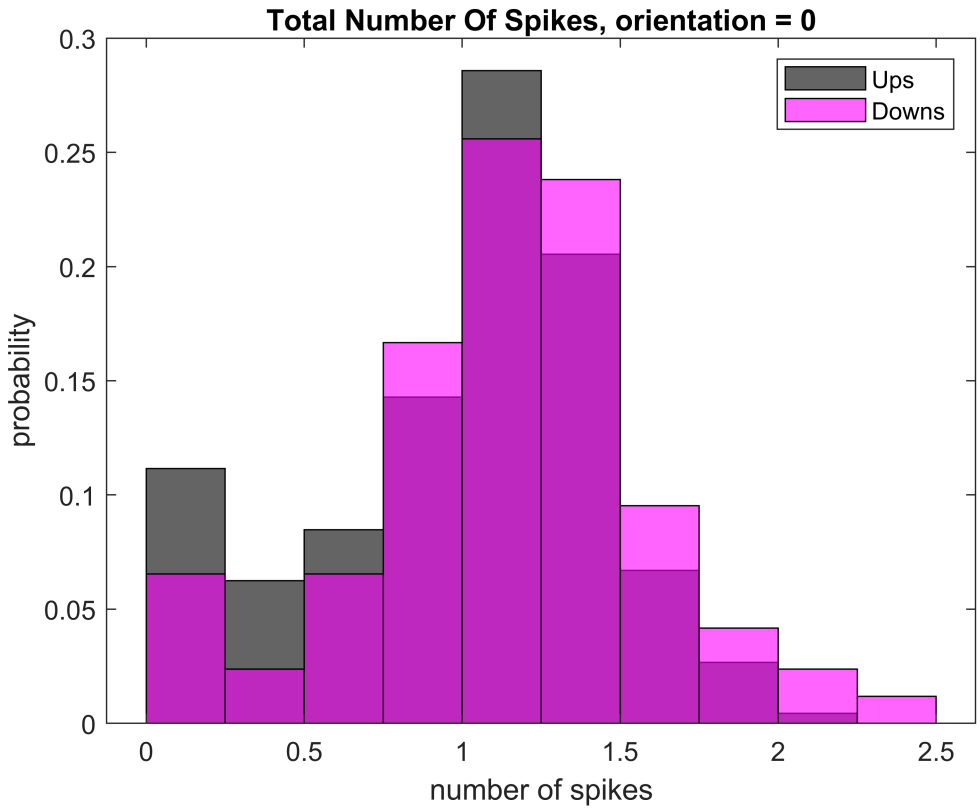
Distributions and ROC AUC for all epochs at each orientation

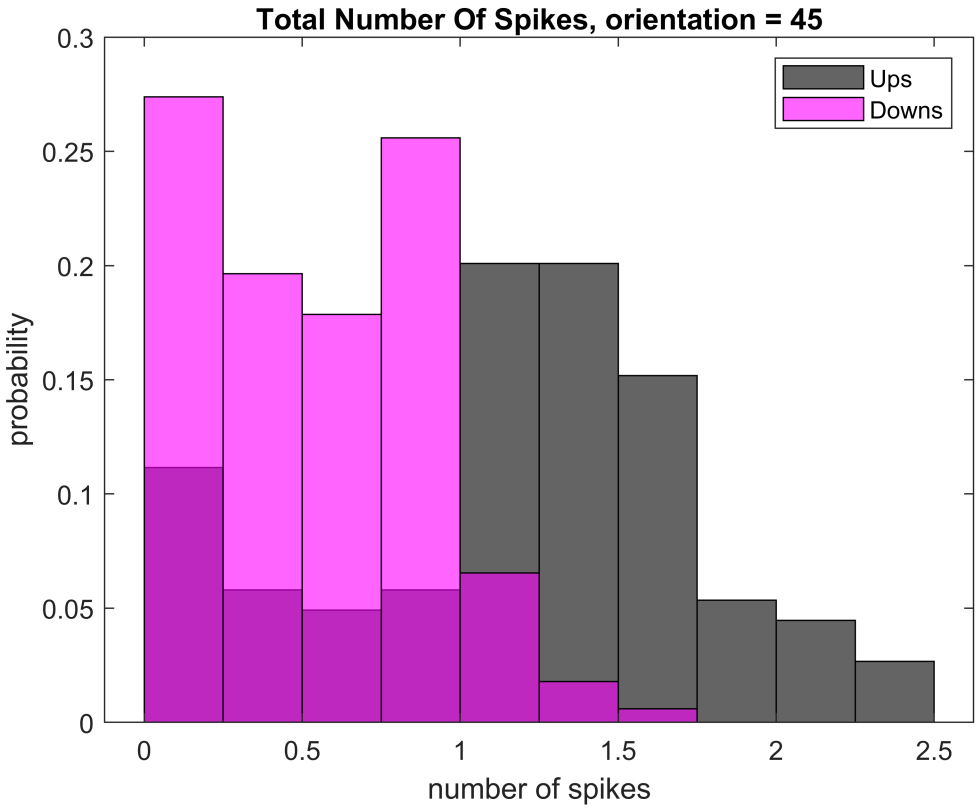
Begin by plotting the distributions for each orientation for both cell types

For each orientation, I am plotting the total number of spikes for every epoch for every cell. There is no averaging. ROCs are calculated between 0.5 and 1.0, with 0.5 indicating that the distributions are identical and 1.0 indicating that they are completely seperable. 0 degrees is rightward motion. 90 Degrees is upwards. 180 is leftwards. 270 is downwards.

