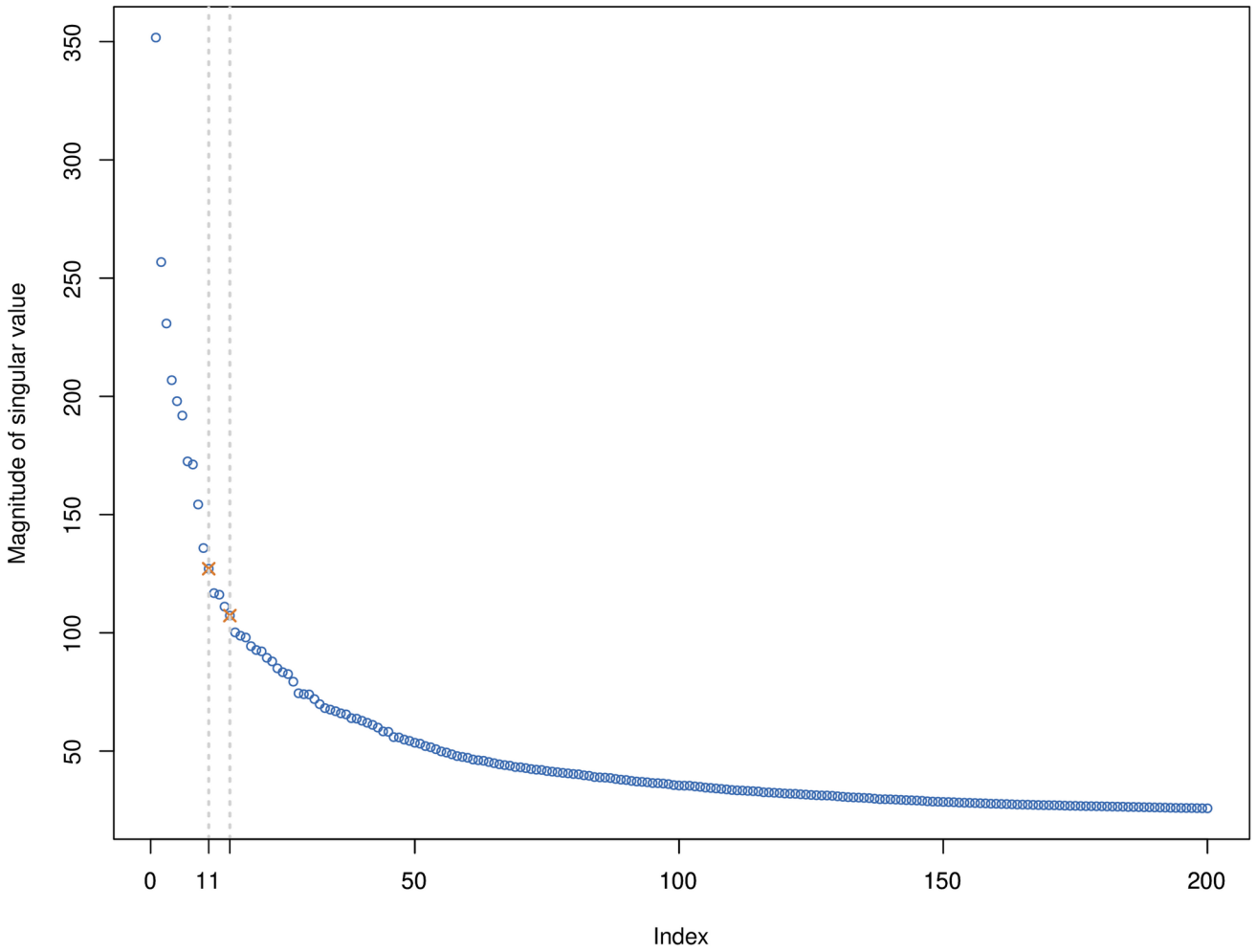
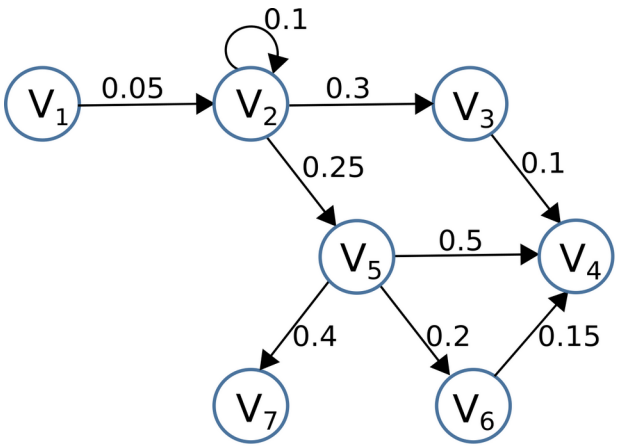


Fig S1. The possible choices for the embedding dimensionality *d={11,15}* were determined by identifying the first and second elbow-point (Zhu and Ghodsi, 2006), respectively, on the scree plot of singular values.



