vfb_neurons_output

August 25, 2024

[1]:
```
!pip install -r requirements.txt --quiet
!pip install vfb_connect --quiet
```

0.1 Creating and Exploring VFBTerm Neuron Objects

We'll start by creating a `VFBTerm` object using the `vfb.term` method.

[2]:
```
# Import the VFBConnect class
from vfb_connect import vfb
```

```
Welcome to the Virtual Fly Brain API
See the documentation at: https://virtualflybrain.org/docs/tutorials/apis/

Establishing connections to https://VirtualFlyBrain.org services…

Session Established!

Type vfb. and press tab to see available queries. You

can run help against any query e.g. help(vfb.get_TermInfo)
```

[3]:
```
vfb_neuron = vfb.term('LPC1 (FlyEM-HB:1838269993)')
print(vfb_neuron)
```

```
VFBTerm(term=Term(term=MinimalEntityInfo(name=LPC1, short_form=VFB_jrchk011),
link=https://n2t.net/vfb:VFB_jrchk011))
```

[4]:
```
vfb_neuron.term.core.types
```

[4]:
```
['Entity',
 'Adult',
 'Anatomy',
 'Cell',
 'Cholinergic',
 'Individual',
 'Nervous_system',
 'Neuron',
 'Visual_system',
 'has_image',
```

```
 'has_neuron_connectivity',
 'has_region_connectivity',
 'FlyEM_HB',
 'NBLAST',
 'NBLASTexp',
 'neuronbridge']
```

[5]:
```
print(vfb_neuron.similar_neurons_nblast)
```

```
[Score(score=0.81, method=NBLAST_score, term=LPC1), Score(score=0.73,
method=NBLAST_score, term=LPC1), Score(score=0.71, method=NBLAST_score,
term=LPC1), Score(score=0.7, method=NBLAST_score, term=LPC1), Score(score=0.7,
method=NBLAST_score, term=LPC1), Score(score=0.7, method=NBLAST_score,
term=LPC1), Score(score=0.69, method=NBLAST_score, term=LPC1), Score(score=0.68,
method=NBLAST_score, term=LPC1), Score(score=0.66, method=NBLAST_score,
term=LPC1), Score(score=0.66, method=NBLAST_score, term=LPC1), Score(score=0.66,
method=NBLAST_score, term=LPC1), Score(score=0.64, method=NBLAST_score,
term=LPC1), Score(score=0.63, method=NBLAST_score, term=LPC1), Score(score=0.63,
method=NBLAST_score, term=LPC1), Score(score=0.63, method=NBLAST_score,
term=LPC1), Score(score=0.63, method=NBLAST_score, term=LPC1), Score(score=0.63,
method=NBLAST_score, term=LPC1), Score(score=0.62, method=NBLAST_score,
term=LPC1), Score(score=0.61, method=NBLAST_score, term=LPC1), Score(score=0.61,
method=NBLAST_score, term=LPC1), Score(score=0.52, method=NBLAST_score,
term=fru-M-500007), Score(score=0.5, method=NBLAST_score, term=VGlut-F-400358),
Score(score=0.49, method=NBLAST_score, term=VGlut-F-700361), Score(score=0.47,
method=NBLAST_score, term=VGlut-F-600153), Score(score=0.46,
method=NBLAST_score, term=VGlut-F-200179), Score(score=0.46,
method=NBLAST_score, term=fru-F-600012), Score(score=0.45, method=NBLAST_score,
term=fru-M-300177), Score(score=0.45, method=NBLAST_score, term=fru-M-200054),
Score(score=0.45, method=NBLAST_score, term=fru-F-800033), Score(score=0.44,
method=NBLAST_score, term=VGlut-F-400543), Score(score=0.44,
method=NBLAST_score, term=fru-M-300284), Score(score=0.43, method=NBLAST_score,
term=fru-M-500018), Score(score=0.43, method=NBLAST_score, term=fru-M-200338),
Score(score=0.42, method=NBLAST_score, term=fru-F-500208), Score(score=0.42,
method=NBLAST_score, term=fru-M-100111), Score(score=0.41, method=NBLAST_score,
term=fru-F-300110), Score(score=0.41, method=NBLAST_score, term=VGlut-F-300353),
Score(score=0.41, method=NBLAST_score, term=VGlut-F-500342), Score(score=0.4,
method=NBLAST_score, term=fru-M-400050), Score(score=0.4, method=NBLAST_score,
term=fru-M-300153), Score(score=0.4, method=NBLAST_score, term=VGlut-F-300281),
Score(score=0.39, method=NBLAST_score, term=Cha-F-300004), Score(score=0.39,
method=NBLAST_score, term=fru-F-300037), Score(score=0.38, method=NBLAST_score,
term=Cha-F-000272), Score(score=0.38, method=NBLAST_score, term=VGlut-F-200328),
Score(score=0.36, method=NBLAST_score, term=fru-M-700048), Score(score=0.35,
method=NBLAST_score, term=Cha-F-200097), Score(score=0.35, method=NBLAST_score,
term=fru-M-400162), Score(score=0.35, method=NBLAST_score, term=fru-M-400070),
Score(score=0.34, method=NBLAST_score, term=fru-M-400134), Score(score=0.32,
method=NBLAST_score, term=fru-M-400012), Score(score=0.32, method=NBLAST_score,
```

```
term=VGlut-F-300276), Score(score=0.31, method=NBLAST_score, term=fru-M-000178),
Score(score=0.31, method=NBLAST_score, term=fru-M-500184), Score(score=0.31,
method=NBLAST_score, term=Gad1-F-100056), Score(score=0.31, method=NBLAST_score,
term=VGlut-F-500073), Score(score=0.3, method=NBLAST_score,
term=VGlut-F-200199), Score(score=0.3, method=NBLAST_score, term=fru-M-600005),
Score(score=0.29, method=NBLAST_score, term=Cha-F-800043), Score(score=0.28,
method=NBLAST_score, term=fru-F-400132), Score(score=0.28, method=NBLAST_score,
term=VGlut-F-700604), Score(score=0.28, method=NBLAST_score, term=fru-M-600074),
Score(score=0.28, method=NBLAST_score, term=VGlut-F-400153), Score(score=0.27,
method=NBLAST_score, term=fru-F-300055), Score(score=0.27, method=NBLAST_score,
term=Gad1-F-900013), Score(score=0.26, method=NBLAST_score, term=VS(LPTC)),
Score(score=0.26, method=NBLAST_score, term=fru-F-200002), Score(score=0.26,
method=NBLAST_score, term=5-HT1B-M-400004), Score(score=0.25,
method=NBLAST_score, term=fru-F-000129), Score(score=0.25, method=NBLAST_score,
term=VGlut-F-200124), Score(score=0.25, method=NBLAST_score, term=fru-F-000039)]
```