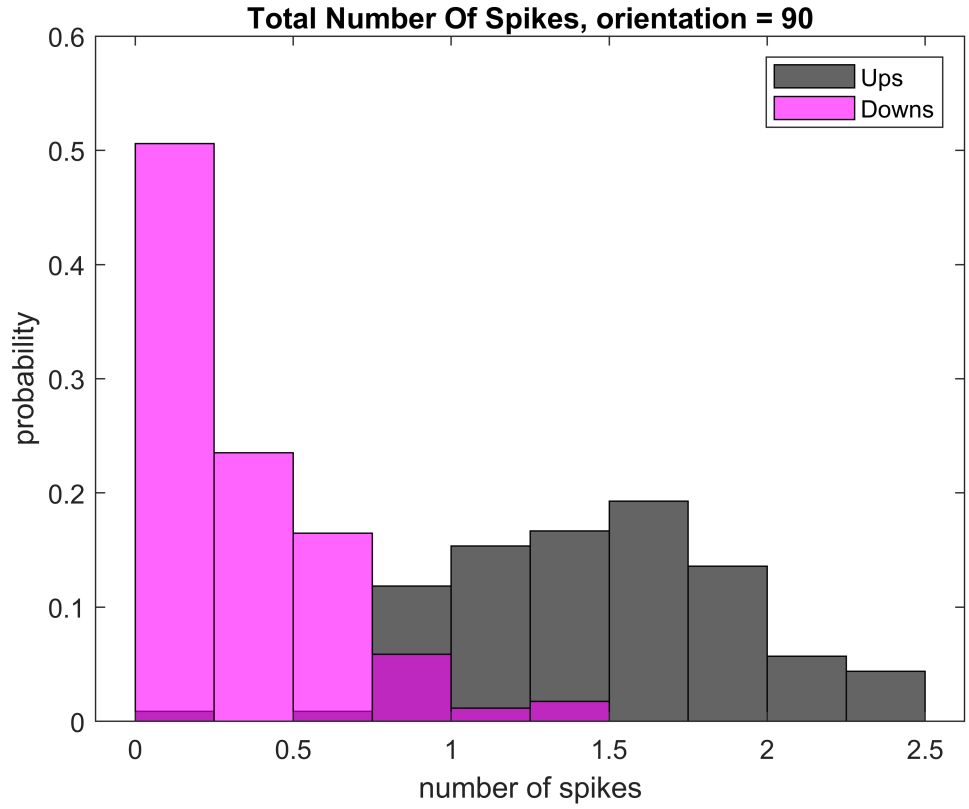
```
All responses are normalized to each cell's mean responses across all epochs
```



