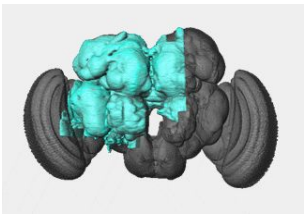


Reference Sheet: Exploring the Hemibrain

Basic Concepts/Background

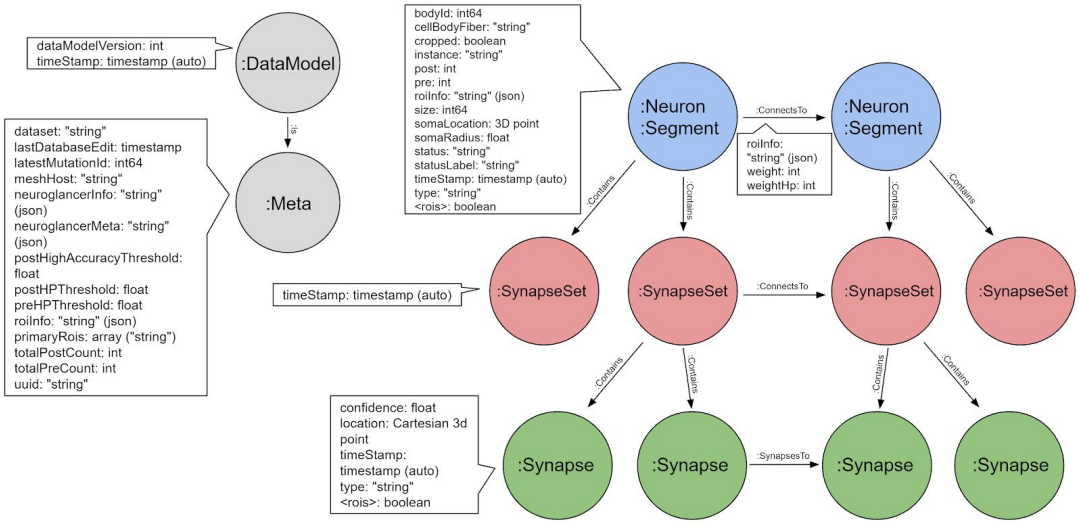
- Fruit Fly neurons are different from vertebrate neurons. The soma of fruit fly neurons migrate to the outside of the brain and do not receive any inputs from other cells at the soma location.
- Orientation of EM data: The orientation of the data is based on the fruit fly's perspective. The data is viewed head on as if the fly is looking at you. Your left is the right side of their brain and your right is the left.
- Neuron A -> Connects To-> Neuron B (super simple relationship)
    - Reference property graph for breakdown
- Neurons:
    - Receive information at their dendrites
    - Send out information from terminal buttons

Terminology

- Connectomics - the production and study of comprehensive maps of connections within an organism's nervous system.
- ROI/primary ROI - Region of Interest. Areas within the brain that are grouped together due to the shared function/which types of call pass through. Primary ROI will hold smaller sub ROIs
- T-Bar/Pre - Location on neuron that send out neurotransmitters into synaptic cleft
- PSD/Post - Location on neuron where receptors absorb neurotransmitters. Postsynaptic Density
- Morphology - General physical structure of a neurons body, related to function of neuron
- Percent Completeness - The number of synaptic sites that belong to a completed body divided by the number of all synaptic sites in a specified ROI.
- Post: Pre Ratio - The ratio of Postsynaptic sites to presynaptic site. Most neurons will have more postsynaptic sites than presynaptic.
- Neuprint: Database that contains all the connectomic data for the hemibrain; pronounced (new-print)
- Cypher: A SQL based language used to query Neuprint
- Neuprint-Python: API access to database
- Antennal lobe - Region of Interest that receives olfactory inputs from olfactory sensory neurons
- MBONs - Mushroom Body Output Neurons. Neurons that integrate sensory information in the learning/ memory center.
- Mushroom Body: ROI associated with olfactory learning and memory formation. One of the most well study areas of the brain
- *Drosophila Melanogaster* - Scientific name for a fruit fly!

