

CLAIMS

1. A system, comprising:
a host processor;
memory accessible by the host processor storing
a topology of a neural network,
a plurality of weights sets to configure the topology to execute a base calling operation,
weight sets in the plurality of weights sets trained on respective training data sets in a
plurality of training data sets, the training data sets corresponding to respective
sequencing events in a plurality of sequencing events of the base calling operation, the
sequencing events spanning temporal progression of the base calling operation through
subseries of sensing cycles in a series of sensing cycles, and spatial progression of the
base calling operation through locations on a biosensor, and
sensor data for sensing cycles in the series of sensing cycles; and
a configurable processor having access to the memory and configured with data flow logic to
load the topology on processing elements of the configurable processor,
select a weight set from the plurality of weights sets based at least in part on a subject
subseries of sensing cycles and/or a subject location on the biosensor,
load, on the processing elements, subject sensor data for the subject subseries of sensing
cycles and the subject location on the biosensor, and
load weights in the selected weight set on the processing elements to configure the topology
with the weights, and to cause the neural network to apply the weights in the selected
weight set on the subject sensor data to produce base call classification data.
2. The system of claim 1, wherein the subseries of sensing cycles include a subseries of
initial sensing cycles, a subseries of intermediate sensing cycles, and a subseries of final sensing
cycles, and wherein the training data sets and the weight sets respectively correspond to the
subseries of initial sensing cycles, the subseries of intermediate sensing cycles, and the subseries
of final sensing cycles.
3. The system of claim 1 or 2, wherein the locations on the biosensor include edge locations
and non-edge locations, and wherein the training data sets and the weight sets respectively
correspond to the edge locations and the non-edge locations.
4. The system of any of claims 1-3, wherein the locations on the biosensor include first
quadrant locations, second quadrant locations, third quadrant locations, and fourth quadrant
locations, and wherein the training data sets and the weight sets respectively correspond to the

first quadrant locations, the second quadrant locations, the third quadrant locations, and the fourth quadrant locations.

5. The system of any of claims 1-4, wherein the biosensor is partitioned into a plurality of tiles, and individual ones of the edge locations, the non-edge locations, the first quadrant locations, the second quadrant locations, the third quadrant locations, and the fourth quadrant locations comprise corresponding one or more tiles of the plurality of tiles.

6. The system of any of claims 1-5, wherein the sequencing events span temporal progression of the base calling operation through base calling paired-end reads, and wherein the training data sets and the weight sets respectively correspond to reads in the paired-end reads.

7. The system of any of claims 1-6, wherein:

the subseries of sensing cycles include a subseries of initial sensing cycles, a subseries of

intermediate sensing cycles, and a subseries of final sensing cycles;

the locations on the biosensor include edge locations and non-edge locations; and

the training data sets and therefore the weight sets respectively correspond to (i) the subseries of

initial sensing cycles and the edge locations, (ii) the subseries of intermediate sensing cycles

and the edge locations, (iii) the subseries of final sensing cycles and the edge locations, (iv)

the subseries of initial sensing cycles and the non-edge locations, (v) the subseries of

intermediate sensing cycles and the non-edge locations, and (vi) the subseries of final sensing

cycles and the non-edge locations.

8. The system of any of claims 1-7, wherein:

the subseries of sensing cycles include a subseries of initial sensing cycles, a subseries of

intermediate sensing cycles, and a subseries of final sensing cycles;

the locations on the biosensor include first category of locations and second category of

locations; and

the training data sets and therefore the weight sets respectively correspond to (i) the subseries of

initial sensing cycles and the first category of locations, (ii) the subseries of intermediate

sensing cycles and the first category of locations, (iii) the subseries of final sensing cycles

and the first category of locations, (iv) the subseries of initial sensing cycles and the second

category of non-edge locations, (v) the subseries of intermediate sensing cycles and the

second category of locations, and (vi) the subseries of final sensing cycles and the second

category of locations.

9. The system of any of claims 1-8, wherein the configurable processor is further to:

determine one or more parameters of the current sequencing run; and
select the weight set from the plurality of weights sets based further on the one or more
determined parameters of the current sequencing run.

10. The system of claim 9, wherein the one or more determined parameters of the current sequencing run comprises one or more of a characteristic of reaction components used in the biosensor, or a phasing characteristic associated with the sensor data.

