Barrel Columns

How many neurons in a barrel column?

- 2550 neurons where measured, located in the C2 barrel column

- mouse C2 barrel column is ~300 micro meters in diameter

- the number of neurons per barrel column varies substantially, even within individual animals

Excitatory vs Inhibitory neurons

- depending on the layer of the C2 barrel column, anywhere between 500 and 1500 cells where found to be excitatory

Excitatory vs Inhibitory synaptic connectivity

- 254 excitatory synaptic connections where found among 1046 tested connections -> 24.3%

Sources

- The Excitatory Neuronal Network of the C2 Barrel Column in Mouse Primary Somatosensory Cortex (https://www.sciencedirect.com/science/article/pii/S0896627308010921)

- Microcolumns in the cerebral cortex (https://www.pnas.org/content/97/10/5019)

- Functionally Independent Columns of Rat Somatosensory Barrel Cortex Revealed with Voltage-Sensitive Dye Imaging (http://www.jneurosci.org/content/21/21/8435)
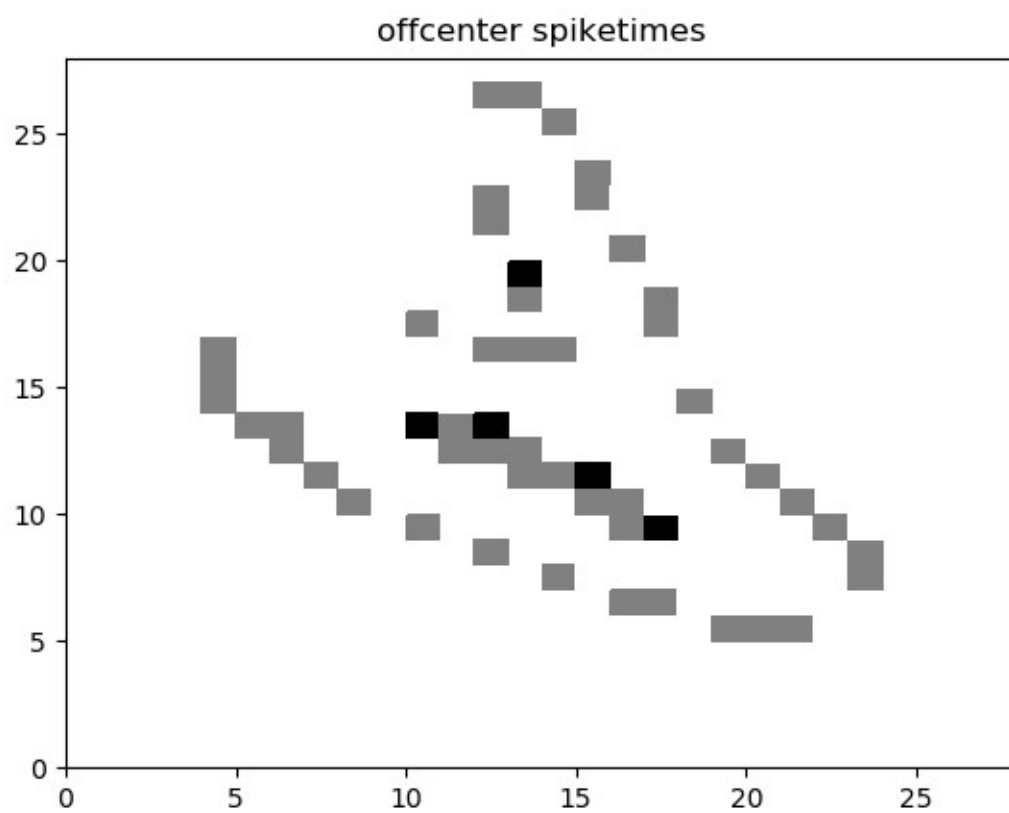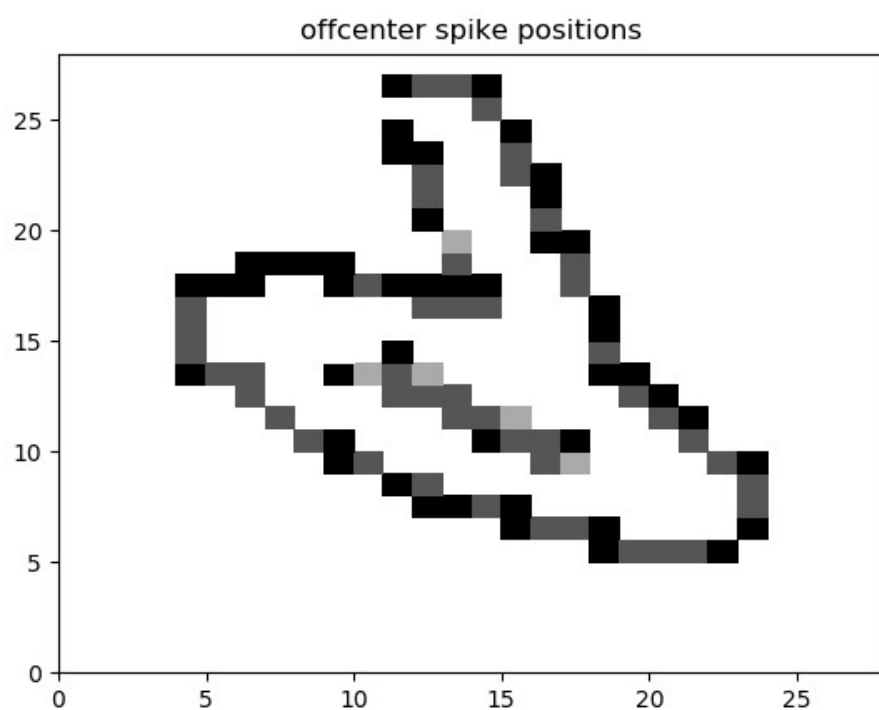