Useful Graphics

1. Property Graph for Neuprint



2. Primary ROI breakdown with corresponding sub ROIs

Brain Region Explorer

OL - Optic Lobe

- ***LA** - Lamina (missing from data set)*
- **ME(R)** - Medulla
- **AME(R)** - Accessory Medulla
- **LO(R)** - Lobula
- **LOP(R)** - Lobula Plate

MB - Mushroom Body (+ACA)*(R/L)

- **CA(R/L)** - Calyx
- **lACA(R)** - Lateral Accessory Calyx
- **dACA(R)** - Dorsal Accessory Calyx
- **vACA(R)** - Ventral Accessory Calyx
- **PED(R)** - Pedunculus
- **aL(R/L)** - Alpha Lobe
  - **a1(R)** - Alpha Lobe Compartment 1
  - **a2(R)** - Alpha Lobe Compartment 2
  - **a3(R)** - Alpha Lobe Compartment 3
- **a'L(R/L)** - Alpha Prime Lobe
  - **a'1(R)** - Alpha Prime Lobe Compartment 1
  - **a'2(R)** - Alpha Prime Lobe Compartment 2
  - **a'3(R)** - Alpha Prime Lobe Compartment 3
- **bL(R/L)** - Beta Lobe
  - **b1(R)** - Beta Lobe Compartment 1
  - **b2(R)** - Beta Lobe Compartment 2
- **b'L(R/L)** - Beta Prime Lobe
  - **b'1(R)** - Beta Prime Lobe Compartment 1
  - **b'2(R)** - Beta Prime Lobe Compartment 2
- **gL(R/L)** - Gamma Lobe
  - **g1(R)** - Gamma Lobe Compartment 1
  - **g2(R)** - Gamma Lobe Compartment 2
  - **g3(R)** - Gamma Lobe Compartment 3
  - **g4(R)** - Gamma Lobe Compartment 4
  - **g5(R)** - Gamma Lobe Compartment 5

LX - Lateral Complex

- **BU(R/L)** - Bulb
- **LAL(R/L)** - Lateral Accessory Lobe
  - **GA(R)** - Gall

VLNP - Ventrolateral Neuropils

- **AOTU(R)** - Anterior Optic Tubercle
- **AVLP(R)** - Anterior Ventrolateral Protocerebrum
- **PVLP(R)** - Posterior Ventrolateral Protocerebrum
- **PLP(R)** - Posterior Lateral Protocerebrum
- **WED(R)** - Wedge

