

	Type	Function	Description	Included in LMeasure
Neuron	Structure	<i>Add Branch</i>	Appends a TracingPoint object as a new branch root to the neuron	NA
		<i>Center Soma</i>	Translates all Neuron coordinates such that the soma centroid falls on the origin (0, 0, 0).	NA
		<i>Scale</i>	Scales the neuron by a given factor along each axis	NA
		<i>Translate</i>	Transforms all coordinates along a given distance along each axis	NA
		<i>Rotate</i>	Rotates all coordinates by given angles around each axis	NA
		<i>Add Soma Points</i>	Appends a list of points as a new soma layer to the neuron	NA
	Morphometric	<i>Width</i>	Calculates the width of the bounding box around a given neuron	Yes
		<i>Height</i>	Calculates the height of the bounding box around a given neuron	Yes
		<i>Depth</i>	Calculates the depth of the bounding box around a given neuron	Yes
		<i>Soma Centroid</i>	Calculates the center-of-mass of all the soma points	No
		<i>Total Root Branches</i>	Calculates the number of branch roots included in the neuron	Yes
		<i>Total Child Nodes</i>	Calculates the number of child nodes included in the neuron	Yes
		<i>Total Tip Nodes</i>	Calculates the total tip (end of branch) nodes included in the neuron	Yes
		<i>Total Bifurcation Nodes</i>	Calculates the total number of bifurcation (branching point) nodes included in the neuron	Yes
		<i>Soma Volume</i>	Calculates the total volume of the neuron's soma points	Yes
		<i>Soma Surface Area</i>	Calculates the total surface area of the neuron's soma points	Yes
		<i>Soma Slice Perimeter</i>	Calculates the perimeter of each Z-slice defined for the soma	No
		<i>Persistence Diagram</i>	Runs a given function over all segments and returns a list of results, can be used to implement persistence diagrams	No
		<i>Arborization Distance</i>	Calculates the distance from the soma centroid to the average of all branch coordinates	No
		<i>Maximum Branch Angle</i>	Finds the largest branching angle in the Neuron	Yes
		<i>Minimum Branch Angle</i>	Finds the minimum branching angle in the Neuron	Yes
		<i>Average Branch Angle</i>	Calculates the average of all branching angles in the neuron	Yes
		<i>Maximum Path Angle</i>	Finds the largest path angle in the Neuron	Yes
		<i>Median Path Angle</i>	Finds the median path angle in the Neuron	Yes
		<i>All Branch Angles</i>	Returns a list of all branch angles in the neuron	Yes
		<i>Max Tortuosity</i>	Finds the largest tortuosity in the Neuron	No
	<i>Median Tortuosity</i>	Finds the median tortuosity in the Neuron	No	
	<i>Maximum Branching Order</i>	Calculates the highest branching order achieved by any tip node	Yes	
	<i>All Segment Lengths</i>	Returns a list of all segment lengths in the Neuron	No	
	<i>All Path Angles</i>	Returns a list of all path angles in the Neuron	No	
	Distributions	<i>Branch Order Counts</i>	Returns a count list of all branch orders	No
		<i>Branch Order Histogram</i>	Returns a histogram of all branch orders of all bifurcations	No
		<i>Path Angle Histogram</i>	Returns a histogram of all path angles	No
<i>Path Distance to Soma Histogram</i>		Returns a histogram of all path distances to the soma	No	