Hypercolumns

Neurons

- hypercolumns consist of two populations of neurons

- one inhibitory and one excitatory

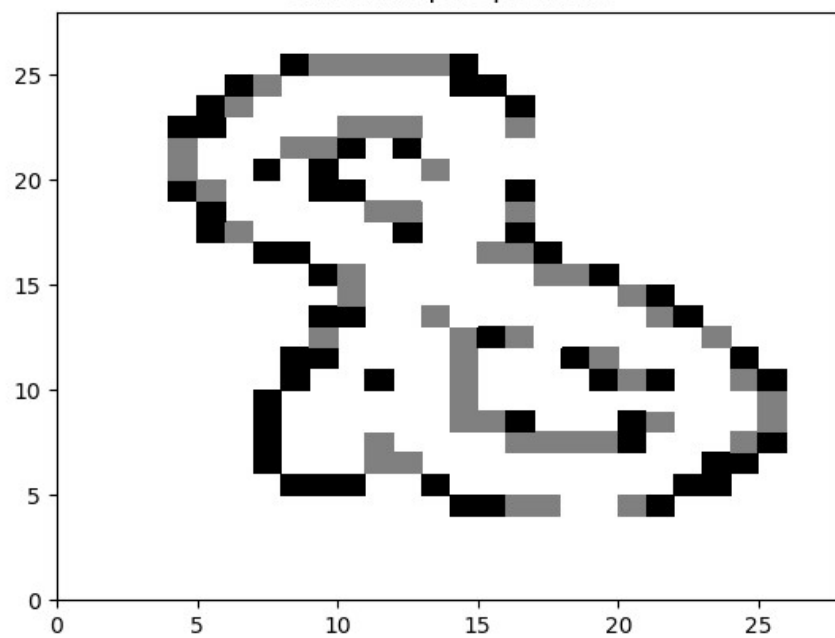- hypercolumns are ~1mm in width

Microcolumns

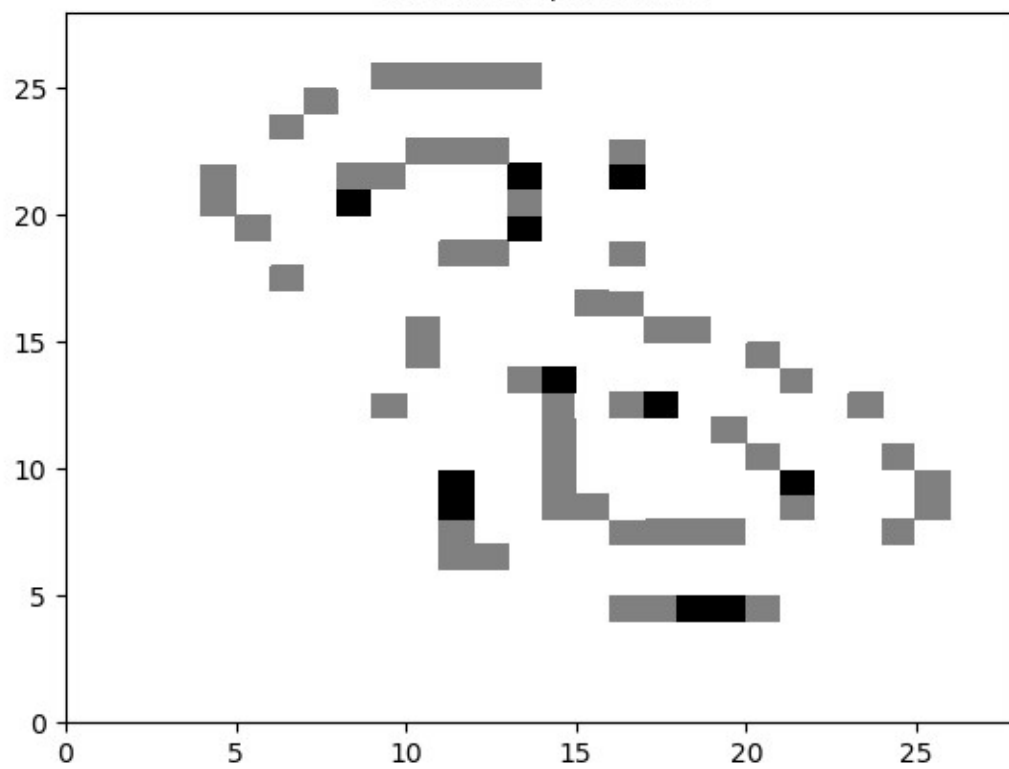- ~100 microcolumns are estimated to be in a hypercolumn