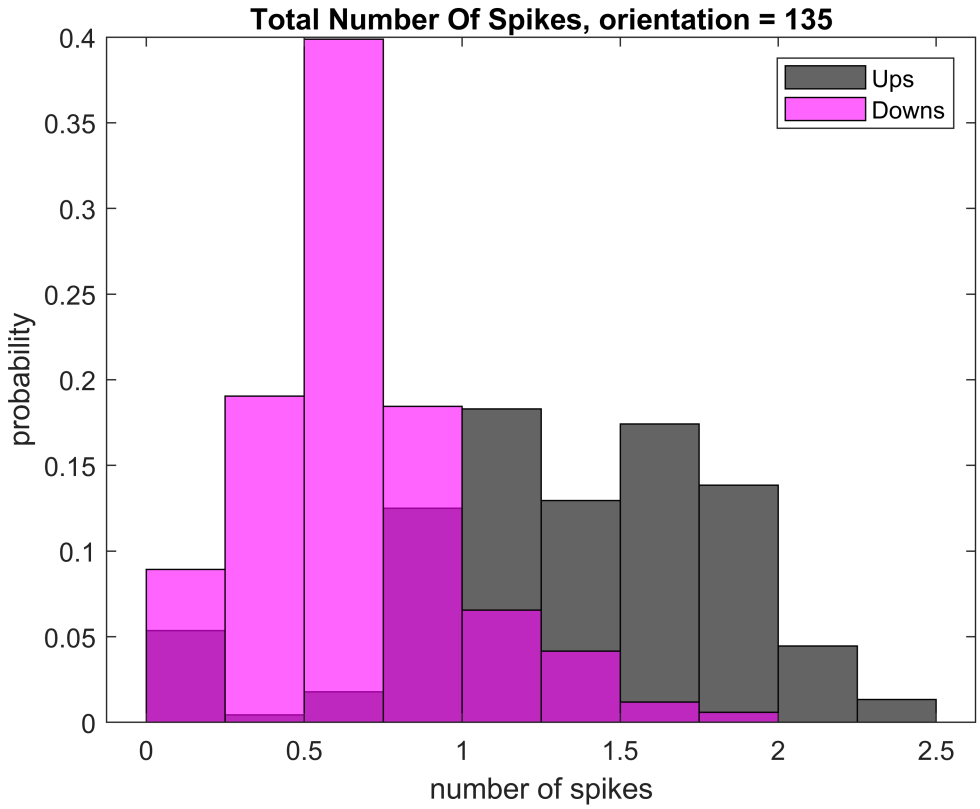

```
ROC AUC = 0.59601
```



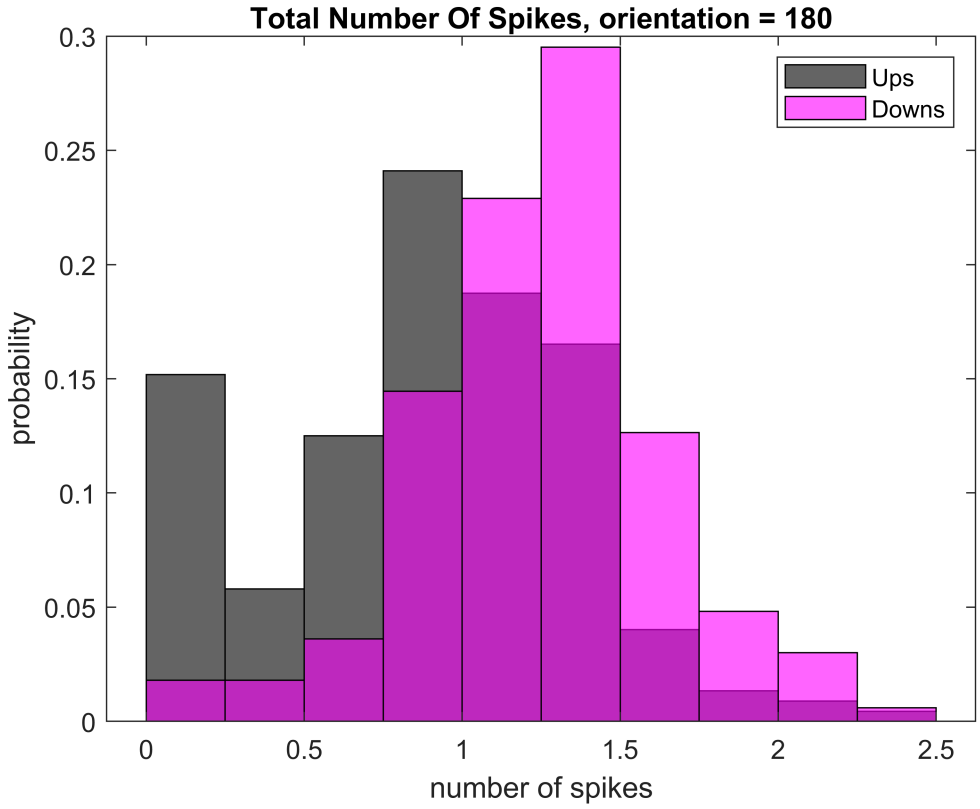

```
ROC AUC = 0.81189
```



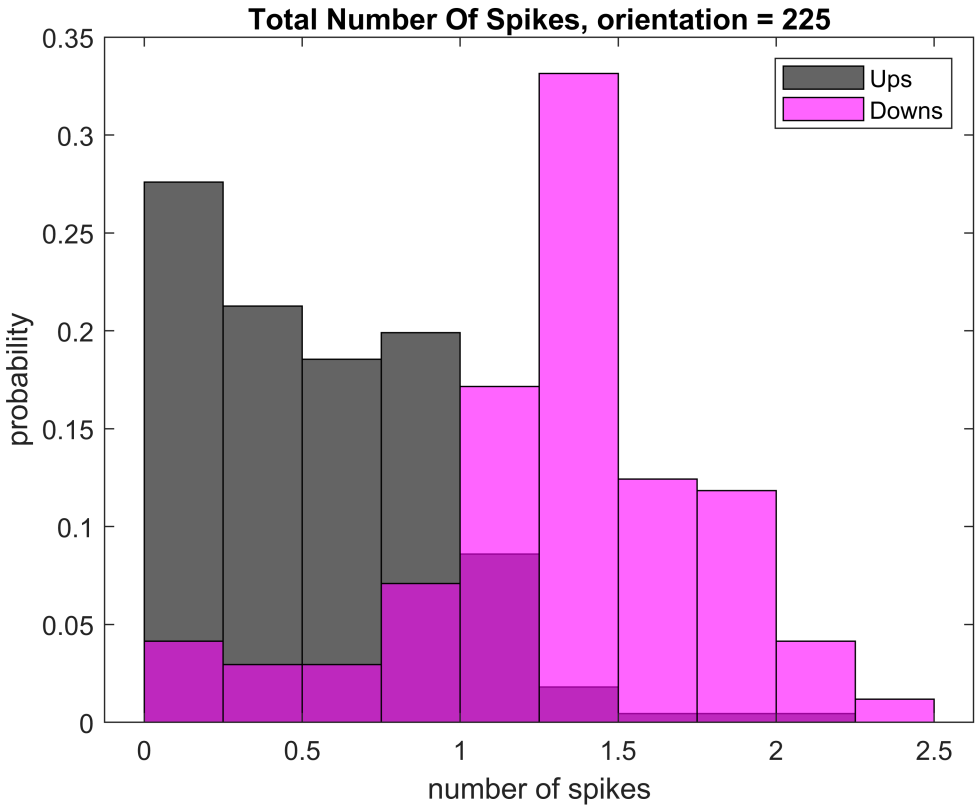

```
ROC AUC = 0.97528
```