11. A system, comprising:

a host processor;

memory accessible by the host processor storing

a topology of a neural network,

first, second, and third weight sets for configuring the topology to execute a base calling

operation, the first, second, and third weight sets respectively corresponding to first,

second, and third subseries of sensing cycles in a series of sensing cycles, and

first, second, and third sensor data respectively corresponding to the first, second, and third

subseries of sensing cycles; and

a configurable processor having access to the memory and configured with data flow logic to
load the topology on processing elements of the configurable processor,

load the first sensor data on the processing elements, load the first weight set on the

processing elements to configure the topology with weights in the first weight set, and

cause the neural network to apply the weights in the first weight set on the first sensor

data to produce first base call classification data for sensing cycles in the first subseries of
sensing cycle,

load the second sensor data on the processing elements, load the second weight set on the

processing elements to configure the topology with weights in the second weight set, and

cause the neural network to apply the weights in the second weight set on the second

sensor data to produce second base call classification data for sensing cycles in the

second subseries of sensing cycle, and

load the third sensor data on the processing elements, load the third weight set on the

processing elements to configure the topology with weights in the third weight set, and

cause the neural network to apply the weights in the third weight set on the third sensor

data to produce third base call classification data for sensing cycles in the third subseries
of sensing cycle.

12. The system of claim 11, wherein the memory further stores:

fourth, fifth, and subsequent weight sets for configuring the topology to execute a base calling operation, the fourth, fifth, and subsequent weight sets respectively corresponding to fourth, fifth, and subsequent subseries of sensing cycles in the series of sensing cycles; and fourth, fifth, and subsequent sensor data for the fourth, fifth, and subsequent subseries of sensing cycles.

13. The system of claim 11 or 12, wherein the configurable processor is configured with data flow logic to:

load the fourth sensor data on the processing elements, load the fourth weight set on the processing elements to configure the topology with weights in the fourth weight set, and cause the neural network to apply the weights in the fourth weight set on the fourth sensor data to produce fourth base call classification data for sensing cycles in the fourth subseries of sensing cycle;

load the fifth sensor data on the processing elements, load the fifth weight set on the processing elements to configure the topology with weights in the fifth weight set, and cause the neural network to apply the weights in the fifth weight set on the fifth sensor data to produce fifth base call classification data for sensing cycles in the fifth subseries of sensing cycle; and

load the subsequent sensor data, and the subsequent weight set on the processing elements to configure the topology with weights in the subsequent weight set, and to cause the neural network to apply the weights in the subsequent weight set on the subsequent sensor data to produce subsequent base call classification data for sensing cycles in the subsequent subseries of sensing cycle.

14. The system of any of claims 11-13, wherein the topology takes, as input, sensor data from successive sensing cycles, and the topology includes spatial layers that do not combine the sensor data and resulting feature maps between the successive sensing cycles, and temporal layers that combine resulting feature maps between the successive sensing cycles.

15. The system of any of claims 11-14, wherein the first weight set includes first spatial weights for the spatial layers and first temporal weights for the temporal layers, the second weight set includes second spatial weights for the spatial layers and second temporal weights for the temporal layers, and the third weight set includes third spatial weights for the spatial layers and third temporal weights for the temporal layers.

16. The system of any of claims 11-15, wherein the first weight set includes spatial weights for the spatial layers and first temporal weights for the temporal layers, the second weight set

includes second temporal weights for the temporal layers, and the third weight set includes third temporal weights for the temporal layers, and wherein the configurable processor is configured with data flow logic to:

load the first sensor data on the processing elements, load the spatial weights and the first temporal weights on the processing elements to configure the spatial layers with the spatial weights and the temporal layers with the first temporal weights, and cause the neural network to apply the configured spatial and temporal layers on the first sensor data to produce first base call classification data for sensing cycles in the first subseries of sensing cycle;

load the second sensor data on the processing elements, load the second temporal weights on the processing elements to reconfigure the temporal layers with weights in the second temporal weights, without reconfiguring the spatial layers, and cause the neural network to apply the reconfigured temporal layers and the previously configured spatial layers on the second sensor data to produce second base call classification data for sensing cycles in the second subseries of sensing cycle; and

load the third sensor data on the processing elements, load the third temporal weights on the processing elements to reconfigure the temporal layers with weights in the third temporal weights, without reconfiguring the spatial layers, and cause the neural network to apply the reconfigured temporal layers and the previously configured spatial layers on the third sensor data to produce third base call classification data for sensing cycles in the third subseries of sensing cycle.