[6]:
```
print(vfb_neuron.potential_drivers_nblast)
```

```
[Score(score=0.27, method=NBLAST_score, term=SS02700)]
```

[7]:
```
print(vfb_neuron.potential_drivers_neuronbridge)
```

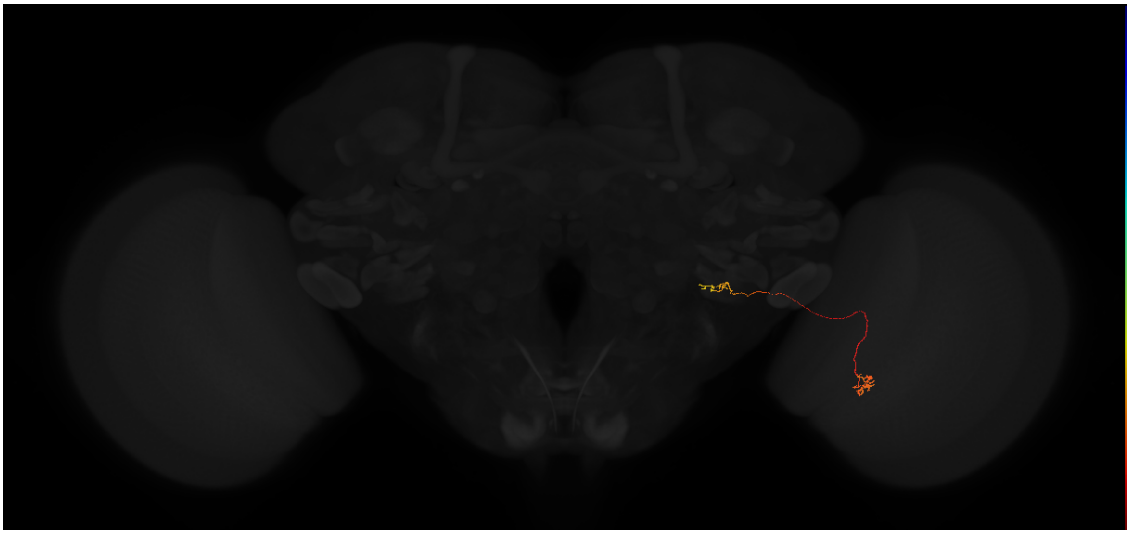
```
[Score(score=01468, method=neuronbridge_score, term=MB005B), Score(score=01286,
method=neuronbridge_score, term=MB005B), Score(score=01280,
method=neuronbridge_score, term=MB005B), Score(score=01096,
method=neuronbridge_score, term=MB005B), Score(score=01051,
method=neuronbridge_score, term=OL0047B), Score(score=00701,
method=neuronbridge_score, term=OL0047B), Score(score=00656,
method=neuronbridge_score, term=MB013B), Score(score=00652,
method=neuronbridge_score, term=SS59911), Score(score=00615,
method=neuronbridge_score, term=MB013B), Score(score=00615,
method=neuronbridge_score, term=MB013B)]
```

