**Figure S1.** Biophysical model of piriform cortex neurons. **A,** Schematic representation of a pyramidal neuron (PYR) model, consisting of a somatic compartment and five dendritic sections arranged from bottom to top. The model incorporates sodium (Na+), delayed rectifier potassium (K+), and leak ion channels, with their respective maximal conductance (gmax) and reversal potentials (E) indicated. **B-C,** Schematics of single compartment models of a feedforward interneuron (FFIN, **B**) and a feedback interneuron (FBIN, **C**), with the respective peak conductance and reversal potentials of the Na+, K+, and leak ion channels.

**Figure S2.** Electrophysiological properties of a pyramidal neuron model. **A,** Step current injections vs. resulting voltage responses from soma and five dendrites (Dend\_sec1 to Dend\_sec5). **B,** Measured steady-state voltage changes in the soma and dendritic sections as a function of injected current. The slope of linear regression for each trace gives the input resistance of the corresponding compartment. **C,** Action potentials evoked at suprathreshold current in each of the soma and dendritic sections. **D,** This panel shows the mean spontaneous firing frequency (means ± SD) recorded from each of the sections across trials (n = 100). **E,** Plot of firing frequency vs. current step amplitude across all compartments. **F,** Example voltage vs. time traces of spontaneous activity recorded from soma and each dendritic section.

**Figure S3.** Electrophysiological properties of a feedforward interneuron model. **A,** Voltage responses recorded from the soma in response to step current injections. **B,** Left, Step current injections in the soma. Middle: Corresponding voltage responses recorded from the soma. Right, Plot of voltage change vs. injected current and its linear regression analysis to obtain the corresponding input resistance. **C,** Plot of an action potential recorded from the soma (I) and the corresponding phase plot (II) **D,** Plot of firing frequency vs. current step amplitude **E,** Example voltage traces of spontaneous activity recorded from the soma. **F,** Average spontaneous firing frequency (means ± SD) recorded across trials (n = 100).

**Figure S4.** Electrophysiological properties of a feedback interneuron model. **A,** Voltage responses recorded from the soma in response to step current injections. **B,** Left, Step current injections in the soma. Middle: Corresponding voltage responses recorded from the soma. Right, Plot of voltage change vs. injected current and its linear regression analysis to obtain the corresponding input resistance. **C,** Plot of an action potential recorded from the soma (I) and the corresponding phase plot (II) **D,** Plot of firing frequency vs. current step amplitude. **E,** Example voltage traces of spontaneous activity recorded from the soma. **F,** Average spontaneous firing frequency (means ± SD) recorded across trials (n = 100).

**Figure S5.** Decoding odor frequency from baseline activity under various synaptic knockout conditions.Bar plots show CNN classification accuracy for discriminating 2Hz vs. 20Hz odor conditions using only pre-stimulus/baseline (0–2s) firing activity of all pyramidal neurons, alongside corresponding shuffle controls. Each panel represents a distinct synaptic disconnection: (**A**) Control, (**B**) FF–PYR, (**C**) FB–PYR, (**D**) FF–FF, (**E**) FB–FB, (**F**) FF–FF and FB–FB, and (**G**) PYR–PYR. Accuracy is reported across three odor conditions (A, B, and Mix), with each condition evaluated over 144 iterations using a random 60%/40% train-test split. Classification performance using activity was statistically compared to chance-level decoding (shuffle condition) using a two-tailed t-test (p < 0.05).