1. **What is the main question that the model was addressing?**

In general, Häusser *et al.* were trying to address the question of whether dendritic spikes *in vivo* contribute to behaviorally relevant computations. More specifically, they investigated if sensory input to dendrites of pyramidal neurons in layer 2/3 of the mouse primary visual cortex *in vivo* contribute to a behaviorally relevant computation, orientation selectivity.

1. **Why is the question important (what is the big picture?)**

Häusser *et al.* state in the paper that "our results demonstrate that dendrites are not passive integrators of sensory-driven input *in vivo*," which I think encapsulates the big picture of this question best. A big question in the field of computational neuroscience is just how much of a role dendrites play in computation -- this statement addresses one line of thought in the field. Häusser *et al.* aimed to understand this role better through *in vivo* experiments in mice.

1. **What was the experimental design, i.e., what were the “treatment” simulations and what were the “control” simulations, or what two sets of simulations were compared to answer the question.**

The experimental design involved both experimental and computational components:

* (Experimental) Häusser *et al.* compared both anesthetized and awake mice (I believe to compare the difference between activity an anesthetized animal and an alert, behaving animal).
* (Experimental)They looked at the effect of blocking dendritic bursts (by hyperpolarizing the membrane) to test if dendritic spikes are required for normal synaptic integration of the visual stimulus.
* (Experimental) They looked at normal NMDA receptor activity versus NMDA receptor role when blocked by MK-801 using whole-cell somatic recordings.
* (Computational) Using a reconstructed layer 2/3 pyramidal neuron (NeuroMorpho), they simulated the role of NMDA blockage by removing the channel type from the simulation, along with removing dendritic voltage-gated sodium channels; from their github page, the cell morphology of the reconstructed neuron was from a cat, so length and diameters of axon, soma, and dendrites were scaled to 70% of their original values to approximate it to mouse values.

1. **What sort of model was this?**

Consulting the .swc file in the NeuroMorpho, the model uses 2945 compartments for the 104 dendritic branches and soma, along with AMPA, GABA and NMDA channels, and a calcium pool. Additionally, the authors state the use of 1,100 synapses, which were randomly distributed across the dendritic tree -- 80% being excitatory, 20% inhibitory. Axons were not modeled, but the github code appears to allow for axons to be included (libcell.py).