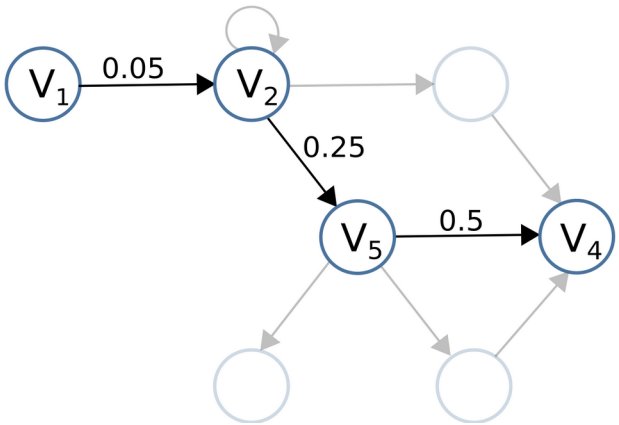
i	$\lvert V_i\rvert$	$\lvert\tilde{V}_i\rvert$
1	1000	10
2	250	2.5
3	100	1
4	500	5
5	300	3
6	400	4
7	150	1.5

Block connection prob. p_{ij}

0	0.05	0	0	0	0	0
0	0.1	0.3	0	0.25	0	0
0	0	0	0.1	0	0	0
0	0	0	0	0	0	0
0	0	0	0.5	0	0.2	0.4
0	0	0	0.15	0	0	0
0	0	0	0	0	0	0

Cost $c_{ij} := \dfrac{1}{p_{ij}|\widetilde{V}_i||\widetilde{V}_j|}$

0	0.8	0	0	0	0	0
0	0	1.33	0	0.53	0	0
0	0	0	2	0	0	0
0	0	0	0	0	0	0
0	0	0	0.13	0	0.42	0.56
0	0	0	0.33	0	0	0
0	0	0	0	0	0	0



Path:

$P = \{V_1, V_2, V_5, V_4\}$

Path length:

$$\ell = c_{12} + c_{25} + c_{54}$$
$$= 0.8 + 0.53 + 0.42$$
$$= 1.75$$

Fig S2. An illustrative example for calculating the path length of a random walk on the circuit.