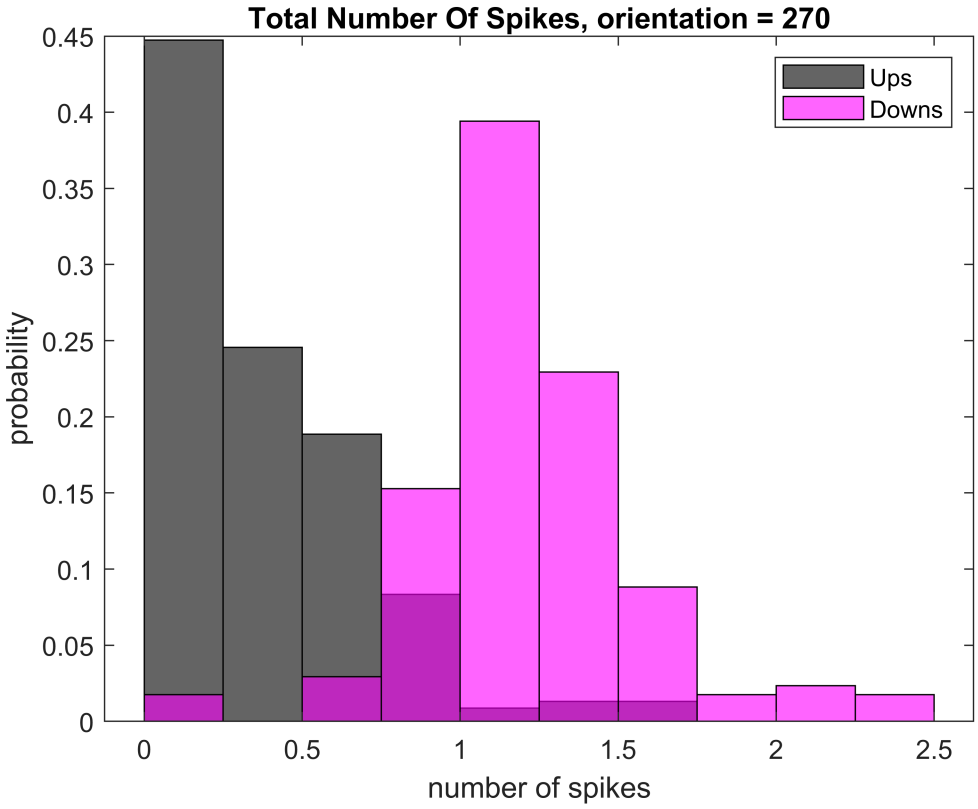

```
ROC AUC = 0.87718
```



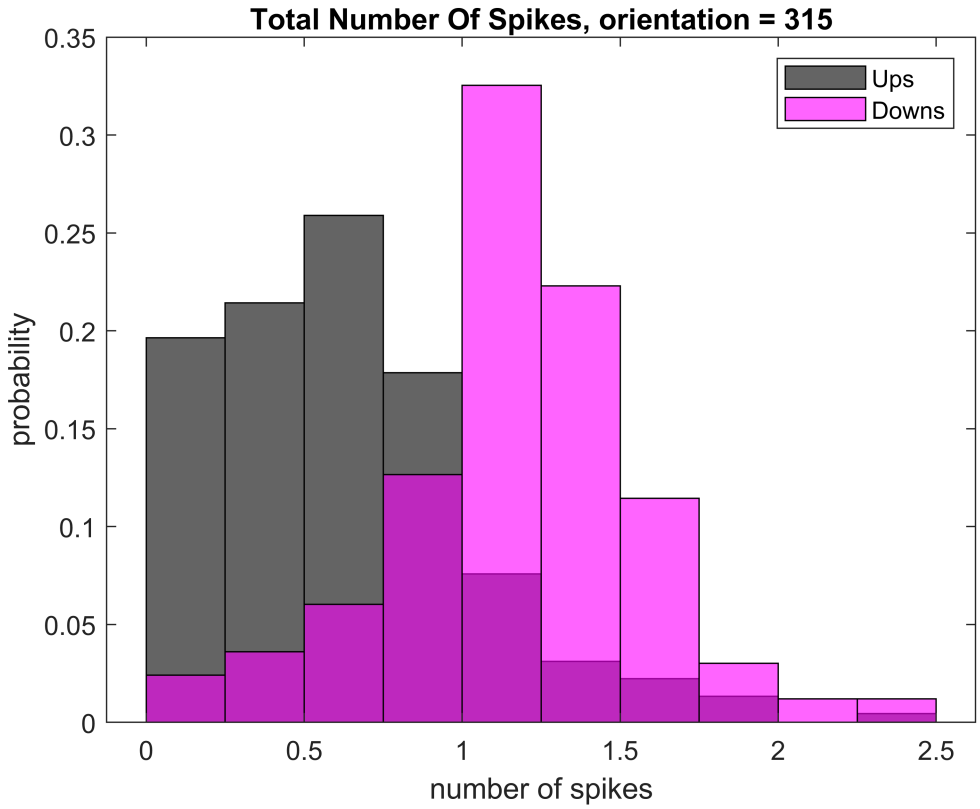

```
ROC AUC = 0.7452
```



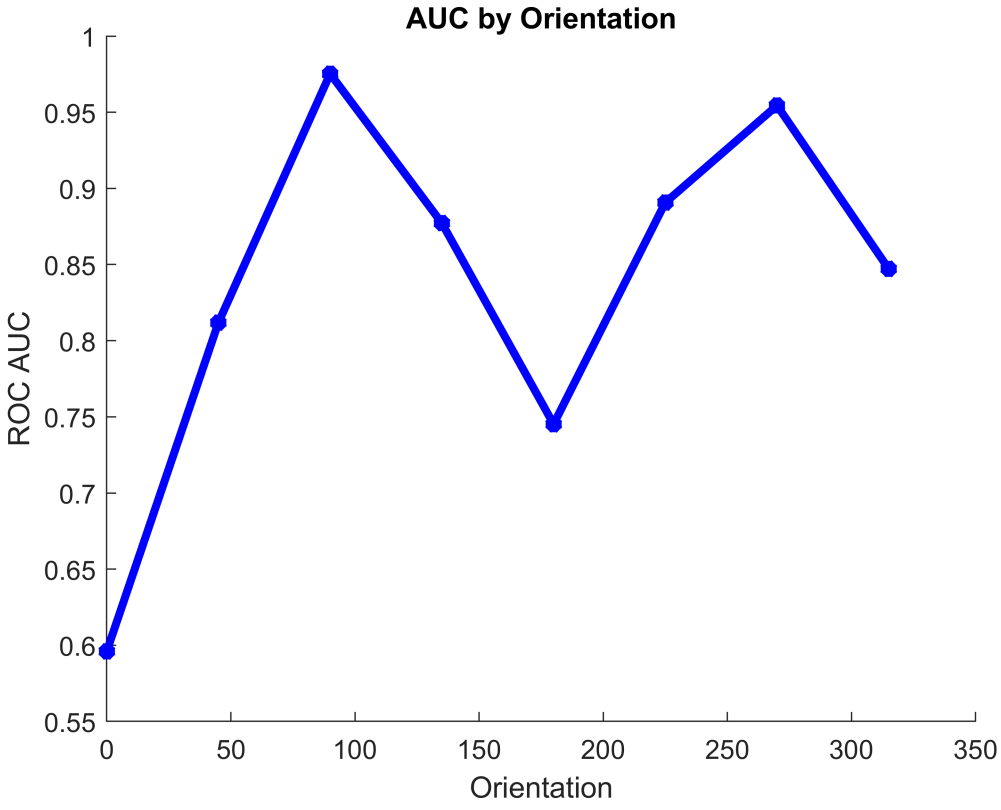

```
ROC AUC = 0.89072
```




```
ROC AUC = 0.95441
```



