In considering that the Hecht-Nielsen function either doesn’t change in value or is negative as shown in the videos, can you make cogent arguments as to why this implies there can be no cycling?

Cycling, inherently, is the transition from state A, through other states and back to state A again, thus producing a cycle. The Hecht-Nielson function gives a value for each state via the function. For a cycle to be produced, the state must transition from a state, through other states and back to the state. Given that the Hecht-Nielson function can be computed for each state, it would be impossible to produce a cycle given that the Hecht-Nielson function will either decrease or remain the same for each state. Thus, once a state is changed to a lower Hecht-Nielson function value, the state cannot be reached again, thus there can not be any cycling.

If the order of asynchronously updating nodes in a Hopfield network is changed, what does this imply insofar as the dynamical system is concerned?  In other words, the sequence of vectors is different and each vector corresponds to some point in a high-dimensional space --- so if the order of nodes that are updated is changed, how does this affect the sequence of points in this higher dimensional space?

I may liken the order of asynchronously updating nodes in a Hopfield network to the order that training data is fed to a neural network. While the order of asynchronously updating nodes in a Hopfield network may have some effect on the error for an individual iteration, the direction of the optimization should not be strongly effected. Thus while having a clever algorithm to determine the order of asynchronous updates in a Hopfield network may improve the speed of training incrementally, it may be possible to get similar performance from a trained network using a few extra training cycles.

Similar to the order of updating neural networks, error per iteration charts may be effected, however the direction of optimization should be unaffected.