<b>TracingPoint</b>		<i>Euclidean Distance to Soma Histogram</i>	Returns a histogram of Euclidean distances from each TracingPoint to the soma	No
		<i>Thickness Histogram</i>	Returns a histogram of all TracingPoint thicknesses	No
		<i>Branch Angle Histogram</i>	Returns a histogram of all branch angles	No
		<i>Path Angles Histogram</i>	Returns a histogram of all path angles	No
		<i>Branch Angles by Branch Orders</i>	Performs a 2D histogram of branch angles and branch orders	No
		<i>Branch Angles by Path Distance</i>	Performs a 2D histogram of branch angles and path distances	No
		<i>Thickness by Branch Order</i>	Performs a 2D histogram of thickness by branch order	No
		<i>Thickness by Path Distance</i>	Performs a 2D histogram of thickness by path distance	No
	<b>Utility</b>	<i>Get Main Branch</i>	Finds the longest branch in the neuron and returns it	NA
		<i>Plot</i>	Generates a X, Y, or Z maximum projection of an entire neuron	No
		<i>Iterate All Points</i>	Iterates through all TracingPoint objects as a Python generator object	NA
		<i>From SWC</i>	Imports a SWC file from either a file on the disk or a Python string object	NA
		<i>To SWC</i>	Exports the neuron as a SWC to either a file or Python string object	NA
		<i>Fix Parents</i>	Ensures that all nodes in the Neuron are correctly linked in the tree structure	NA
	<b>Structure</b>	<i>Add Child</i>	Adds another TracingPoint as either an extension of a single branch if one does not already exist, or as a second sub-branch	NA
		<i>Get Tip Nodes</i>	Returns a list of all tip node TracingPoints	Yes
		<i>Get Bifurcation Nodes</i>	Returns a list of all bifurcation node TracingPoints	Yes
		<i>Get All Nodes</i>	Returns a list of all node TracingPoints	NA
		<i>Get All Segments</i>	Returns a list of all TracingPoint pairs representing individual segments along the branch	NA
		<i>Path Distance to Child</i>	Returns the path distance from the given point and a given child node	Yes
		<i>Next Bifurcation Point</i>	Finds the nearest neighbor bifurcation point in the branch tree	NA
	<i>Select Nodes</i>	Returns all nodes which return true for a given test function, used to select TracingPoints which meet a given criteria	NA	
<b>Morphometric</b>	<i>Total Children</i>	Counts the number of subbranches present at this TracingPoint	Yes	
	<i>Total Child Nodes</i>	Recursively counts the number of TracingPoints that make up all subbranches of this TracingPoint	Yes	
	<i>Total Tip Nodes</i>	Counts the total number of child nodes which are tips nodes	Yes	
	<i>Total Bifurcation Nodes</i>	Counts the total number of child nodes which are bifurcation nodes	Yes	
	<i>Is Tip Node</i>	Returns True if the node is a tip node	Yes	
	<i>Is Bifurcation Node</i>	Returns True if the node is a bifurcation node	Yes	
	<i>Is Root Node</i>	Returns True if the node is a root node	Yes	
	<i>Path Distance to Root</i>	Calculates the total path distance from this node to the soma	Yes	
	<i>Width</i>	Calculates the width of a bounding box around the branch	Yes	
	<i>Height</i>	Calculates the height of a bounding box around the branch	Yes	
	<i>Depth</i>	Calculates the depth of a bounding box around the branch	Yes	
	<i>Volume</i>	Calculates the volume of a bounding box around the branch	Yes	

Utility		<i>Distance to Ends</i>	Calculates the Euclidean distance to each child tip node	Yes
		<i>Path Distance to Ends</i>	Calculates the path distance to each child tip node	Yes
		<i>Partition Asymmetry</i>	Calculates the partition asymmetry of this node	Yes
		<i>Neurite Tortuosity</i>	Calculates the tortuosity of the neurite	No
		<i>Branching Order</i>	Calculates the branching order of this node	Yes
	Utility	<i>Euclidean Distance</i>	Calculates the Euclidean distance between two TracingPoints	NA
		<i>Slice Surface Area</i>	Calculates the surface area of a collections of points that define a slice	NA
		<i>Slice Perimeter</i>	Calculates the perimeter of a collection of points that define a slice	NA
		<i>To SWC</i>	Exports this branch to a SWC file	NA
		<i>Fix Parents</i>	Corrects linkages for all TracingPoint children of this node	NA
	Math	<i>Rotation Matrix</i>	Calculates a standard rotation matrix of three angles	NA
		<i>Tangent from Points</i>	Calculates a tangent vector from a list of points	NA
		<i>Dot Product</i>	Performs the dot product of two vectors	NA
		<i>Absolute Dot Product</i>	Calculates the absolute value of the dot product	NA

**Table 1 Implemented *nGauge* Functions**

All functions implemented in *nGauge*. Along the left hand side, functions are divided into different modules and function types.