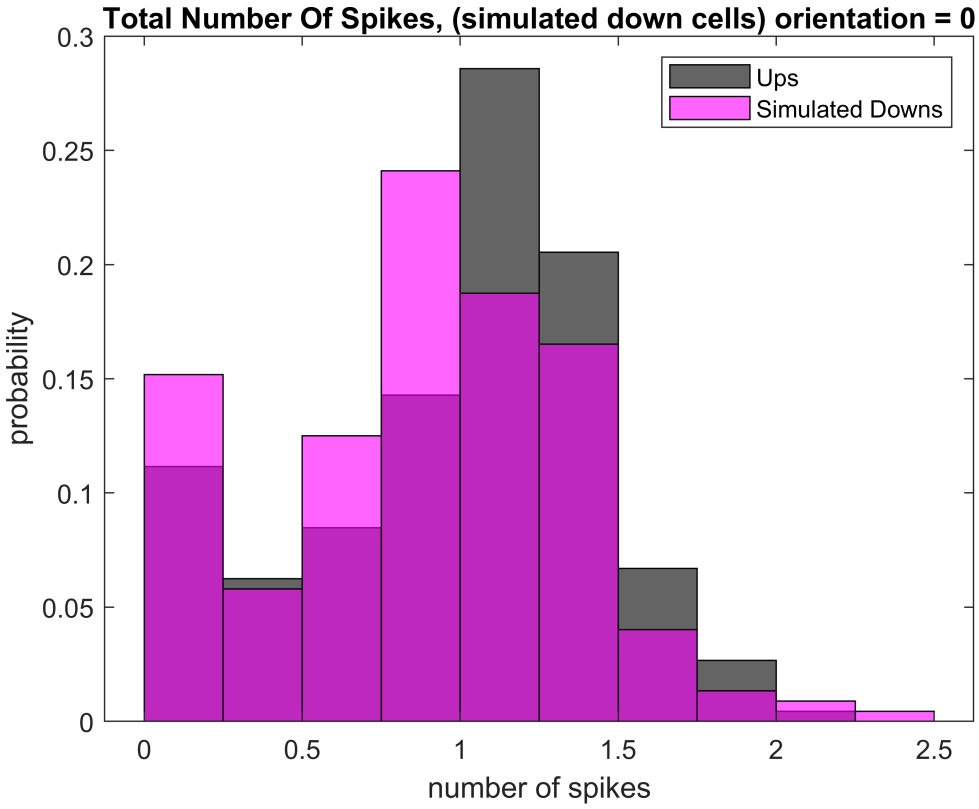

```
ROC AUC = 0.84707
```



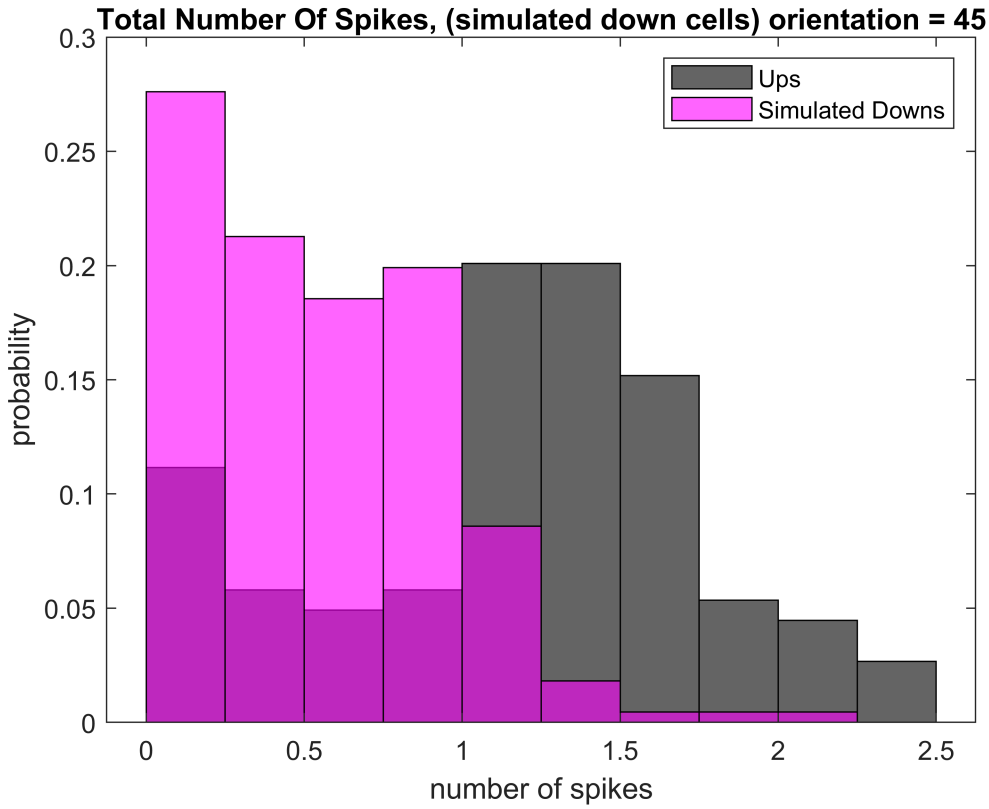
Compare to case where there are two identical cell types

Here I'm plotting the UP cells verus a flipped version of the UP cells (i.e. "simulated ups), and the same for the down cells. This creates symmetry in that the simulated populations have identical tuning curves to the population against which they are compared.

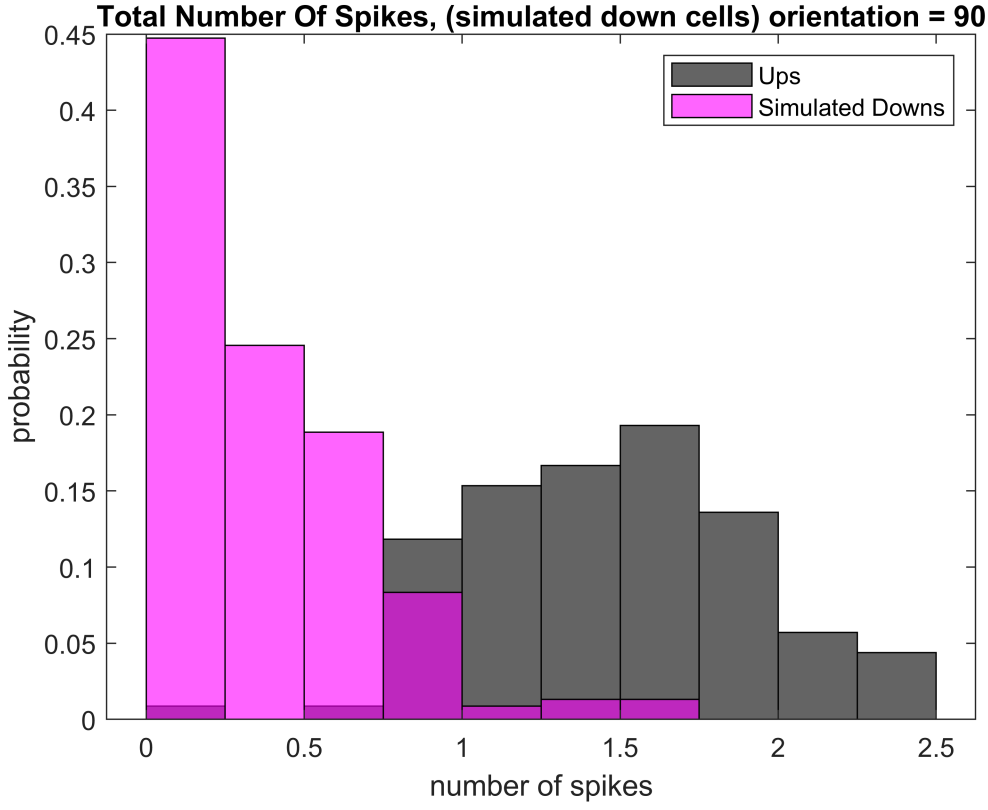
First Compare Normal UP cells to SIMULATED DOWN cells (i.e. flipped up cells)