Sources

- Chaos and synchrony in a model of a hypercolumn in visual cortex (https://link.springer.com/article/10.1007/BF00158335)

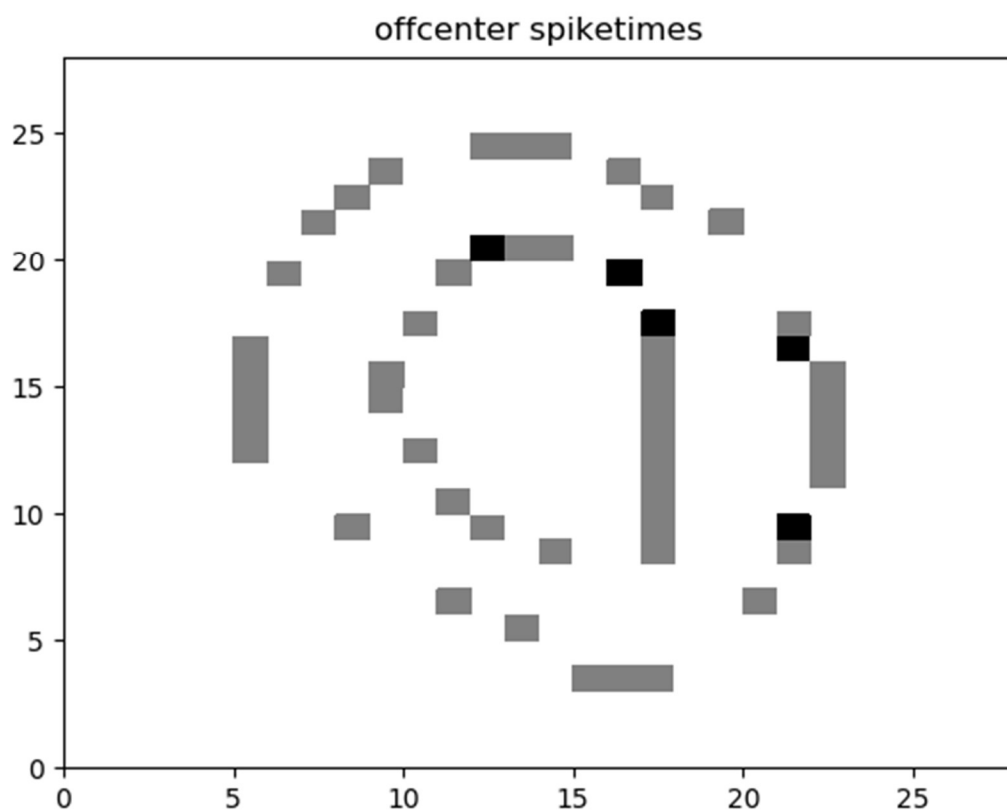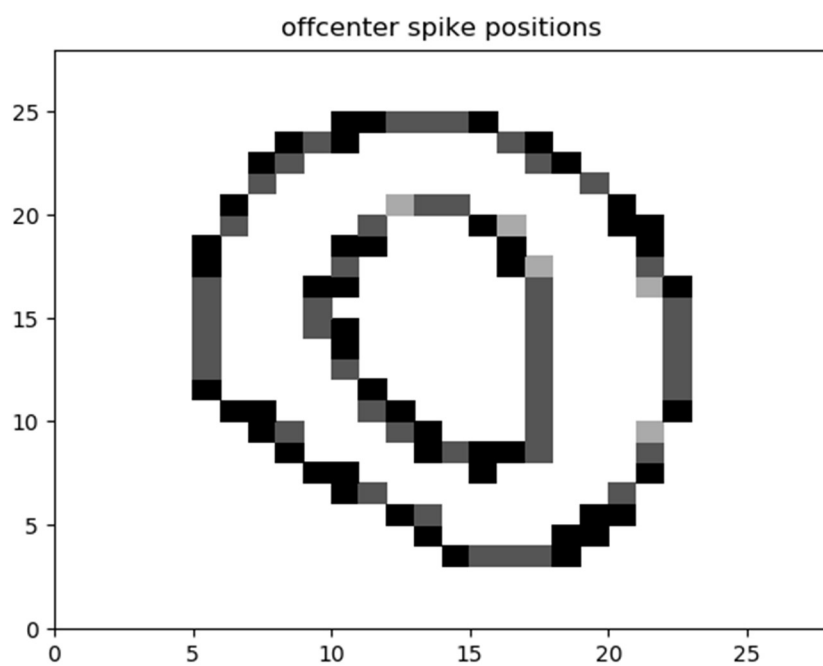