**Supplementary File 1. Table of Main Model Parameters.** For full code, see http://modeldb.yale.edu/266774

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| Parameter | Value | Units | Description |
| N | 100 | - | Number of neurons per population |
| dt | 1 | ms | Integration time step |
| T | 50 | ms | Stimulus pulse duration |
| τstim | 50 | ms | Decay constant of stimulus |
| τw | 40 | ms | Time window for firing rate integration |
| pr | 40 | Hz | Rate of Poisson stimulus pulse |
| ρ | 1/7 | - | Fractional change of synaptic activation |
| τsE, τsI | 80,10 | ms | Time constant for synaptic activation for excitatory (EE) and inhibitory (EI, IE) connections |
| gL | .01 | μS | Leak conductance |
| Cm | 20 x gL | nF | Membrane capacitance |
| EL | -60 | mV | Leak reversal potential |
| EE, EI | -5,-70 | mV | Excitatory and inhibitory reversal potentials |
| vth | -55 | mV | Spiking threshold potential |
| vrest | -60 | mV | Resting potential |
| vhold | -61 | mV | Reset potential |
| tref | 2 | ms | Absolute refractory period |
| τp, τd | 2000, 1000 | ms | LTP/LTD eligibility trace time constant |
| Tpmax, Tdmax | 0.95, 1 | - | Saturation level, LTP/LTD eligibility trace (scaled relative to Tdmax = 1) |
| ηp, ηd | 1, 0.55 | ms-1 | Activation rate, LTP/LTD eligibility trace (scaled relative to ηp = 1) |
| τpFF, τdFF | 200, 800 | ms | LTP/LTD eligibility trace time constant, feed forward connections |
| Tpmax,FF, Tdmax,FF | 0.98, 1 | - | Saturation level, LTP/LTD eligibility trace, feed forward connections (scaled relative to Tdmax = 1) |
| ηpFF, ηdFF | 0.44, 0.33 | ms-1 | Activation rate, LTP/LTD eligibility trace, feed forward connections (scaled relative to ηp = 1) |
| Treward | 25 | ms | Duration of neuromodulator presentation upon change in stimulus |
| Ttr | 25 | ms | Duration of refractory period for traces following neuromodulator presentation |
| η | .0045(recurrent)  , .08 (feed-forward) | ms-1 | Learning rates, recurrent and feed forward connections |
| ϕ | 0.3 | - | Sparsity of fixed connections |
| WEEMT, WEIMT | .02, .7 | μS | Synaptic connection strength, Timer to Messenger excitatory to excitatory (EE) and inhibitory to excitatory (EI) connections |
| WEITT, WEIMM | 1, 1 | μS | Synaptic connection strength, intercolumnar Timer-Timer and Messenger-Messenger inhibitory to excitatory (EI) connections |
| WIETT, WIEMM | .002, .01 | μS | Synaptic connection strength, intracolumnar Timer-Timer and Messenger-Messenger excitatory to inhibitory (IE) connections |