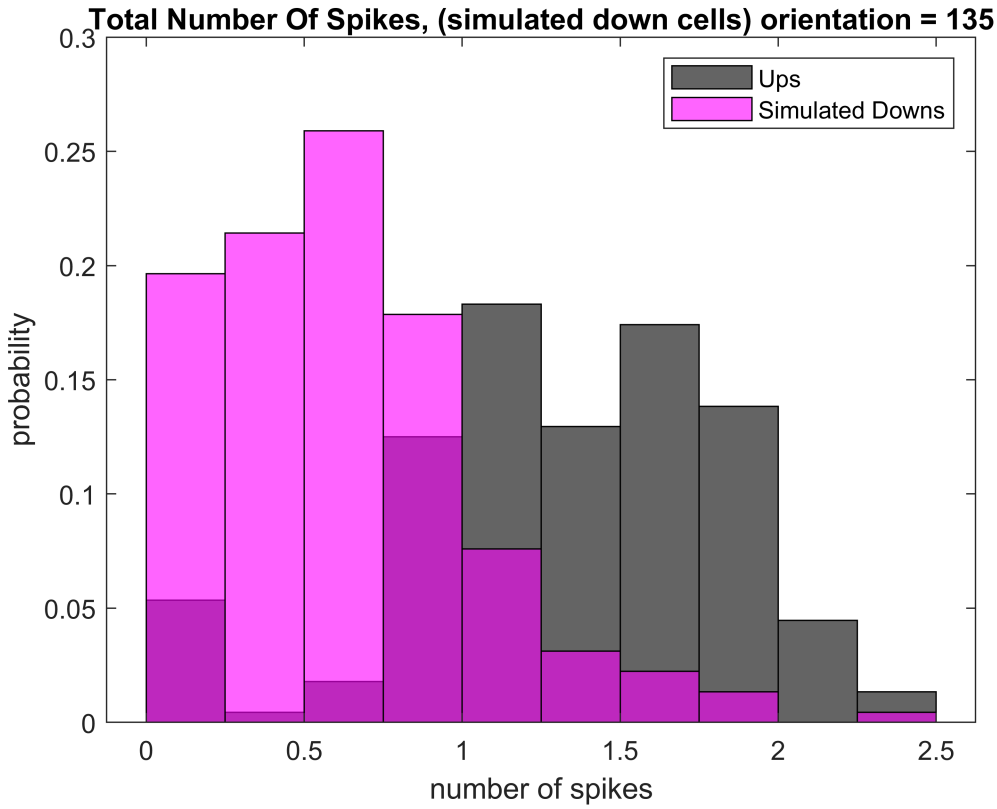

```
ROC AUC = 0.57383
```



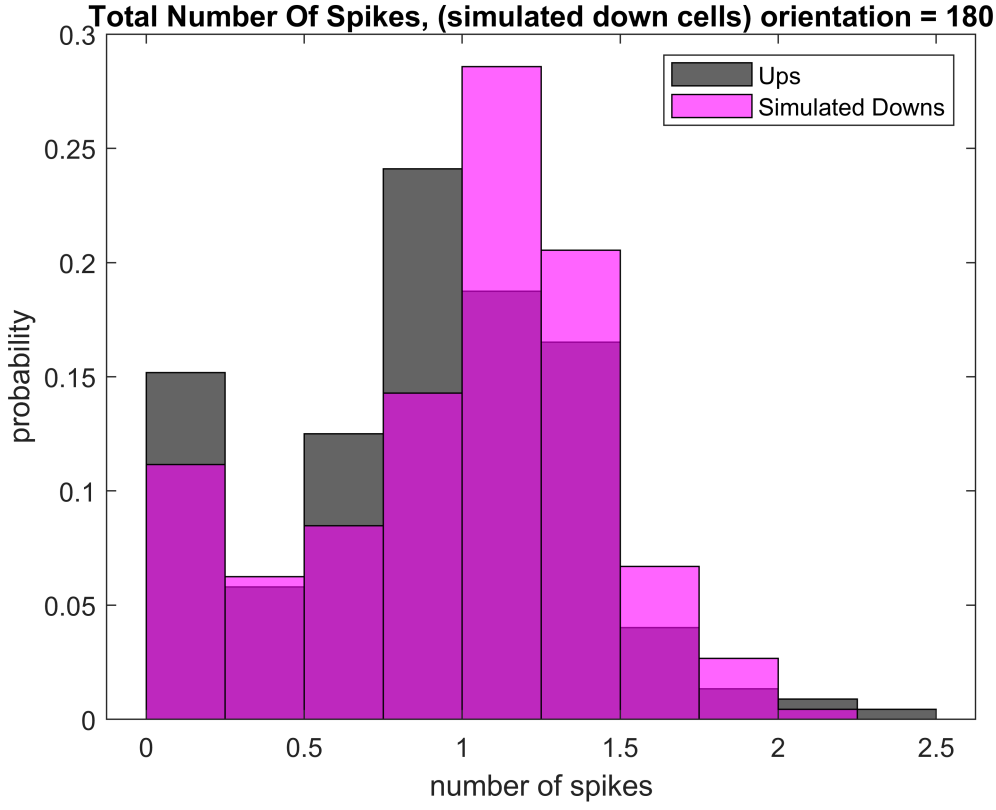

```
ROC AUC = 0.80674
```



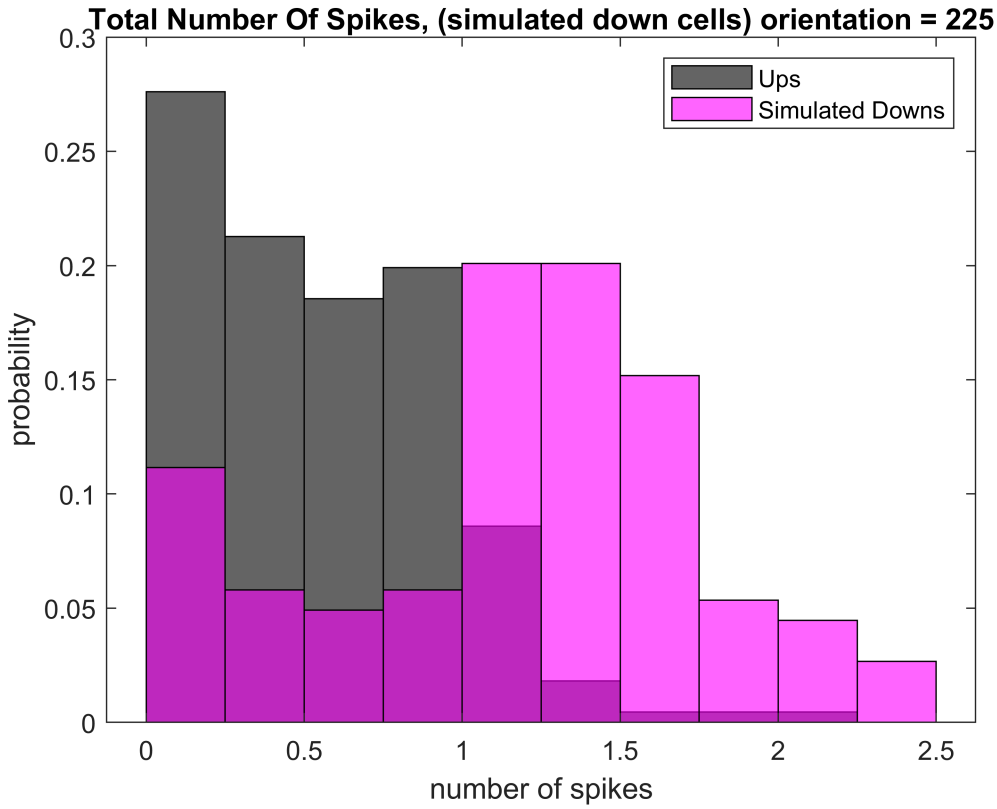

```
