

CLAIMS

What is claimed is:

- 5 1. A computer-implemented method for seizure detection using at least one processor, the method comprising:
- obtaining brain signal data of brain electrical activity of a subject;
- processing the brain signal data using a deep neural network to obtain a first processed output data of the brain signal data, the first processed output data
- 10 indicating one or more seizure events in the brain signal data;
- processing the first processed output data using a statistical model to obtain a second processed output data of the brain signal data, wherein the statistical model is configured to model transitions between the one or more seizure events and one or more non-seizure events in the first processed output
- 15 data of the brain signal data; and
- determining the one or more seizure events based on the second processed output data of the brain signal data.
2. The method of claim 1, wherein the brain signal data processed using the
- 20 deep neural network comprises spectral, temporal and spatial information in relation to the one or more seizure events.
3. The method of claim 1 or 2, further comprising producing an image-based representation of the brain signal data in the time-frequency domain, wherein said
- 25 processing the brain signal data using a deep neural network comprises processing the image-based representation to obtain the first processed output data.
4. The method of any one of claims 1 to 3, wherein the first processed output data comprises outliers, and said processing the first processed output data using a
- 30 statistical model to obtain a second processed output data of the brain signal data further comprises reducing the outliers in the first processed output data.

5. The method of any one of claims 1 to 4, wherein the brain signal data comprises a plurality of signals, each of the plurality of signals corresponding to a respective channel that is associated with a different brain spatial location, and said
5 processing the brain signal data using a deep neural network further comprises convolving each of the plurality of signals corresponding to a respective channel with a one-dimensional linear finite impulse response filter.
6. The method of any one of claims 1 to 5, wherein the deep neural network
10 is trained using a brain signal dataset comprising brain signal segments relating to seizure events and brain signal segments relating to non-seizure events.
7. The method of any one of claims 1 to 6, further comprising segmenting
15 the brain signal data into a plurality of different spectral bands.
8. The method of any one of claims 1 to 7, wherein the statistical model comprises a Hidden Markov Model (HMM).
9. The method of any one of claims 1 to 7, wherein the statistical model
20 comprises a Conditional Random Field (CRF).
10. The method of any one of claims 1 to 9, wherein the brain signal data comprises electroencephalogram (EEG) signal data acquired using an EEG device.
11. A system for seizure detection, the system comprising:
25 a memory; and
at least one processor communicatively coupled to the memory and configured to:
obtain brain signal data of brain electrical activity of a subject;
process the brain signal data using a deep neural network to obtain a first
30 processed output data of the brain signal data, the first processed output data indicating one or more seizure events in the brain signal data;

process the first processed output data using a statistical model to obtain a second processed output data of the brain signal data, wherein the statistical model is configured to model transitions between the one or more seizure events and one or more non-seizure events in the first processed output data of the brain signal data; and

5 determine the one or more seizure events based on the second processed output data of the brain signal data.

12. The system of claim 11, wherein the brain signal data processed using the deep neural network comprises spectral, temporal and spatial information in relation to
10 the one or more seizure events.

13. The system of claim 11 or 12, further comprising producing an image-based representation of the brain signal data in the time-frequency domain, wherein said processing the brain signal data using a deep neural network comprises processing the
15 image-based representation to obtain the first processed output data.

14. The system of any one of claims 11 to 13, wherein the first processed output data comprises outliers, and said processing the first processed output data using a statistical model to obtain a second processed output data of the brain signal data further
20 comprises reducing the outliers in the first processed output data.

15. The system of any one of claims 11 to 14, wherein the brain signal data comprises a plurality of signals, each of the plurality of signals corresponding to a respective channel that is associated with a different brain spatial location, and said
25 processing the brain signal data using a deep neural network further comprises convolving each of the plurality of signals corresponding to a respective channel with a one-dimensional linear finite impulse response filter.

16. The system of any one of claims 11 to 15, wherein the deep neural network
30 is trained using a brain signal dataset comprising brain signal segments relating to seizure events and brain signal segments relating to non-seizure events.

17. The system of any one of claims 11 to 16, wherein the statistical model comprises a Hidden Markov Model (HMM) or a Conditional Random Field (CRF).

5 18. The system of any one of claims 11 to 17, further comprising segmenting the brain signal data into a plurality of different spectral bands.

19. The system of any one of claims 11 to 18, wherein the brain signal data comprises electroencephalogram (EEG) signal data acquired using an EEG device.
10

20. A computer program product, embodied in one or more non-transitory computer-readable storage mediums, comprising instructions executable by at least one processor to perform a method for seizure detection, the method comprising:

obtaining brain signal data of brain electrical activity of a subject;
15 processing the brain signal data using a deep neural network to obtain a first processed output data of the brain signal data, the first processed output data indicating one or more seizure events in the brain signal data;

processing the first processed output data using a statistical model to obtain a second processed output data of the brain signal data, wherein the statistical model is
20 configured to model transitions between the one or more seizure events and one or more non-seizure events in the first processed output data of the brain signal data; and

determining the one or more seizure events based on the second processed output data of the brain signal data.

25