

CLAIMS

1. A system, comprising:

at least one processor; and

a non-transitory computer-readable medium comprising instructions thereon that, when executed by the at least one processor, cause the system to:

~~memory-stor~~e~~ing~~, for a current sequencing cycle of a sequencing run, respective current intensity values for respective pixels in a plurality of pixels;

~~the memory-stor~~e~~ing~~, for one or more previous sequencing cycles of the sequencing run that precede the current sequencing cycle, sequences of respective previous intensity values for the respective pixels;

generate, using a state generator, ~~having access to the memory, configured to generate~~ respective current state values for the respective pixels in dependence upon:

(i) the respective current intensity values, and

(ii) respective previous intensity values in the sequences of respective previous intensity values;

~~and to store the respective current state values in the memory;~~ and

generate, using a base caller, ~~having access to the memory, configured to generate~~ base calls for the current sequencing cycle in response to processing:

(i) the respective current intensity values, and

(ii) the respective current state values.

2. The system of claim 1, wherein:
respective intensity values for the respective pixels are each characterized by channel-specific intensity values for a plurality of channels; and
respective state values for the respective pixels are each characterized by channel-specific state values for the plurality of channels.

~~3. The system of claim 1 or 2, wherein respective state values for the respective pixels are each characterized by channel-specific state values for the plurality of channels.~~

~~4. The system of any of claims 1-3, wherein the respective current state values are pixel-wise encoded with the respective current intensity values.~~

35. The system of ~~any of claims 2-4~~ claim 2, wherein channel-specific state values for a subset of channels in the plurality of channels are pixel-wise encoded with the respective current intensity values.

46. The system of ~~any of claims 3-5~~ claim 2, wherein the channel-specific state values are averaged across channels in the plurality of channels to generate respective pan-channel current state values, wherein the respective pan-channel current state values are pixel-wise encoded with the respective current intensity values.

~~7. The system of any of claims 4-6, wherein the pixel-wise encoding includes pixel-wise concatenation.~~

~~8. The system of any of claims 4-7, wherein the pixel-wise encoding includes pixel-wise summing.~~

~~59.~~ The system of any of claims 1-~~48~~, wherein the respective current state values are respective current average intensities determined for the respective pixels at the current sequencing cycle from

- (i) the respective previous intensity values, and
- (ii) the respective current intensity values.

~~640.~~ The system of claim ~~59~~, wherein the respective current average intensities are each characterized by channel-specific current average intensities.

~~744.~~ The system of any of claims 1-~~48~~, wherein the respective current state values are respective current maximum intensities determined for the respective pixels at the current sequencing cycle from:

- (i) the respective previous intensity values~~;~~ and
- (ii) the respective current intensity values.

~~842.~~ The system of claim ~~744~~, wherein the respective current maximum intensities are each characterized by channel-specific current maximum intensities.

9. A computer-implemented method, comprising:
accessing, for a current sequencing cycle of a sequencing run, respective current intensity
values for respective pixels in a plurality of pixels;
accessing, for one or more previous sequencing cycles of the sequencing run that precede
the current sequencing cycle, sequences of respective previous intensity values for the respective
pixels;
generating, using a state generator, respective current state values for the respective pixels
in dependence upon:
_____ (i) the respective current intensity values; and
_____ (ii) respective previous intensity values in the sequences of respective previous
intensity values; and
generating, using a base caller, base calls for the current sequencing cycle in response to
processing:
_____ (i) the respective current intensity values; and
_____ (ii) the respective current state values.

1013. The ~~system~~ computer-implemented method of claim 9 ~~of any of claims 1-8~~, wherein
the respective current state values are respective current minimum intensities determined for the
respective pixels at the current sequencing cycle from
(i) the respective previous intensity values, and
(ii) the respective current intensity values.

1144. The computer-implemented method ~~system~~ of claim 1013, wherein the respective current minimum intensities are each characterized by channel-specific current minimum intensities.

1215. The computer-implemented method of any of claims 9-11 ~~system of any of claims 1-14~~, wherein the respective current state values are respective current exponentially weighted average intensities determined for the respective pixels at the current sequencing cycle from

- (i) the respective previous intensity values, and
- (ii) the respective current intensity values.

1316. The computer-implemented method ~~system~~ of claim 12-15, wherein the respective current exponentially weighted average intensities are determined based on weighting recent sequencing cycles more than earlier sequencing cycles.

1417. The computer-implemented method ~~system~~ of claim 12-15 or 13-16, wherein the respective current exponentially weighted average intensities are each characterized by channel-specific current exponentially weighted average intensities.