ROC AUC = 0.97349
```



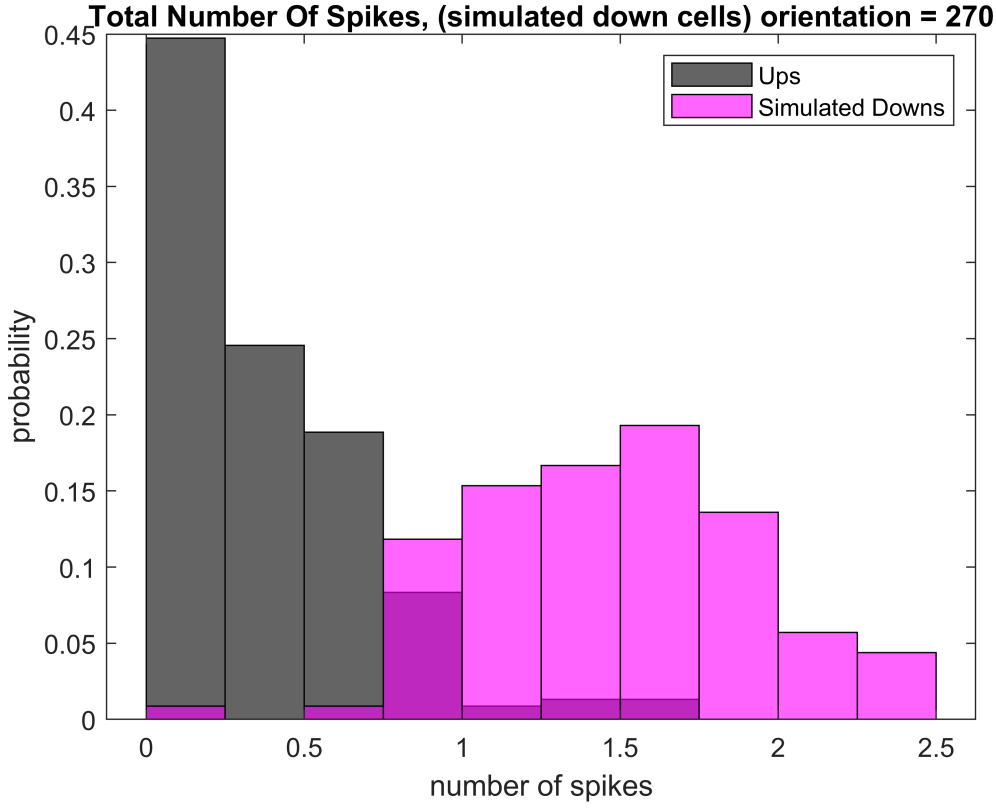

```
ROC AUC = 0.8768
```



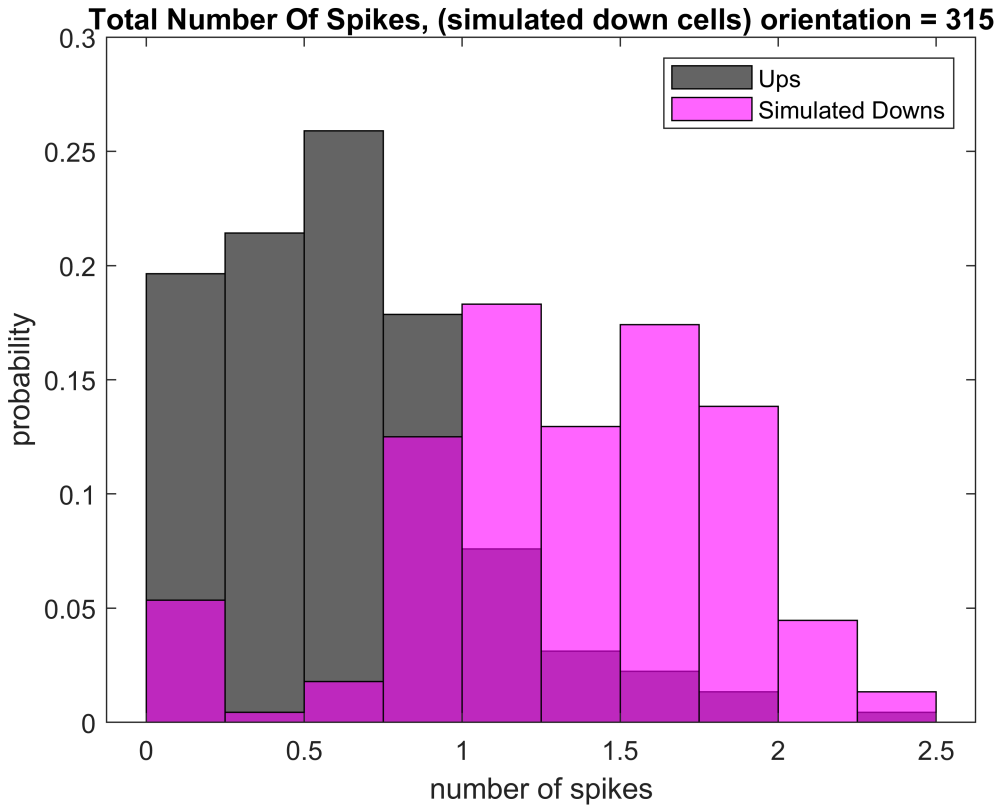

```
ROC AUC = 0.57383
```




```
ROC AUC = 0.80674
```