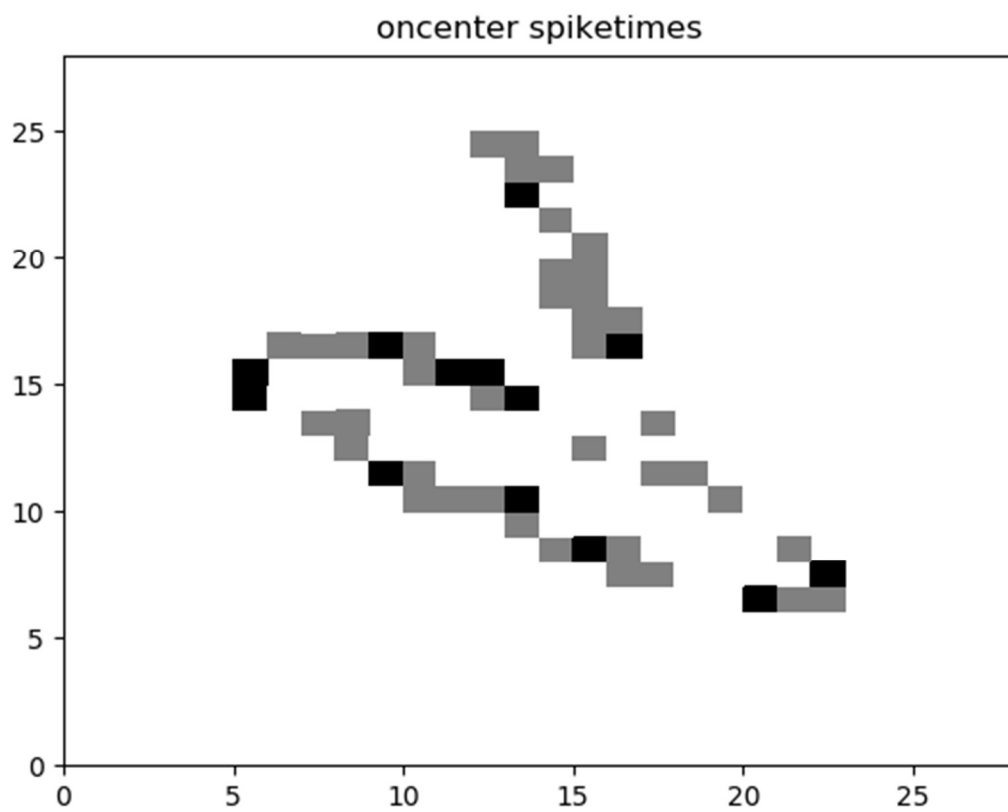- The functional geometry of local and horizontal connections in a model of V1 (http://www.math.utah.edu/~bresslof/publications/03-3.pdf)

