



JULY 2025
Modeling Tools Updates

Find us at CNS*2025 in Florence, Italy July 5-9!

You can chat with us throughout the week, or find us at the following:

- **Sunday, Poster P109:** "From point neurons to biophysically detailed networks: A data-driven framework for multi-scale modeling of brain circuits" by Beatriz Herrera et al.
- **Tuesday, workshop:** "Enabling synaptic plasticity, structural plasticity, and multi-scale modeling with morphologically detailed neurons using Arbor"
- **Wednesday, workshop:** "Bridging complexity and abstraction: Large-scale mechanistic models of brain circuits from biophysically detailed to simplified representations"

Presentations at the 2025 Japan Neuroscience Society (JNS) annual meeting

Shinya Ito will be presenting "Deep-learning-assisted simulation of a cortical network: integrating anatomy, physiology and function" at two JNS sessions:

Satellite Symposium: Connecting Digital Brains Across the World

When: July 23, 13:00-17:00 JST (04:00 UTC)

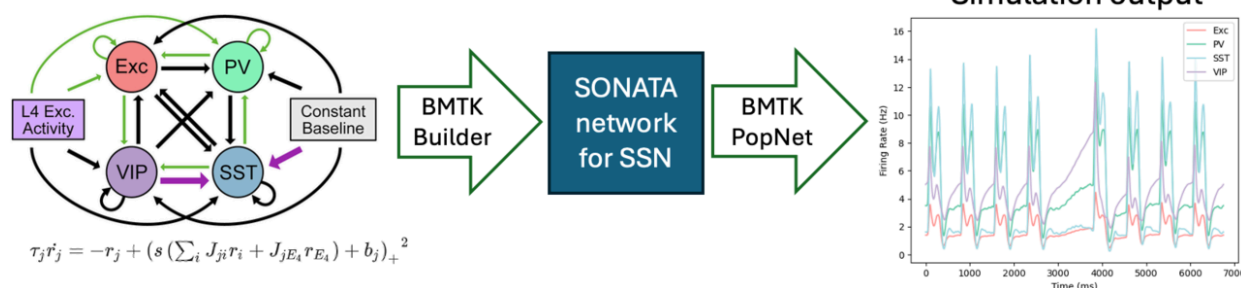
Format: In-person and online (registration required)

Symposium: Advances in Brain Modeling and AI Applications

When: July 25, 14:10-16:10 JST (05:10 UTC)

Format: In-person

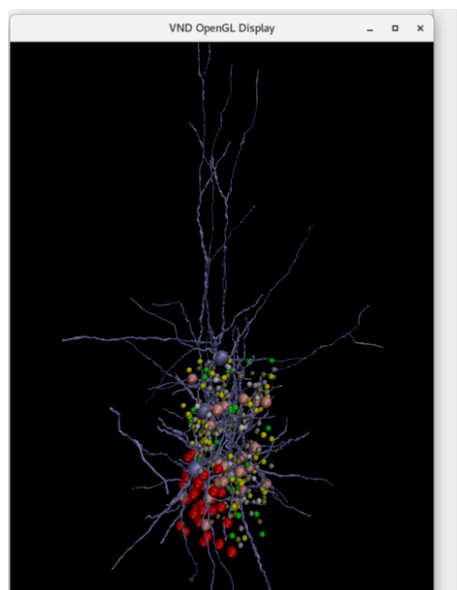
New BMTK PopNet option: Stabilized Supralinear Network (SSN)



Originally introduced in [Rubin et al., 2015](#), and used in our recent study ([Ito et al., 2024](#)), Stabilized Supralinear Network (SSN) is now available as a new option for PopNet in BMTK. Using files in SONATA format to define models, it simulates population-level dynamics leveraging Numba acceleration. For a 4-population network, simulation is ~5000x faster than real time.

LEARN MORE

3D neuronal models connected to an interactive Python notebook



```

In [15]: exc_cell_ids
Out[15]: array(['155', '12', '63', '227', '149', '100', '42', '152', '138', '74',
               '75', '132', '206', '26', '164', '147', '157', '20', '5', '191',
               '93', '31', '137', '111'], dtype=object)

In [16]: inh_cell_ids = internal_nodes_df[internal_nodes_df['ei'] == 'i']['node_id']
inh_cell_ids = np.random.choice(inh_cell_ids, size=int(len(inh_cell_ids)*.1)

In [17]: inhSel=VND.NeuronSel(f'(node_id == {" ".join(inh_cell_ids)}) && (population

In [18]: inhSel
Out[18]: NeuronSel(len=6)

In [19]: excSel=VND.NeuronSel(f'(node_id == {" ".join(exc_cell_ids)}) && (population

In [20]: excSel
Out[20]: NeuronSel(len=24)

In [33]: r='pink', style='soma', scaling='2.0', material='Opaque', resolution='15',s
Out[33]: '14'

In [34]: VND.add_rep(sel=inhSel, color='iceblue', style='morphology', scaling='1.6',
Out[34]: '15'

```

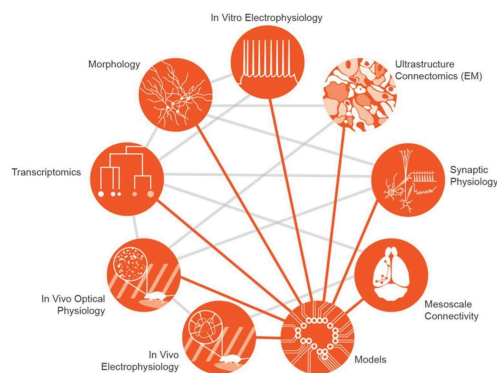
[VND neuronal visualization software](#) now offers a live connection to a [Jupyter notebook Python session](#).

The VND selection language is used to make selection objects, which in turn can be queried for their attribute data and spike events, allowing analysis with the powerful ecosystem of Python data manipulation and computational tools. Graphical representations can be created from selection objects and analysis results. These representations appear in the VND 3D display and GUI for direct manipulation. Simple interactive access to model data supports both visual and quantitative exploration. The [latest VND release](#) offers the Jupyter-Python connection as an early feature.

New perspective paper in *Nature Neuroscience*

A group of Allen Institute co-authors published a perspective paper: "[Integrating multimodal data to understand cortical circuit architecture and function](#)."

We discuss advances in integrative neuroscience, highlighting techniques like Patch-seq for describing cell types – the building blocks of brain circuits, electron microscopy for tracing connectivity, and 2-photon calcium imaging and Neuropixels electrophysiology for characterizing neural activity *in vivo*. Bio-realistic simulations integrate all these modalities and furnish a platform for answering questions not readily accessible in experiments.



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Please help us understand what the field needs by filling out this brief survey. Your insights are essential in helping us develop tools that better serve the neuroscience community.

NEURAL MODELING SURVEY

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