

Claims:

1. A computer-implemented method of facilitating electrocardiogram ("ECG") analysis, the method comprising:
receiving one or more sensed ECG traces for a patient, each of the sensed ECG traces
5 representing sensed patient heart activity over a sensed time period;
for each of the one or more sensed ECG traces:
identifying a plurality of corresponding sensed ECG trace segments, each of the sensed
ECG trace segments representing sensed patient heart activity for the patient over a
segment of the sensed time period; and
10 determining a representative ECG trace based on at least one of the identified
corresponding sensed ECG trace segments; and
causing at least one neural network classifier to be applied to the one or more determined
representative ECG traces to determine one or more diagnostically relevant scores related
to at least one diagnosis of the patient.
- 15 2. The method of claim 1 wherein determining the representative ECG trace
comprises identifying a subset of the plurality of corresponding sensed ECG trace
segments, the subset excluding at least one of the plurality of corresponding sensed ECG
trace segments, and determining the representative ECG trace based on the identified
subset.
- 20 3. The method of claim 2 wherein identifying the subset of the plurality of
corresponding sensed ECG trace segments comprises:
applying principal component analysis to the plurality of corresponding sensed ECG
trace segments to determine a respective set of principal component scores associated
with each of the corresponding sensed ECG trace segments; and
25 comparing the principal component scores to identify the at least one of the plurality of
corresponding sensed ECG trace segments to be excluded from the subset.
4. The method of claim 3 wherein each of the sets of principal component scores
includes a first principal component score and a second principal component score and
wherein comparing the principal component scores comprises:

determining a first confidence limit and a second confidence limit from the first and second principal component scores respectively; and

for each of the corresponding sensed ECG trace segments, comparing the first and second principal component scores associated with the sensed ECG trace segment to the first and second confidence limits.

5 5. The method of claim 4 wherein comparing the first and second principal component scores associated with the sensed ECG trace segment to the first and second confidence limits comprises determining whether the first and second principal component scores are outside of an ellipse having a radius set by the first and second confidence limits, and if so, identifying the sensed ECG trace segment to be excluded from the subset.

6. The method of claim 4 or 5 wherein determining the first and second confidence limits comprises applying the Hotelling T2 statistic to the first and second principal component scores respectively.

15 7. The method of claim 6 wherein applying the Hotelling T2 statistic to the first and second principal component scores comprises using the critical value of the F-distribution at least about 95% confidence.

8. The method of any one of claims 2 to 7 wherein determining the representative ECG trace based on the at least one of the identified corresponding sensed ECG trace segments comprises averaging the corresponding sensed ECG trace segments included in the subset.

20 9. The method of any one of claims 1 to 8 wherein identifying the plurality of corresponding sensed ECG trace segments comprises identifying respective common features in the sensed ECG trace segments and identifying respective start and end times for each of the plurality of sensed ECG trace segments relative to the identified common features.

10. The method of claim 9 wherein identifying the respective common features comprises identifying respective R peaks in each of the sensed ECG trace segments.

11. The method of any one of claims 1 to 10 further comprising producing signals

representing the one or more diagnostically relevant scores for causing at least one display to display a representation of the one or more diagnostically relevant scores.

12. The method of any one of claims 1 to 11 wherein the at least one neural network classifier includes a BrS neural network classifier.

5 13. The method of any one of claims 1 to 12 further comprising training the at least one neural network classifier, the training comprising:

receiving a plurality of sets of training ECG traces, wherein each set of the sets of training ECG traces represents sensed heart activity over a training time period for a respective associated training patient of a plurality of training patients;

10 receiving, for each set of the plurality of sets of training ECG traces, a respective diagnosis for the training patient associated with the set of training ECG traces;

for each of the training ECG traces:

identifying a plurality of corresponding training ECG trace segments, each of the training ECG trace segments representing patient heart activity over a segment of the training

15 time period; and

determining a representative training ECG trace based on at least one of the identified corresponding training ECG trace segments; and

causing the at least one neural network classifier to be trained using the representative training ECG traces and the diagnoses.

20 14. A computer-implemented method of facilitating electrocardiogram ("ECG") analysis, the method comprising:

receiving a plurality of sets of training ECG traces, wherein each set of the sets of training ECG traces represents sensed heart activity over a training time period for a respective associated training patient of a plurality of training patients;

25 receiving, for each set of the plurality of sets of training ECG traces, a respective diagnosis for the training patient associated with the set of training ECG traces;

for each of the training ECG traces:

identifying a plurality of corresponding training ECG trace segments, each of the training ECG trace segments representing patient heart activity over a segment of the training

time period;

and determining a representative training ECG trace based on at least one of the identified corresponding training ECG trace segments;

and causing at least one neural network classifier to be trained using the representative training ECG traces and the diagnoses, the at least one neural network classifier configured to output one or more diagnostically relevant scores related to at least one diagnosis.

15 15. The method of claim 14 wherein determining the representative training ECG trace comprises identifying a subset of the plurality of corresponding training ECG trace segments, the subset excluding at least one of the plurality of corresponding training ECG trace segments, and determining the representative training ECG trace based on the identified subset.

16. The method of claim 15 wherein identifying the subset of the plurality of corresponding training ECG trace segments comprises:

15 applying principal component analysis to the plurality of corresponding training ECG trace segments to determine a respective set of principal component scores associated with each of the corresponding training ECG trace segments; and

comparing the principal component scores to identify the at least one of the plurality of corresponding training ECG trace segments to be excluded from the subset.

20 17. The method of claim 16 wherein each of the sets of principal component scores includes a first principal component score and a second principal component score and wherein comparing the principal component scores comprises:

determining a first confidence limit and a second confidence limit from the first and second principal component scores respectively; and

25 for each of the corresponding training ECG trace segments, comparing the first and second principal component scores associated with the training ECG trace segment to the first and second confidence limits.

18. The method of claim 17 wherein comparing the first and second principal component scores associated with the training ECG trace segment to the first and second

confidence limits comprises determining whether the first and second principal component scores are outside of an ellipse having a radius set by the first and second confidence limits, and if so, identifying the training ECG trace segment to be excluded from the subset.

- 5 19. The method of claim 17 or 18 wherein determining the first and second confidence limits comprises applying a Hotelling T2 statistic equation to the first and second principal component scores respectively.
20. The method of claim 19 wherein applying the Hotelling T2 statistic equation to the first and second principal component scores comprises using the critical value of the
- 10 F-distribution at at least about 95% confidence.
21. The method of any one of claim 15 to 20 wherein determining the representative ECG trace based on the at least one of the identified corresponding training ECG trace segments comprises averaging the corresponding training ECG trace segments included in the subset.
- 15 22. The method of any one of claims 14 to 21 wherein identifying the plurality of corresponding training ECG trace segments comprises identifying respective common features in the training ECG trace segments and identifying respective start and end times for each of the plurality of training ECG trace segments relative to the identified common features.
- 20 23. The method of claim 22 wherein identifying the respective common features comprises identifying respective R peaks in each of the training ECG trace segments.
24. The method of any one of claims 14 to 23 wherein the at least one neural network classifier includes a BrS neural network classifier and wherein each of the diagnoses received includes a BrS diagnoses.
- 25 25. A system for facilitating electrocardiogram ("ECG") analysis comprising at least one processor configured to perform the method of any one of claims 1 to 24.
26. A non-transitory computer readable medium having stored thereon codes which when executed by at least one processor cause the at least one processor to perform the method of any one of claims 1 to 24.