offcenter spike positions

offcenter spiketimes
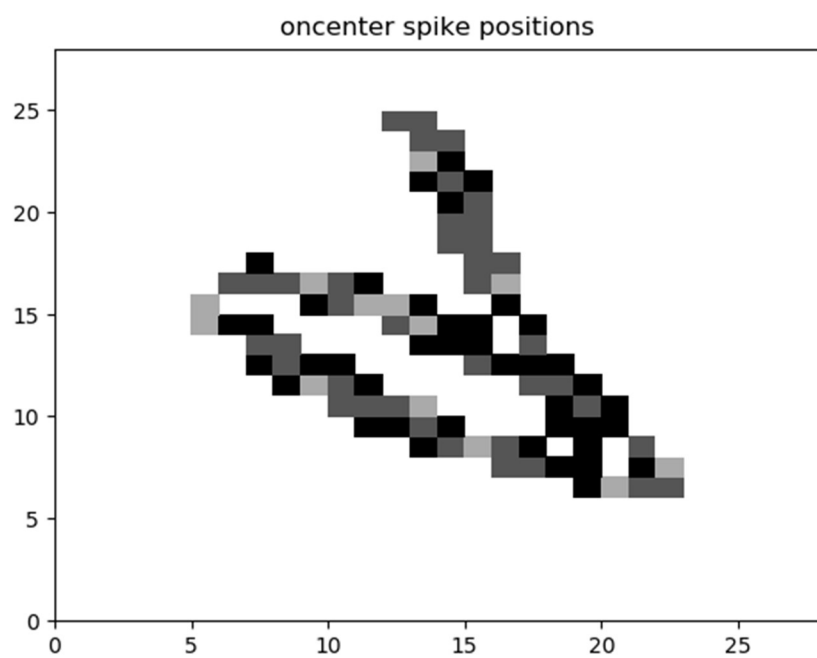
offcenter spike positions
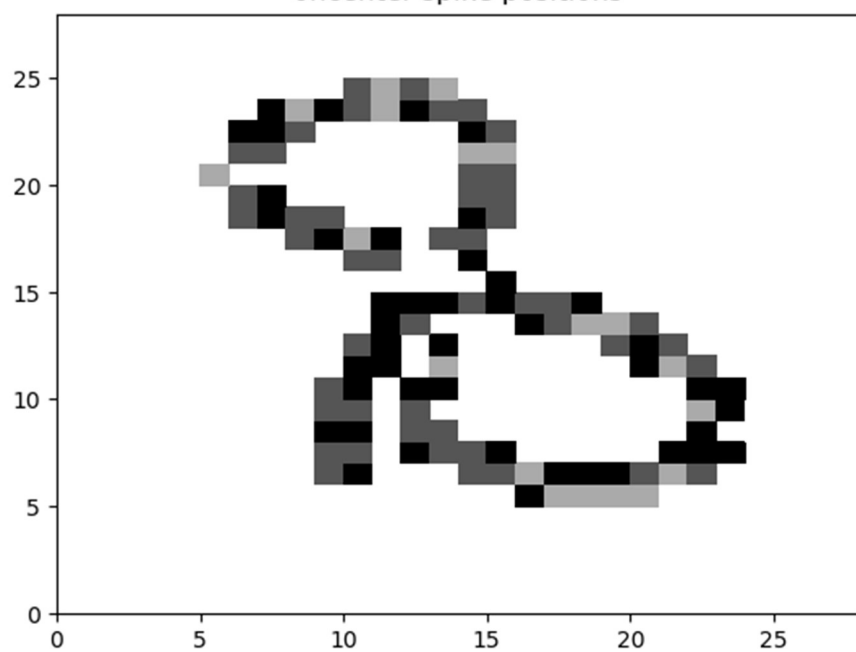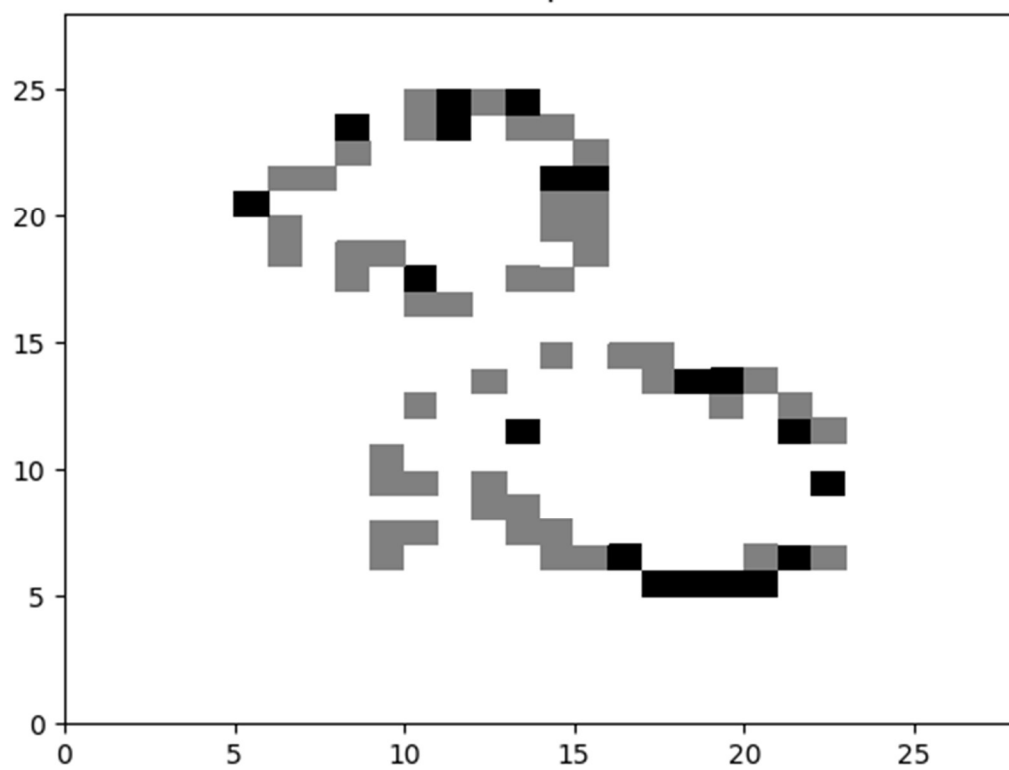

