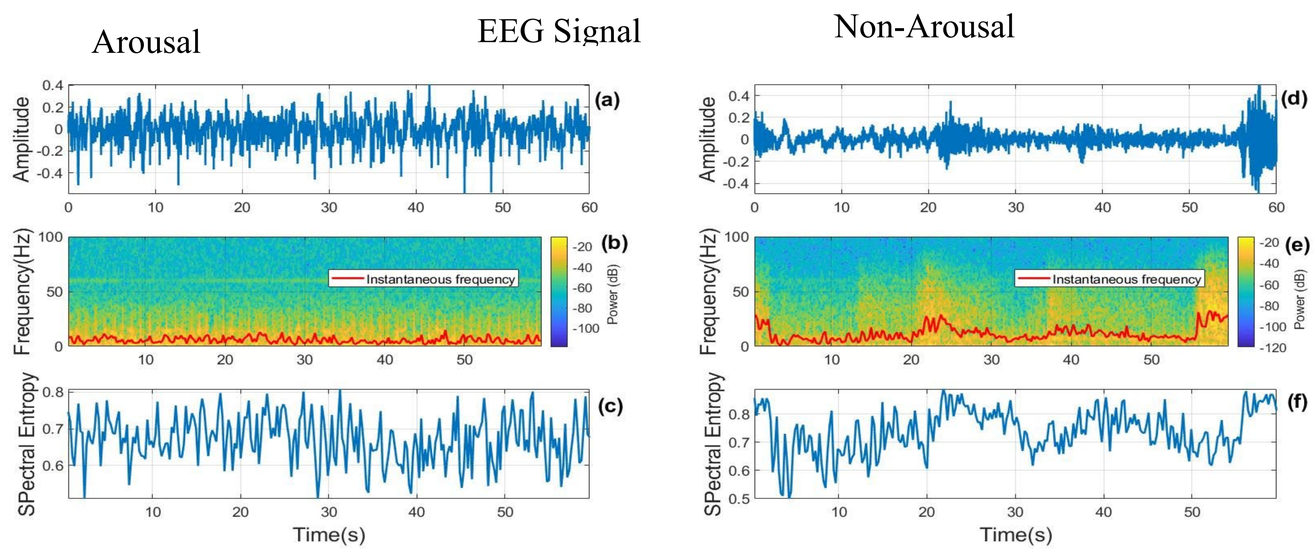


Layer type	Parameters	Number of parameters	Output shape
Input	--	--	(258, 2)
BiLSTM	Number of features= 50,	--	(50)
Output	Fully connected to output	2	2

Activation function: Sigmoid Cost function: Cross entropy

Method:

- Sequences of Instantaneous frequencies and Spectral entropies are used as feature vectors
- Feature vectors are normalized
- At first stage, ninety LSTM models are trained then, nine QD layers are modelled each for ten LSTMs.
- Finally, o/p of QD layers are averaged for prediction



- Segments of one minute durations are used for training
- Testing involves one minute segments with 50% overlapping.
- For 1 minute segment of a given PSG signal (*fs*=200Hz), a feature vector of 258 length is obtained by computing spectrograms over 258 time windows.
- The time outputs for the instantaneous frequency and spectral entropy values correspond to the center of the time windows

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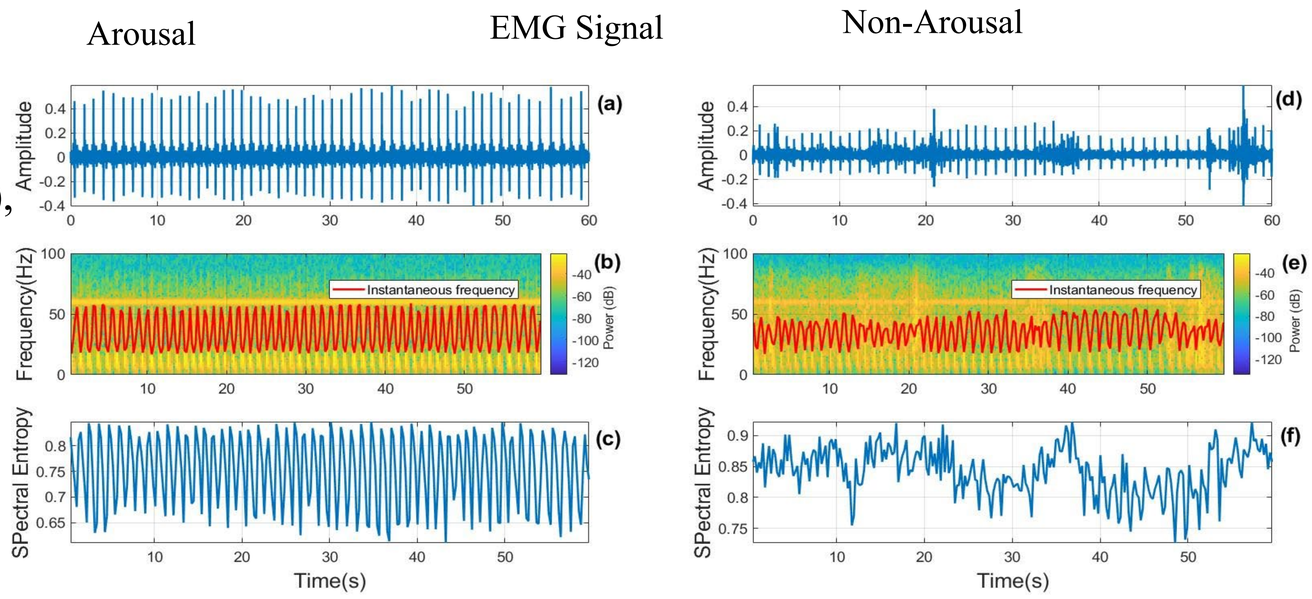

Highlights:

- No preprocessing is done in this work
- Algorithm learns suitable features from training data
- Low computational complexity

Future work: Performance can be boosted by:

- Deriving clinically informative reconstructed PSG signals using appropriate transforms
- Better tuning of LSTM models
- Including more feature vectors.

Scores (Test Data subset)

AUPRC	0.095
AUROC	0.624

Average run time (test set): 0.306% of quota

Maximum run time (test set): 0.32% of quota