

# Self-similarity of Neurons in Strahler Order Analysis

Pin-Ju Chou<sup>1\*</sup>, Ching-Che Charng<sup>2</sup>, Harrison Ku<sup>3</sup>, Chung-Chuan Lo<sup>1,2</sup>

<sup>1</sup>*Department of Life Science, National Tsing Hua University, HsingChu, Taiwan*

<sup>2</sup>*Institute of Systems Neuroscience, National Tsing Hua University, HsingChu, Taiwan*

<sup>3</sup>*Department of Computer Science, National Tsing Hua University, HsingChu, Taiwan*

Owing to the mass variation of neuron morphology, universal similarities among neurons are obscure. Meanwhile, it is important to examine the mutual laws of neuron growth underlying the diversiform appearance of neurons. Former research made use of the Strahler ordering system and shed light on the correlation of path length and branch number with Strahler order. The fact is also found in FlyCircuit whole data neurons, and this research steps further, we used the system as a metric to evaluate the symmetry of a neuron and investigated how the correlation between morphology features and Strahler order changes with different classifications of symmetry. Furthermore, this correlation variation can be transformed into formulas, describing branch number, path length, and the average path length of each Strahler order. To conclude, we provide a new method to classify the symmetry of neurons in a concise way.

Keywords: Strahler number, FlyCircuit, neuron morphology, fractals

Email: [a0989092006@gmail.com](mailto:a0989092006@gmail.com)