offcenter spiketimes

offcenter spike positions

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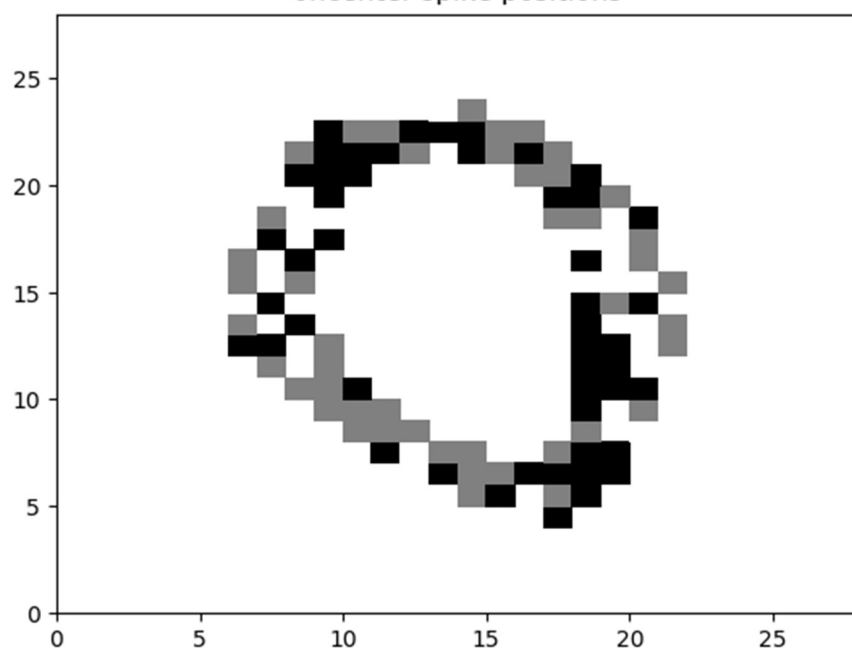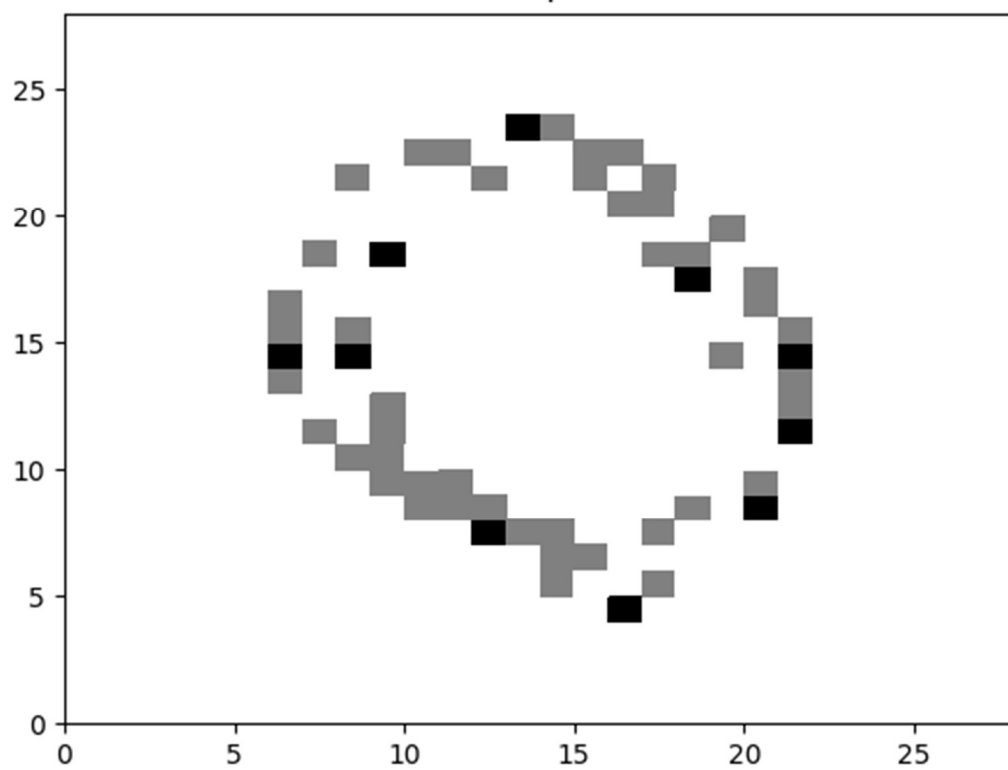
oncenter spike positions

