

CLAIMS

Claim 1. 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 divided from a series of sensing cycles,

wherein the first, second, and third weight sets are determined using respective training

data generated during the first, second, and third subseries 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.

Claim 2. The system of claim 1, 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.

Claim 3. The system of claim 1 or 2, 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.

Claim 4. The system of any of claims 1-3, 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.

Claim 5. The system of any of claims 1-4, 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.

Claim 6. The system of any of claims 1-5, 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.

Claim 7. The system of any of claims 1-6, wherein weights in the first, second, and third weight sets are quantized using different scaling factors.

Claim 8. The system of any of claims 1-7, wherein weights in the first, second, and third weight sets respectively correspond to first, second, and third sequencing chemistries.

Claim 9. The system of any of claims 1-8, wherein weights in the first, second, and third weight sets respectively correspond to first, second, and third sequencing assays.

Claim 10. The system of any of claims 1-9, wherein weights in the first, second, and third weight sets respectively correspond to first, second, and third sequencing configurations.

Claim 11. 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 corresponding to first one or more tile locations of a flow cell, (ii) second sensor data from clusters corresponding to second one or more tile locations 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 divided from a series of sensing cycles, and wherein the first weight set and the second weight set are determined using respective training data corresponding to the first one or more tile locations and the second one or more tile locations of the flow cell;

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.

Claim 12. The method of claim 11, 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.

Claim 13. The method of claim 11 or 12, 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.

Claim 14. The method of any of claims 11-13, 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.

Claim 15. The method of any of claims 11-14, 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.

Claim 16. A non-transitory computer readable storage medium storing instructions that, when executed by at least one processor, cause a system to:

load a topology of a neural network on processing elements of a processor, the processor to execute base call operations;
store (i) first sensor data from clusters corresponding to first one or more tile locations of a flow cell, (ii) second sensor data from clusters corresponding to second one or more tile locations 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 divided from a series of sensing cycles, and wherein the first weight set and the second weight set are determined using respective training data corresponding to the first one or more tile locations and the second one or more tile locations of the flow cell;
configure the topology of the neural network with the first weight set, and cause 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

configure the topology of the neural network with the second weight set, and cause 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.

Claim 17. The non-transitory computer readable storage medium recited in claim 16, wherein the subset of sensing cycles is a first subset of sensing cycles, and further comprising instructions, that when executed by the at least one processor, cause the system to:

store (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;
configure the topology of the neural network with the third weight set, and cause 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

configure the topology of the neural network with the fourth weight set, and cause 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.

Claim 18. The non-transitory computer readable storage medium recited in claim 16 or 17, 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.

Claim 19. The non-transitory computer readable storage medium recited in claim 16-18, 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.

Claim 20. The non-transitory computer readable storage medium recited in claim 16-19, further comprising instructions, that when executed by the at least one processor, cause the system to:

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