[8]:
```
print(vfb_neuron.parents)
```

```
VFBTerms(terms=VFBTerms(terms=[VFBTerm(term=Term(term=MinimalEntityInfo(name=LPC
1, short_form=FBbt_00111767), link=https://n2t.net/vfb:FBbt_00111767))]))
```

[9]:
```
vfb_neuron.show()
```

```
Loading thumbnail for LPC1
```



[10]:
```
upstream_partners = vfb_neuron.upstream_partners()
print(upstream_partners)
```

```
[Partner(weight=10, partner=PVLP011_R (FlyEM-HB:5813039148)), Partner(weight=10,
partner=PLP249(SCB022)_R (FlyEM-HB:5813062698)), Partner(weight=5, partner=LPC1
(FlyEM-HB:1808624842)), Partner(weight=4, partner=LPC1 (FlyEM-HB:5813039479)),
Partner(weight=4, partner=LPC1 (FlyEM-HB:5812998572)), Partner(weight=3,
partner=LPC1 (FlyEM-HB:1808629175)), Partner(weight=3, partner=LPC1 (FlyEM-
HB:1838266061)), Partner(weight=3, partner=LPC1 (FlyEM-HB:1808965929)),
Partner(weight=3, partner=LPC1 (FlyEM-HB:5813034310)), Partner(weight=2,
partner=PLP202_R (FlyEM-HB:5813022599)), Partner(weight=2, partner=LPC1 (FlyEM-
HB:1806885186)), Partner(weight=2, partner=LPC1 (FlyEM-HB:1714134266)),
Partner(weight=2, partner=LPC1 (FlyEM-HB:5812997786)), Partner(weight=2,
partner=LPC1 (FlyEM-HB:1806893720)), Partner(weight=2, partner=LPC1 (FlyEM-
HB:1808279458)), Partner(weight=2, partner=LPC1 (FlyEM-HB:5812993718)),
Partner(weight=1, partner=LPC1 (FlyEM-HB:1839314480)), Partner(weight=1,
partner=LPC1 (FlyEM-HB:1805844441)), Partner(weight=1, partner=LPC1 (FlyEM-
HB:1714138427)), Partner(weight=1, partner=LPC1 (FlyEM-HB:5812998594)),
Partner(weight=1, partner=LPC1 (FlyEM-HB:5812997949)), Partner(weight=1,
partner=LPC1 (FlyEM-HB:1808620692)), Partner(weight=1, partner=LPC1 (FlyEM-
HB:5813039484)), Partner(weight=1, partner=LPC1 (FlyEM-HB:1807592904)),
Partner(weight=1, partner=LPC1 (FlyEM-HB:5813038963)), Partner(weight=1,
partner=LPC1 (FlyEM-HB:1838969023)), Partner(weight=1, partner=LPC1 (FlyEM-
HB:5812983613)), Partner(weight=1, partner=SAD013_R (FlyEM-HB:5813024035)),
Partner(weight=1, partner=LPC1 (FlyEM-HB:1807930214)), Partner(weight=1,
partner=LLPC3 (FlyEM-HB:5813022935)), Partner(weight=1, partner=LPC1 (FlyEM-
HB:1807238852)), Partner(weight=1, partner=LPC1 (FlyEM-HB:1837902676)),
Partner(weight=1, partner=LPC2 (FlyEM-HB:2398215718)), Partner(weight=1,
partner=LPC1 (FlyEM-HB:5812998639)), Partner(weight=1, partner=LPC1 (FlyEM-
HB:1809320060)), Partner(weight=1, partner=LPC1 (FlyEM-HB:1806850696)),
```

```
Partner(weight=1, partner=LPC1 (FlyEM-HB:1806880698)), Partner(weight=1,
partner=LLPC3 (FlyEM-HB:5812994421)), Partner(weight=1, partner=LPC1 (FlyEM-
HB:1807235150)), Partner(weight=1, partner=LPC1 (FlyEM-HB:5812999239))]
```