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oncenter spike positions
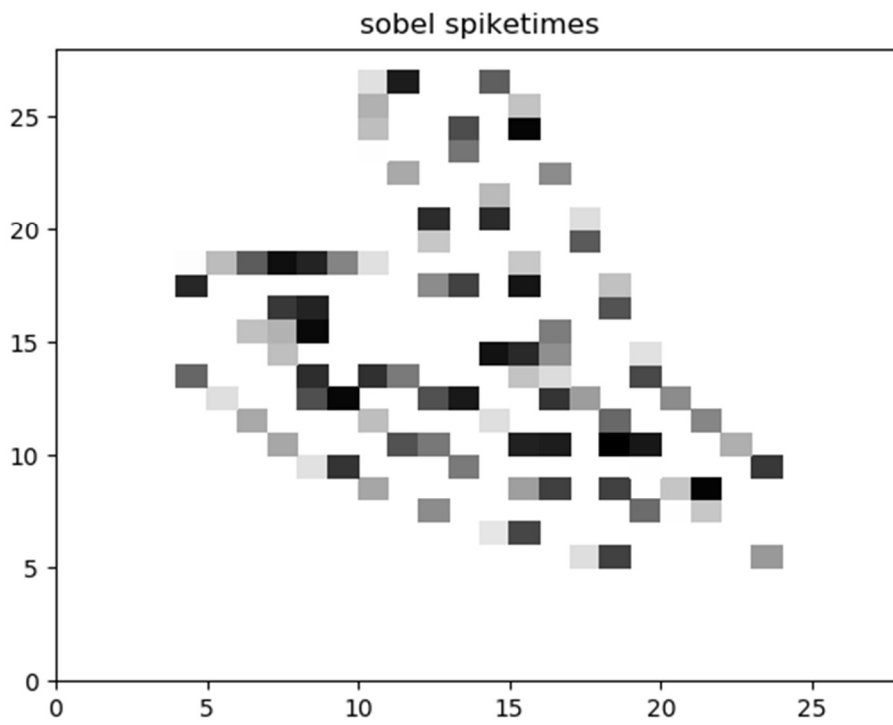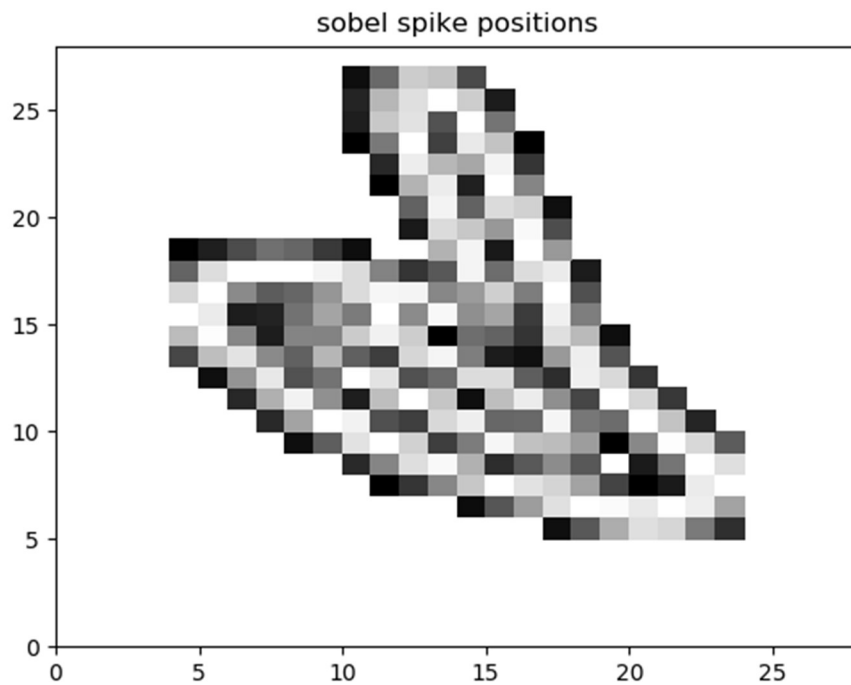

