Each simulation was run with a version of a code like this with varying parameters:

STDP\_network\_simulation.m

The function takes as input 3 variables: STDP type, simulation duration in seconds, and sim number

STDP\_type is a vector of 0’s and 1’s encoding the configuration of STDP types within the network. It is encoded by [L4->L4, L2/3->L4, L5/6->L4, L4->L2/3, L2/3->L2/3, L5/6->L2/3, L4->L5/6, L2/3->L5/6, L5/6->L5/6]. For example, to run the “good example” configuration used in Fig 2a, the input would be:

type = [1,1,0,1,1,0,0,1,0]

Duration is 60 (seconds) by default but a short and reasonable simulation could be run in 10 seconds.

Sim number is simply an integer to track repeated runs of the simulation given the same STDP configuration.

Thus if you type “STDP\_network\_simulation([1,1,0,1,1,0,0,1,0],10,1).m” into Matlab, you will run a simulation.

The parameters used in the simulations are well labeled in the code and are easily compared to the set of parameters used as reported in Supplementary Table S1.

Figures can be recreated by running any of the following Matlab scripts

Fig 2: Good example Bad example

examples.m

Fig 3c: Best 16 weight matrix

analysis\_16\_default.m

Fig 3d: 512 success histogram

analysis\_512\_default.m

Fig 4a,b: modulation robustness

modulation\_robustness\_plots.m

Fig 4c,d,e: A tau, EXC, and delay robustness

robustness\_plots.m

Fig S2a-c: convergence example

convergence\_individual\_weights\_example.m

Fig S2d: convergence summary

convergence.m

Fig S3a: 512 success curve

analysis\_512\_default.m

Fig S3b: 512 success curve outside of default parameter values

success\_various\_exc\_analysis.m

Fig S3c: Firing rate as a function of EXC

firing\_rate\_various\_exc\_analysis.m

Fig S4: modulation robustness

modulation\_robustness\_plots.m

Fig S5: Multimodality within the best 16

weight\_histograms\_multimodality.m

Fig S6: Experimental estimates of LTP/LTD balance

balance\_plot.m

Table S2: weight table

weight\_table\_s2.m