[11]:
```
downstream_partners = vfb_neuron.downstream_partners()
print(downstream_partners)
```

```
[Partner(weight=32, partner=PVLP011_R (FlyEM-HB:5813039148)), Partner(weight=21,
partner=PLP018_R (FlyEM-HB:1535144397)), Partner(weight=18, partner=PLP163_R
(FlyEM-HB:1572240664)), Partner(weight=8, partner=PLP018_R (FlyEM-
HB:5813040309)), Partner(weight=7, partner=LPC1 (FlyEM-HB:1808620692)),
Partner(weight=7, partner=LPC1 (FlyEM-HB:1808965929)), Partner(weight=6,
partner=AVLP370_R (FlyEM-HB:1541964241)), Partner(weight=5, partner=LPC1 (FlyEM-
HB:5812997786)), Partner(weight=5, partner=PLP012_R (FlyEM-HB:5813020388)),
Partner(weight=4, partner=DNa07_R (FlyEM-HB:1627618361)), Partner(weight=4,
partner=LAL136_b_R (FlyEM-HB:5813104190)), Partner(weight=4, partner=DNp11_R
(FlyEM-HB:1281324958)), Partner(weight=4, partner=LPC1 (FlyEM-HB:5812998572)),
Partner(weight=3, partner=VES009_R (FlyEM-HB:1140923511)), Partner(weight=3,
partner=LPC1 (FlyEM-HB:1806893720)), Partner(weight=3, partner=LPC1 (FlyEM-
HB:1806885186)), Partner(weight=3, partner=LPC1 (FlyEM-HB:1839314480)),
Partner(weight=3, partner=LPC1 (FlyEM-HB:5812999239)), Partner(weight=2,
partner=LPLC4_R (FlyEM-HB:1563126068)), Partner(weight=2, partner=LPC1 (FlyEM-
HB:5812993718)), Partner(weight=2, partner=LPC1 (FlyEM-HB:1808624862)),
Partner(weight=2, partner=LPC1 (FlyEM-HB:1806850696)), Partner(weight=2,
partner=LPC1 (FlyEM-HB:5813039484)), Partner(weight=2, partner=PVLP130_R (FlyEM-
HB:1601711357)), Partner(weight=2, partner=LPC1 (FlyEM-HB:5813039479)),
Partner(weight=2, partner=PLP249(SCB022)_R (FlyEM-HB:5813062698)),
Partner(weight=2, partner=PVLP150(SCB030)_R (FlyEM-HB:1385093648)),
Partner(weight=2, partner=LPC1 (FlyEM-HB:1838266061)), Partner(weight=2,
partner=LPC1 (FlyEM-HB:1807592904)), Partner(weight=2, partner=LPC1 (FlyEM-
HB:1808629175)), Partner(weight=2, partner=LPC1 (FlyEM-HB:5813045475)),
Partner(weight=1, partner=PLP029_R (FlyEM-HB:5813054141)), Partner(weight=1,
partner=LPC1 (FlyEM-HB:5812998594)), Partner(weight=1, partner=LPC1 (FlyEM-
HB:5812998639)), Partner(weight=1, partner=LPC1 (FlyEM-HB:5813038958)),
Partner(weight=1, partner=LPC1 (FlyEM-HB:1837902676)), Partner(weight=1,
partner=LLPC3 (FlyEM-HB:5812997184)), Partner(weight=1, partner=LPC1 (FlyEM-
HB:1808624842)), Partner(weight=1, partner=PS143_R (FlyEM-HB:1748666238)),
Partner(weight=1, partner=LPC1 (FlyEM-HB:1775513344)), Partner(weight=1,
partner=LPC1 (FlyEM-HB:1838969023)), Partner(weight=1, partner=LPC1 (FlyEM-
HB:5813038963)), Partner(weight=1, partner=LPC1 (FlyEM-HB:5812997949)),
Partner(weight=1, partner=LPC2 (FlyEM-HB:2398215718)), Partner(weight=1,
partner=LPLC1_R (FlyEM-HB:1469269528)), Partner(weight=1, partner=LPC1 (FlyEM-
HB:5812983613)), Partner(weight=1, partner=LPC1 (FlyEM-HB:1778613177)),
Partner(weight=1, partner=LPC1 (FlyEM-HB:1808279458)), Partner(weight=1,
partner=LPC1 (FlyEM-HB:5813034310)), Partner(weight=1, partner=PLP035_R (FlyEM-
HB:1441978094)), Partner(weight=1, partner=LPC1 (FlyEM-HB:1842090544)),
Partner(weight=1, partner=LLPC3 (FlyEM-HB:5812998802)), Partner(weight=1,
partner=LPC1 (FlyEM-HB:1745518676)), Partner(weight=1, partner=LPC1 (FlyEM-
```

```
HB:1714134266)), Partner(weight=1, partner=LPC1 (FlyEM-HB:1714138427)),
Partner(weight=1, partner=LPLC1_R (FlyEM-HB:1407874177)), Partner(weight=1,
partner=SMP584_R (FlyEM-HB:482754144)), Partner(weight=1, partner=LLPC3 (FlyEM-
HB:5812998819)), Partner(weight=1, partner=PLP148_R (FlyEM-HB:1437613888)),
Partner(weight=1, partner=LPC1 (FlyEM-HB:1434768400)), Partner(weight=1,
partner=PVLP127_R (FlyEM-HB:1566178485))]
```