oncenter spiketimes
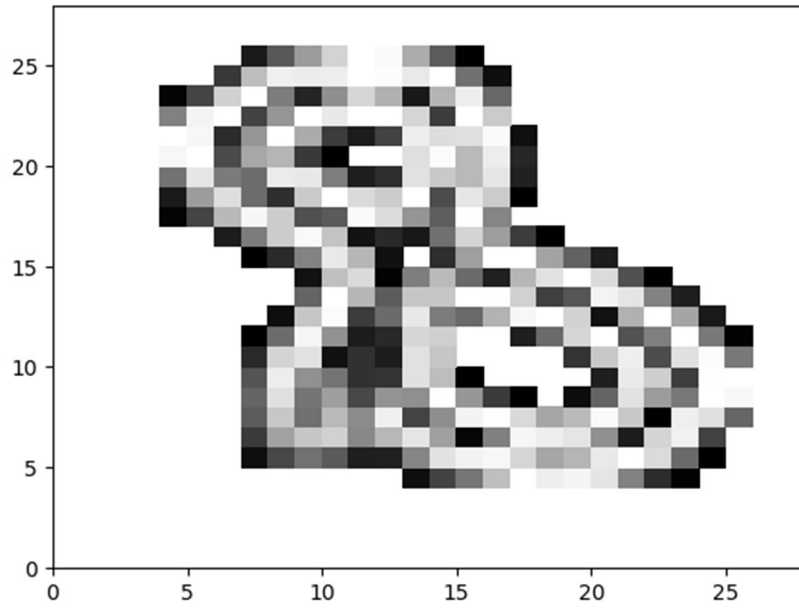
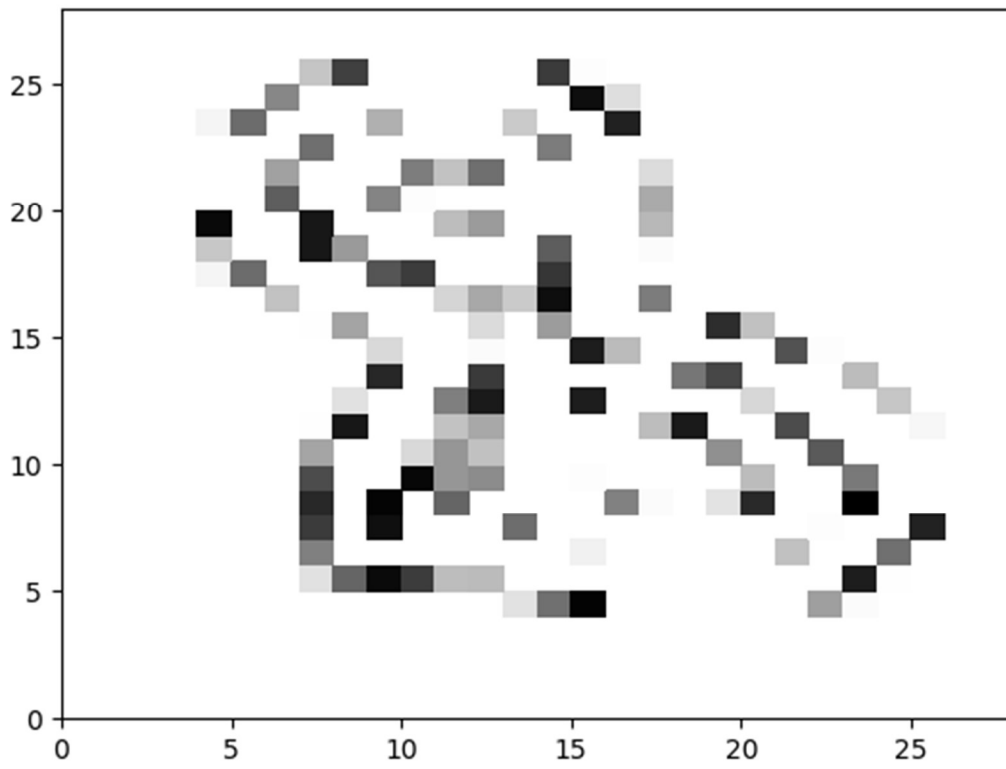oncenter spike positions

oncenter spiketimes

For my third filter, I decided to implement a sobel-like algorithm. I thought it would be interesting because it is essentially a combination between the on and off filters.
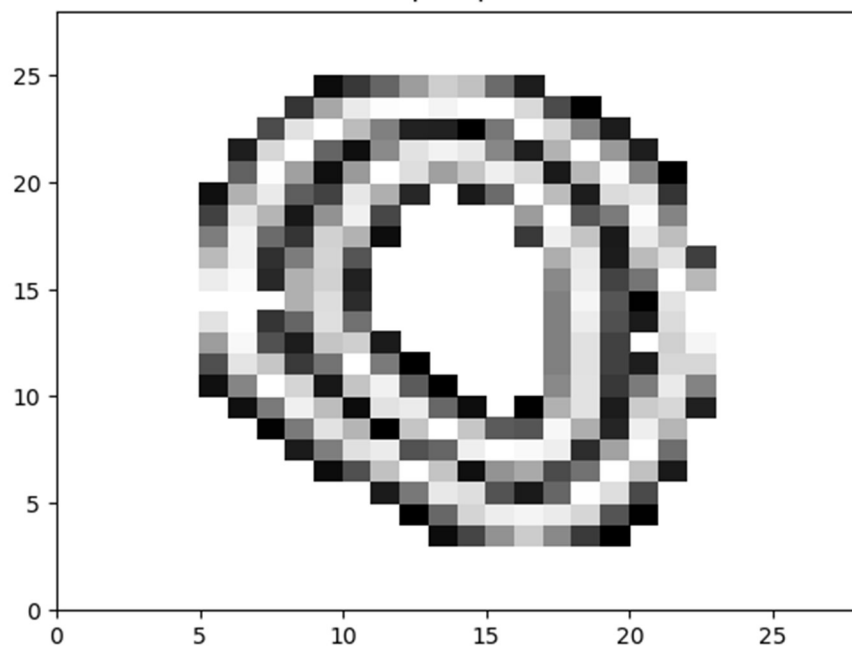

sobel spike positions

sobel spiketimes

sobel spike positions

sobel spiketimes

sobel spike positions

sobel spiketimes