15. A non-transitory computer-readable storage medium comprising instructions that, when executed by at least one processor, cause a computing device to:

access, for a current sequencing cycle of a sequencing run, respective current intensity values for respective pixels in a plurality of pixels;

access, for one or more previous sequencing cycles of the sequencing run that precede the current sequencing cycle, sequences of respective previous intensity values for the respective pixels;

generate, using a state generator, respective current state values for the respective pixels in dependence upon:

(i) the respective current intensity values; and

(ii) respective previous intensity values in the sequences of respective previous intensity values; and

generate, using a base caller, base calls for the current sequencing cycle in response to processing:

(i) the respective current intensity values; and

(ii) the respective current state values.

1618. The non-transitory computer-readable storage medium ~~system~~ of claim ~~any of claims 1-11~~ 15, wherein the respective current state values are respective current moving average intensities determined for the respective pixels at the current sequencing cycle from

(i) the respective current intensity values, and

(ii) a rolling subset of the respective previous intensity values.

1719. The non-transitory computer-readable storage medium ~~system~~ of claim 1618, wherein the respective current moving average intensities are each characterized by channel-specific current moving average intensities.

~~1820.~~ The non-transitory computer-readable storage medium ~~system~~ of any of claims ~~1-19~~ 15-17, wherein each of the respective current intensity values is attributed to an active state bucket or an inactive state bucket based on comparison of the respective current intensity values to respective current active state intensities and respective current inactive state intensities.

~~1921.~~ The non-transitory computer-readable storage medium ~~system~~ of claim ~~20~~ 18, wherein the respective current active state intensities are respective current global maximum intensities determined for the respective pixels at the current sequencing cycle from

(i) the respective previous intensity values.

~~22.—The system of claim 21, wherein the respective current global maximum intensities are each characterized by channel-specific current global maximum intensities.~~

~~23.—The system of any of claims 20, wherein the respective current inactive state intensities are respective current global minimum intensities determined for the respective pixels at the current sequencing cycle from~~

~~(i) the respective previous intensity values.~~

~~24.—The system of claim 23, wherein the respective current global minimum intensities are each characterized by channel-specific current global minimum intensities.~~

~~25. The system of any of claims 1-24, wherein the respective current state values further include respective current active state values and respective current inactive state values generated for the respective pixels at the current sequencing cycle.~~

~~26. The system of claim 25, wherein the respective current active state values are each characterized by channel-specific current active state values.~~

~~27. The system of claim 25 or 26, wherein the respective current inactive state values are each characterized by channel-specific current inactive state values.~~

20. The non-transitory computer-readable storage medium ~~system~~ of any of claims ~~20-~~
~~27~~ 15-19, wherein a current active state value for a pixel in a subject channel is determined at the
current sequencing cycle from:

(i) a current intensity value for the pixel in the subject channel that is detected and attributed
to ~~the~~ an active state bucket at the current sequencing cycle; and

(ii) previous intensity values for the pixel in the subject channel that were detected at the
previous sequencing cycles.

~~29. A system, comprising:~~

~~memory storing current sequencing images for clusters for a current sequencing cycle of a
sequencing run, and previous sequencing images for the clusters for one or more previous
sequencing cycles of the sequencing run that precede the current sequencing cycle;~~

~~a host processor having access to the memory and configured to generate, for the current sequencing cycle, current per-pixel states for pixels in the sequencing images based on the current sequencing images and the previous sequencing images;~~

~~a configurable processor having access to the memory and configured to execute a neural network to produce base call classification scores; and~~

~~a data flow logic having access to the memory, the host processor, and the configurable processor and configured~~

~~to provide the current per-pixel states and the current sequencing images to the neural network and cause the neural network to produce current base call classification scores for the clusters for the current sequencing cycle in response to processing the current per-pixel states and the current sequencing images, and~~

~~to provide the current base call classification scores to the host.~~

30. —A system, comprising:

~~a neural network-based base caller configured to process a first sliding window of sequencing cycles including sequencing images for a center sequencing cycle, one or more right flanking sequencing cycles, and one or more left flanking sequencing cycles;~~

~~a state generator configured to determine per-pixel states of the sequencing images in the first sliding window of sequencing cycles based on (i) pixel intensities in a sequencing image for the center sequencing cycle in the first sliding window of sequencing cycles, and (ii) pixel intensities in sequencing images for sequencing cycles preceding the center sequencing cycle in the first sliding window of sequencing cycles; and~~

~~the neural network-based base caller further configured to process the sequencing images in the first sliding window of sequencing cycles along with the per-pixel states to base call the center sequencing cycle in the first sliding window of sequencing cycles.~~

31. —A computer-implemented method, including:

~~accessing current window-sequenced signal data for a first plurality of sequencing cycles in a current sliding window of sequencing cycles;~~

~~accessing previous-sequenced signal data for a second plurality of sequencing cycles that precede sequencing cycles in the first plurality of sequencing cycles;~~

~~generating state signal data based on the current window-sequenced signal data and the previous-sequenced signal data; and~~

~~base calling at least one sequencing cycle in the first plurality of sequencing cycles in response to processing the current window-sequenced signal data and the state signal data.~~