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Digital reconstructions of NCx & SSCx: Highly detailed, biologically motivated structure and functional tracking.

Setting: The BlueBrain model is complex. A simplified, topological view allows for activity tracking and reveals competing neuron functions.



Motivation: Construct a random model whose topology matches the topology of observed neural circuits.

applied topology

eco-topology

Inferring species observations from limited data: reconstructing the fundamental niche.

Setting: The hypervolume (niche as a dataset) is thought to have holes, which indicate climate pressures. Current methods use KDEs that blur sparse observations and obscure topology.



Motivation: Develop computational methods for inferencing and sparsification while respecting topology.

$dynamic\ topology$

Performing updates to persistent homology summaries: reusing already done computations.



Setting: Generalized structures allow for all dynamic changes, but are not implemented and are inefficient. Most commonly used software does not keep track of executed matrix operations.



Motivation: Implement usable software that updates class representatives with minimal operations. Focus on simplex removal.