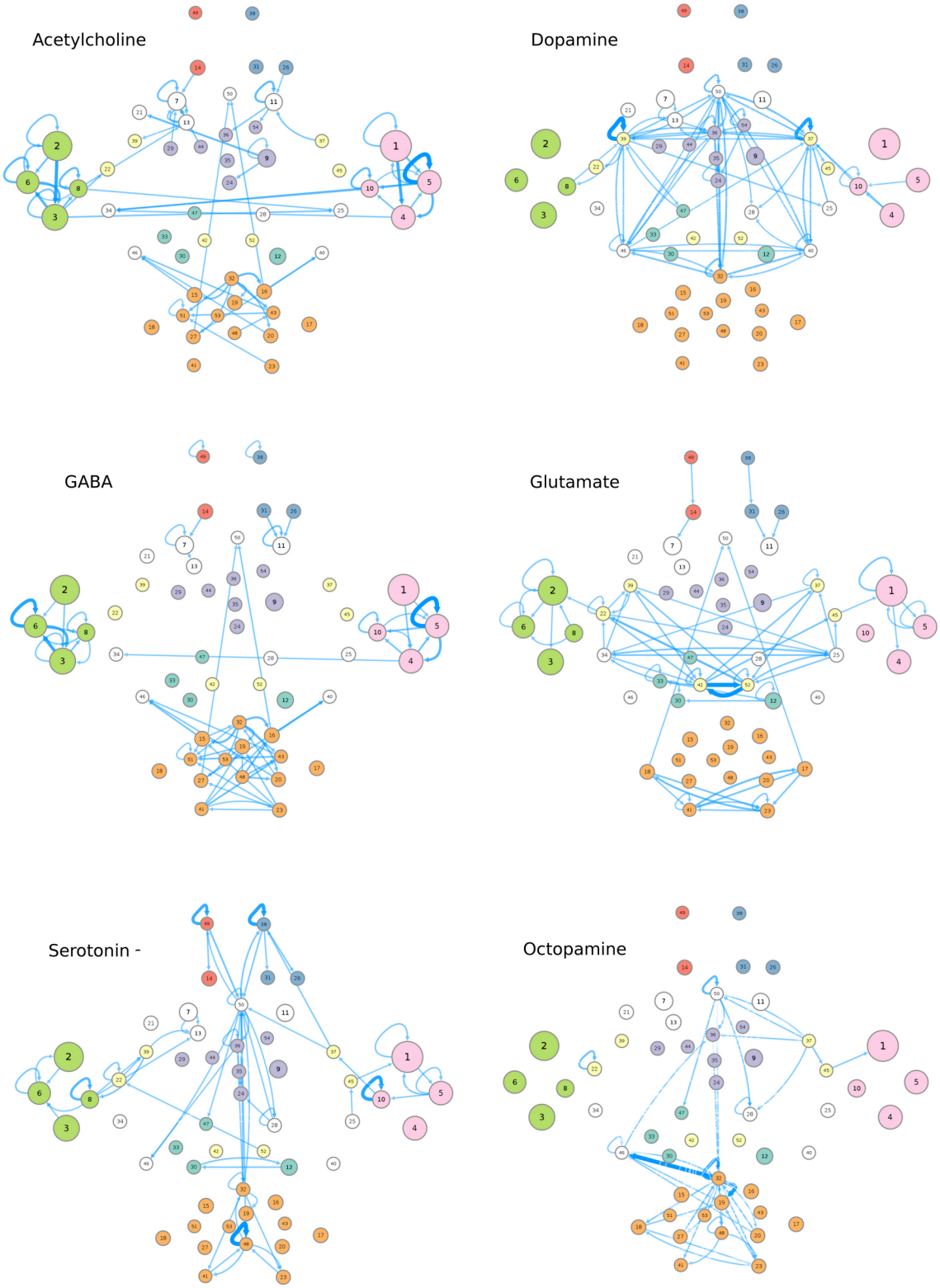


Fig S3. Each circuit corresponds to one neurotransmitter (NT). More specifically, to create each circuit we consider, for each class, only those neurons which are identified with that particular NT. If a particular class has zero neurons of that corresponding NT, then that class is inactive in the resulting circuit (with no incoming or outgoing edges). The edge weights are recalculated appropriately.

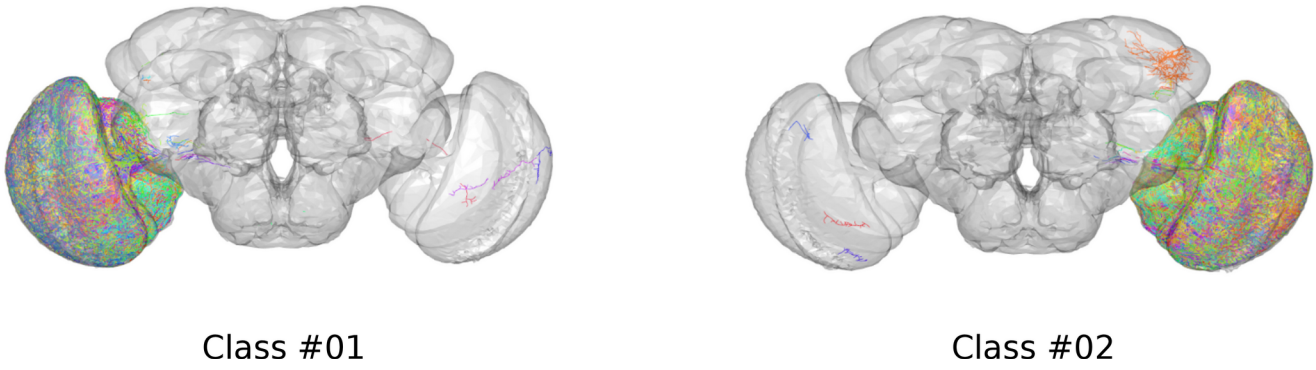


Fig S4. Each connectivity-class embedded in the NATverse 3D template. *I ran into an orientation issue listing the other 52 classes. Working on adding the remaining classes right away.*