[12]:
```
vfb_neuron.plot_partners(partners=[p for p in downstream_partners if p.weight <␣
↪10 and p.weight > 5], template='JRC2018Unisex')
# By default the origin neuron is included and show in black.
# The weight parameter is the strength of the connection (# of synapses)␣
↪between the origin neuron and the partner neuron.
# we can tune what connections are shown by limiting the weight of the␣
↪connections e.g. [p for p in downstream_partners if p.weight < 10 and p.
↪weight > 5]

# TODO Alpha represents strength of connection but doesn't appear to be␣
↪displaying correctly
```

```
Plotting 3D representation of 5 items
```

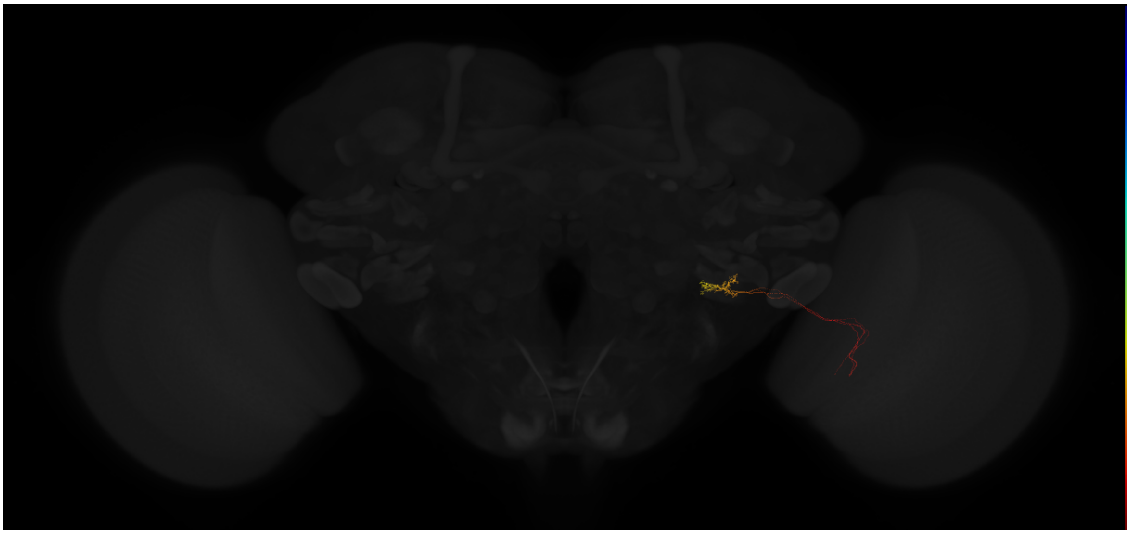
[13]:
```
high_simiarity_neuron_scores = [neuron for neuron in vfb_neuron.
↪similar_neurons_nblast if neuron.score > 0.7]
# We are also limiting the neurons to those with a score of greater than 0.7


vfb_neuron.plot_similar(similar=high_simiarity_neuron_scores,␣
↪template='JRC2018Unisex')
```

```
Plotting 3D representation of 4 items
```

[14]:
```
from vfb_connect.schema.vfb_term import VFBTerms

high_simiarity_neurons = VFBTerms([neuron.term for neuron in␣
↪high_simiarity_neuron_scores])

high_simiarity_neurons.plot3d_by_type()
# This will plot the similar neurons in 3D by type
# The type is the most specific parent type of the neuron

# TODO the legend_group is not displaying correctly
```

```
Enforcing the display template space as JRC2018Unisex from the first skeleton
found. Specify a template to avoid this.

Plotting 3D representation of 3 items
```

[15]:
```
high_simiarity_neurons.show(template='JRC2018Unisex')
```



[16]:
```
# This is a quick way to show to show complex data before plotting in 3d etc.
VFBTerms([partner.partner for partner in downstream_partners]).
  ↪show(transparent=False)
```