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Hebbian based learning with winner-take-all for spiking neural networks ANKUR GUPTA, LYLE LONG, The Pennsylvania State University — Learning methods for spiking neural networks are not as well developed as the traditional neural networks that widely use back-propagation training. We propose and implement a Hebbian based learning method with winner-take-all competition for spiking neural networks. This approach is spike time dependent which makes it naturally well suited for a network of spiking neurons. Homeostasis with Hebbian learning is implemented which ensures stability and quicker learning. Homeostasis implies that the net sum of incoming weights associated with a neuron remains the same. Winner-take-all is also implemented for competitive learning between output neurons. We implemented this learning rule on a biologically based vision processing system that we are developing, and use layers of leaky integrate and fire neurons. The network when presented with 4 bars (or Gabor filters) of different orientation learns to recognize the bar orientations (or Gabor filters). After training, each output neuron learns to recognize a bar at specific orientation and responds by firing more vigorously to that bar and less vigorously to others. These neurons are found to have bell shaped tuning curves and are similar to the simple cells experimentally observed by Hubel and Wiesel in the striate cortex of cat and monkey.

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