CX - Central Complex

- **FB** - Fan-Shaped Body
  - **FBl1** - Fan-Shaped Body layer 1
  - **FBl2** - Fan-Shaped Body layer 2
  - **FBl3** - Fan-Shaped Body layer 3
  - **FBl4** - Fan-Shaped Body layer 4
  - **FBl5** - Fan-Shaped Body layer 5
  - **FBl6** - Fan-Shaped Body layer 6
  - **FBl7** - Fan-Shaped Body layer 7
  - **FBl8** - Fan-Shaped Body layer 8
  - **FBl9** - Fan-Shaped Body layer 9
- **EB** - Ellipsoid Body
  - **EBr1** - Ellipsoid Body Zone r1
  - **EBr2r4** - Ellipsoid Body Zone r2r4
  - **EBr3am** - Ellipsoid Body Zone r3am
  - **EBr3d** - Ellipsoid Body Zone r3d
  - **EBr3pw** - Ellipsoid Body Zone r3pw
  - **EBr5** - Ellipsoid Body Zone r5
  - **EBr6** - Ellipsoid Body Zone r6
- **AB(R/L)** - Asymmetrical Body
- **PB** - Protocerebral Bridge
  - **PB(R1)** - Protocerebral Bridge Glomerulus R1
  - **PB(R2)** - Protocerebral Bridge Glomerulus R2
  - **PB(R3)** - Protocerebral Bridge Glomerulus R3
  - **PB(R4)** - Protocerebral Bridge Glomerulus R4
  - **PB(R5)** - Protocerebral Bridge Glomerulus R5
  - **PB(R6)** - Protocerebral Bridge Glomerulus R6
  - **PB(R7)** - Protocerebral Bridge Glomerulus R7
  - **PB(R8)** - Protocerebral Bridge Glomerulus R8
  - **PB(R9)** - Protocerebral Bridge Glomerulus R9
  - **PB(L1)** - Protocerebral Bridge Glomerulus L1
  - **PB(L2)** - Protocerebral Bridge Glomerulus L2
  - **PB(L3)** - Protocerebral Bridge Glomerulus L3
  - **PB(L4)** - Protocerebral Bridge Glomerulus L4
  - **PB(L5)** - Protocerebral Bridge Glomerulus L5
  - **PB(L6)** - Protocerebral Bridge Glomerulus L6
  - **PB(L7)** - Protocerebral Bridge Glomerulus L7
  - **PB(L8)** - Protocerebral Bridge Glomerulus L8
  - **PB(L9)** - Protocerebral Bridge Glomerulus L9
- **NO** - Noduli
  - **NO(R/L)** - Noduli (each hemisphere)
    - **NO1(R/L)** - Nodulus 1
    - **NO2(R/L)** - Nodulus 2
    - **NO3(R/L)** - Nodulus 3

LH(R) - Lateral Horn

SNP - Superior Neuropils

- **SLP(R)** - Superior Lateral Protocerebrum
- **SIP(R/L)** - Superior Intermediate Protocerebrum
- **SMP(R/L)** - Superior Medial Protocerebrum

INP - Inferior Neuropils

- **CRE(R/L)** - Crepine
  - **RUB(R)** - Rubus
  - **ROB(R)** - Round Body
- **SCL(R/L)** - Superior Clamp
- **ICL(R/L)** - Inferior Clamp
- **IB** - Inferior Bridge
- **ATL(R/L)** - Antler

AL - Antennal Lobe (L/R)

VMNP - Ventromedial Neuropils

- **VES(R/L)** - Vest
- **EPA(R/L)** - Epaulette
- **GOR(R/L)** - Gorget
- **SPS(R/L)** - Superior Posterior Slope
- **IPS(R)** - Inferior Posterior Slope

PENP - Periesophageal Neuropils

- **SAD** - Saddle
  - **AMMC** - Antennal Mechanosensory and Motor Center
- **FLA(R)** - Flange
- **CAN(R)** - Cantle
- **PRW** - Prow

GNG - Gnathal Ganglia

Major Fiber Bundles

- **AOT(R)**- Anterior Optic Tract
- **GC** - Great Commissure
- **GF(R)** - Giant Fiber (single neuron, not fiber bundle)
- **mALT(R/L)** - Medial Antennal Lobe Tract
- **POC** - Posterior Optic Commissure

(R/L) indicates two ROIs, one for the right side Region(R) and one for the left Region(L)

* MB(+ACA)(R) contains all right MB neuropil, including lACA, dACA, and vACA. MB(R) does not include the ACA's

Useful Links

Web Access to Neuprint Database - You must create account with a gmail address to query database and receive authorization token for API access

Github for all Neuprint related capabilities - for API access please refer to the Neuprint-Python Repository

Neuprint-Python Documentation - Refer to for all calls

Published paper of the connectome

Introduction to the Hemibrain - Simple breakdown of the dataset with plenty of detail

Janelia FlyEm web page for Hemibrain work

Video of brain dissection - If you're interested a video on how the dissection of the brain is done

Questions?

You can contact Chelsea (works on data set everyday) via slack or email (cxa6ky@virginia.edu)