

NEST: Simulator for large-scale neural networks

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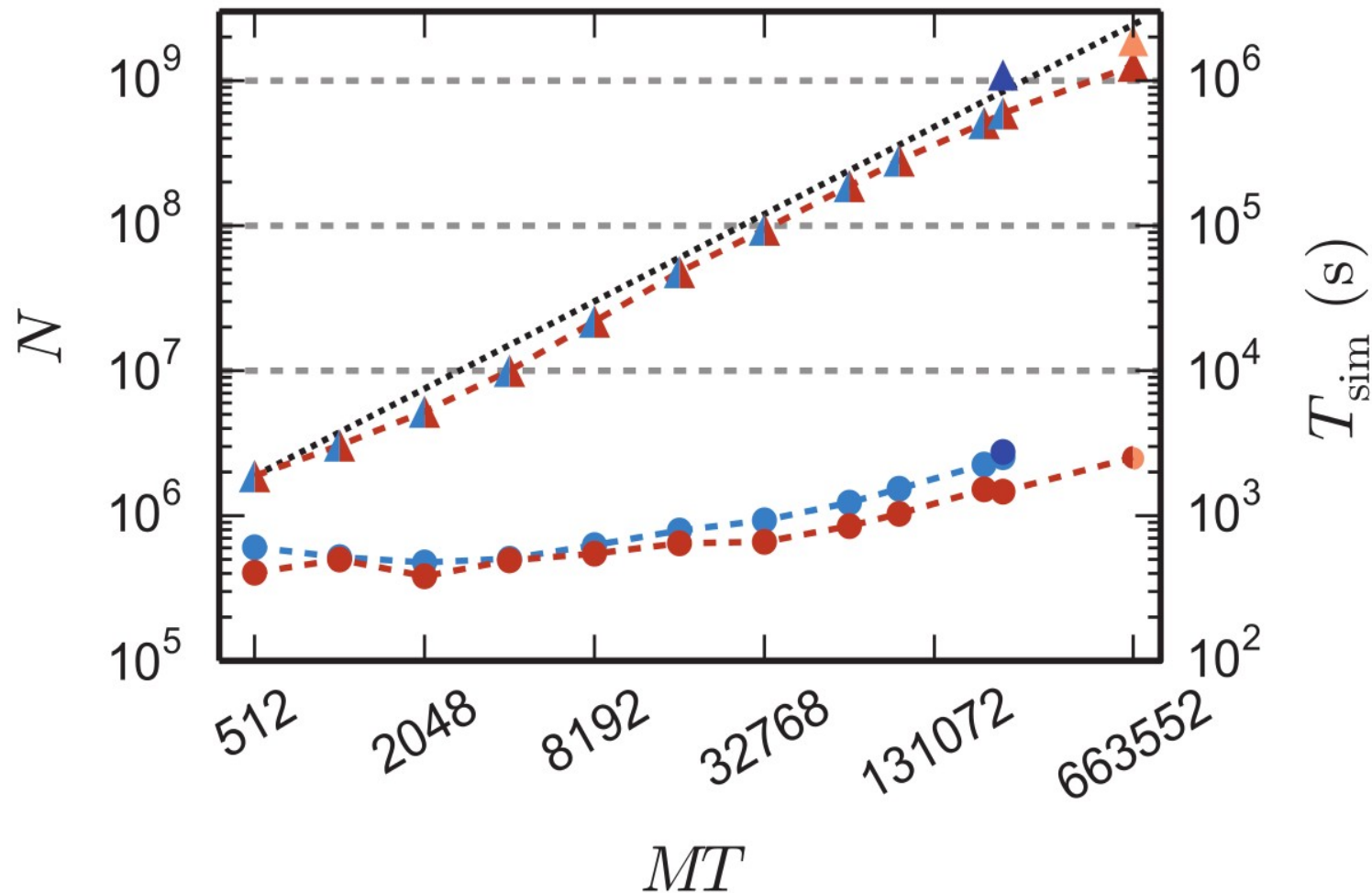
What is NEST?

NEST = NEural Simulation Tool



- **Goal: understanding brain (dis)function**
- Interaction of multiple scales
 - single neurons – populations – brain areas – whole brain
- **Large networks of spiking point-neuron models**
- ~~Detailed morphology~~ (see NEURON, GENESIS)

Performance



- **world record for large-scale spiking network simulations with 1.86 billion neurons and 11.1 trillion synapses** on the full Japanese K computer using NEST 2.6.0 technology [Kunkel et. al (2014)]
- **Same code** that you can compile and run **on your laptop**

- **C++** kernel
- Neuron and synapse models defined in C++
- Hybrid parallelization
 - multi-threading for shared-memory machines
 - MPI for clusters and supercomputers
- Built-in **simulation language interpreter** (SLI)
- **Python**-based user interface (PyNEST, PyNN)
- Interface to Multi Simulator Coordinator (MUSIC)

- **Exact integration** for linear sub-threshold dynamics
- **Suitable solver** for non-linear models
- Globally time-driven simulation
 - By default spikes restricted to grid
 - **Continuous time interaction** for some models

Quality Assurance

- Extensive test suite
- Strict code guidelines and code review
- Continuous integration

- Leaky integrate-and-fire neuron (LIF)
- Adaptive exponential LIF model (AdEx)
- Binary neurons (McCulloch-Pitts, sigmoidal)
- MAT2 neuron model
- Hodgkin-Huxley-type models
- Neuron models with few compartments
- *<your model here>*

- Static synapses (current & conductance based)
 - Spike-timing dependent plasticity
 - Short-/ long-term plasticity
 - Neuromodulatory synapses using dopamine
 - **Gap junctions** [Hahne et al. (2015)]
 - *<your model here>*
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- Efficient high-level connectivity functions
 - Topology module for **spatially-structured** networks
 - Connection set algebra (CSA)
 - Compact definition of **complex connectivities**

Supported Platforms

- Linux
- Mac OS X
- IBM Blue Gene (L/P/Q)
- K („kei“)

- Windows (*please use a virtual machine!*)

Get it now!

- Open source (GPLv2)
- Latest stable release
 - current release: NEST 2.10.0
 - <http://www.nest-simulator.org/download>
- Development version
 - <https://github.com/nest/nest-simulator>
 - **Report issues!**
 - **Fork and contribute!**

Help!

- Documentation
 - <http://www.nest-simulator.org/documentation>
- NEST user mailing list
 - <http://www.nest-simulator.org/community>
- Developer space
 - <https://nest.github.io/nest-simulator>
- Community
 - <http://www.nest-initiative.org>