17. The system of any of claims 11-16, wherein weights in the first, second, and third weight sets are quantized using different scaling factors.

18. The system of any of claims 11-17, wherein weights in the first, second, and third weight sets respectively correspond to first, second, and third sequencing chemistries.

19. The system of any of claims 11-18, wherein weights in the first, second, and third weight sets respectively correspond to first, second, and third sequencing assays.

20. The system of any of claims 11-19, wherein weights in the first, second, and third weight sets respectively correspond to first, second, and third sequencing configurations.

21. A computer-implemented method for generating base call classification data, comprising: loading a topology of a neural network on processing elements of a processor, the processor to execute base call operations;

storing (i) first sensor data from clusters within first one or more tiles of a flow cell, (ii) second sensor data from clusters within second one or more tiles of the flow cell, (iii) a first weight set comprising first one or more weights, and (iv) a second weight set comprising second one or more weights, wherein the first sensor data and the second sensor data are generated during a subset of sensing cycles in a series of sensing cycles;

configuring the topology of the neural network with the first weight set, and causing the neural network configured with the first weight set to process the first sensor data and to produce first base call classification data for the first one or more tiles and for the subset of sensing cycles; and

configuring the topology of the neural network with the second weight set, and causing the neural network configured with the second weight set to process the second sensor data and to produce second base call classification data for the second one or more tiles and for the subset of sensing cycles.

22. The method of claim 21, wherein the subset of sensing cycles is a first subset of sensing cycles, and wherein the method further comprises:

storing (i) third sensor data from clusters within the first one or more tiles, (ii) fourth sensor data from clusters within the second one or more tiles, (iii) a third weight set, and (iv) a fourth weight set, wherein the third sensor data and the fourth sensor data are generated during a second subset of sensing cycles in the series of sensing cycles, the second subset of sensing cycles subsequent to the first subset of sensing cycles in the series of sensing cycles;

configuring the topology of the neural network with the third weight set, and causing the neural network configured with the third weight set to process the third sensor data and to produce third base call classification data for the first one or more tiles and for the second subset of sensing cycles; and

configuring the topology of the neural network with the fourth weight set, and causing the neural network configured with the fourth weight set to process the fourth sensor data and to produce fourth base call classification data for the second one or more tiles and for the second subset of sensing cycles.

23. The method of claim 21 or 22, wherein:

the first one or more tiles are within a first area of the flow cell; and

the second one or more tiles are within a second area of the flow cell.

24. The method of any of claims 21-23, wherein:

the first one or more tiles are edge tiles of the flow cell; and
the second one or more tiles are non-edge tiles of the flow cell.

25. The method of any of claims 21-24, further comprising:

generating the first weight set by training the neural network on sensor data generated solely from edge tiles; and
generating the second weight set by training the neural network on sensor data generated solely from non-edge tiles.

26. A system, comprising:

a host processor;
memory accessible by the host processor storing (i) a topology of a neural network, and (ii) a plurality of weights to configure the topology to execute a basecalling operation, wherein the plurality of weights are based on tile locations, a series of sensing cycles, and/or sensor data; and
a configurable processor having access to the memory and configured with data flow logic to
load the topology on processing elements of the configurable processor,
load the plurality of weights on the processing elements to configure the topology with the plurality of weights, to cause the neural network to produce base call classification data.

27. The system of claim 26, wherein the plurality of weights is a first plurality of weights, the tile locations are first tile locations, the series of sensing cycles is a first series of sensing cycles, and the sensor data are first sensor data, and wherein:

the memory is to further store a second plurality of weights to configure the topology to execute a basecalling operation, wherein the second plurality of weights are based on second tile locations, a second series of sensing cycles, and/or second sensor data; and
the configurable processor is configured with data flow logic to
load the second plurality of weights on the processing elements to configure the topology with the second plurality of weights, to cause the neural network to produce additional base call classification data.

28. The system of claim 27, wherein:

the first tile locations are on a first area within a flow cell; and
the second tile locations are on a second area within the flow cell.

29. The system of claim 27 or 28, wherein:

the second series of sensing cycles occur subsequent to the first series of sensing cycles.