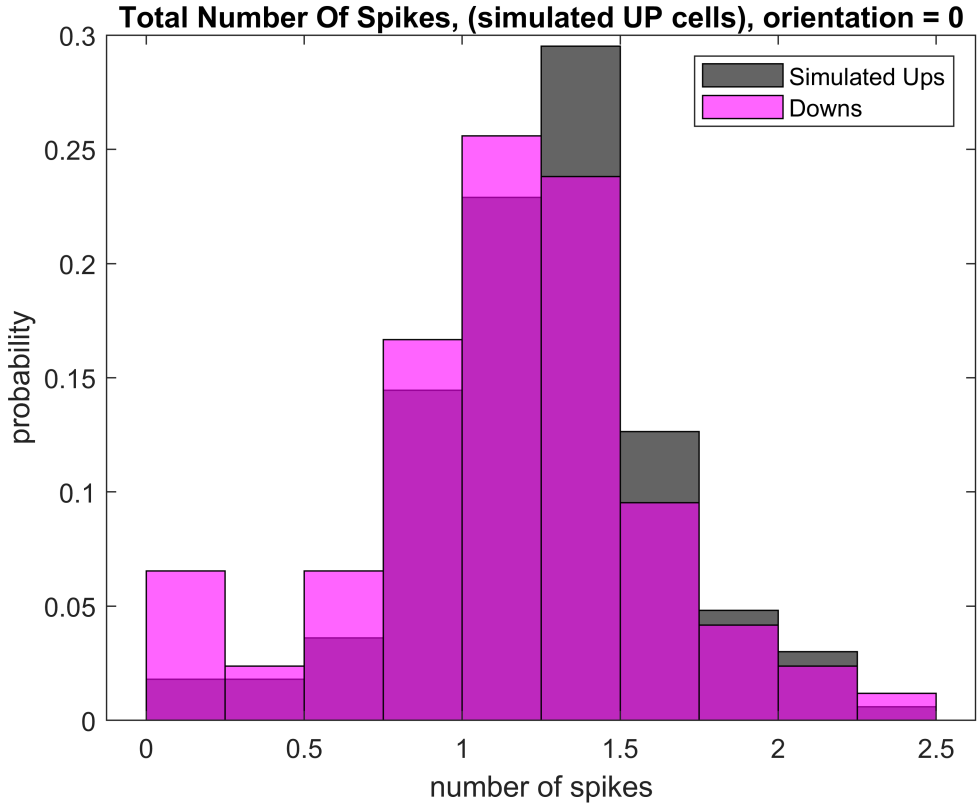



```
ROC AUC = 0.97349
```

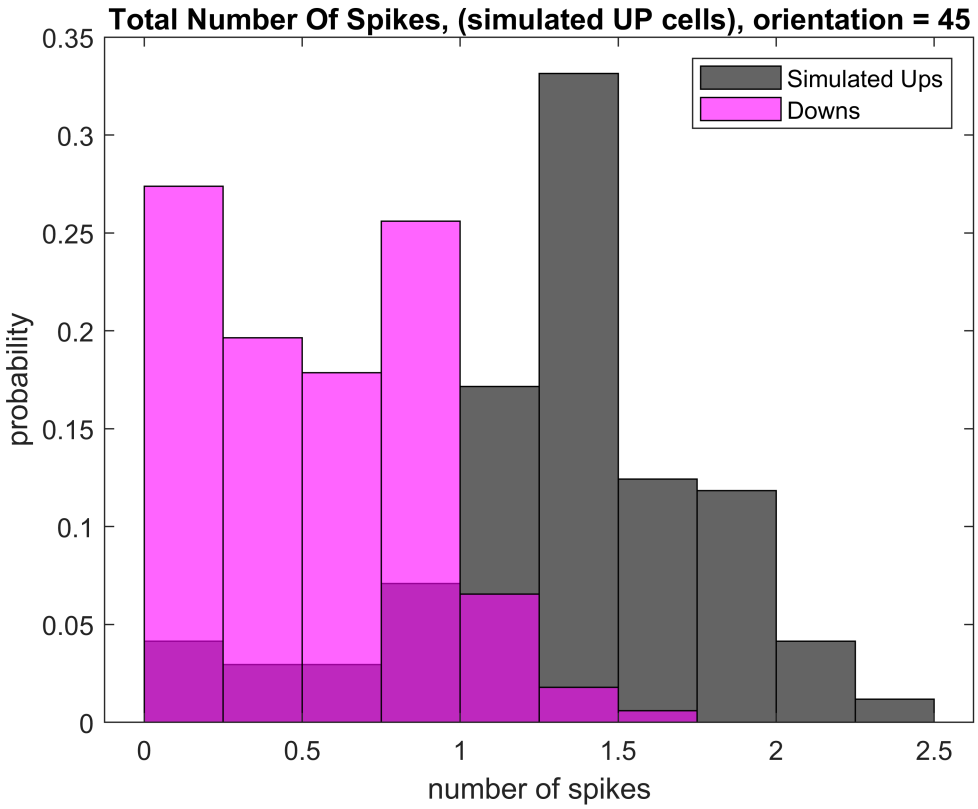



```
ROC AUC = 0.8768
```

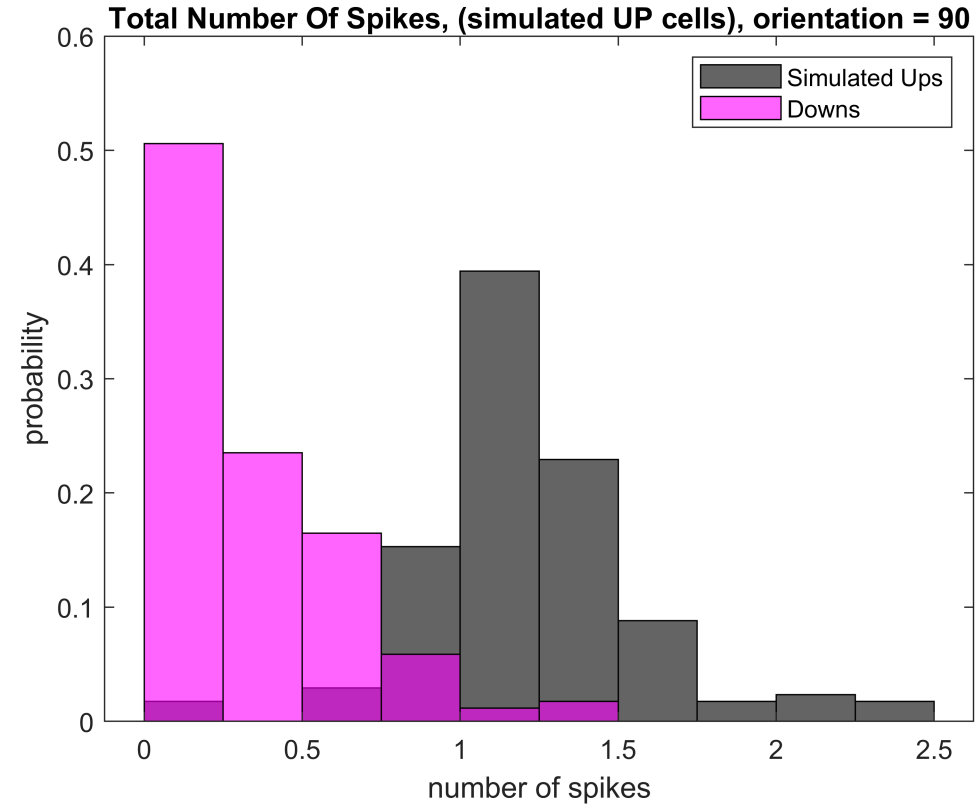
Next compare normal DOWN cells to SIMULATED UP cells (i.e. flipped down cells)



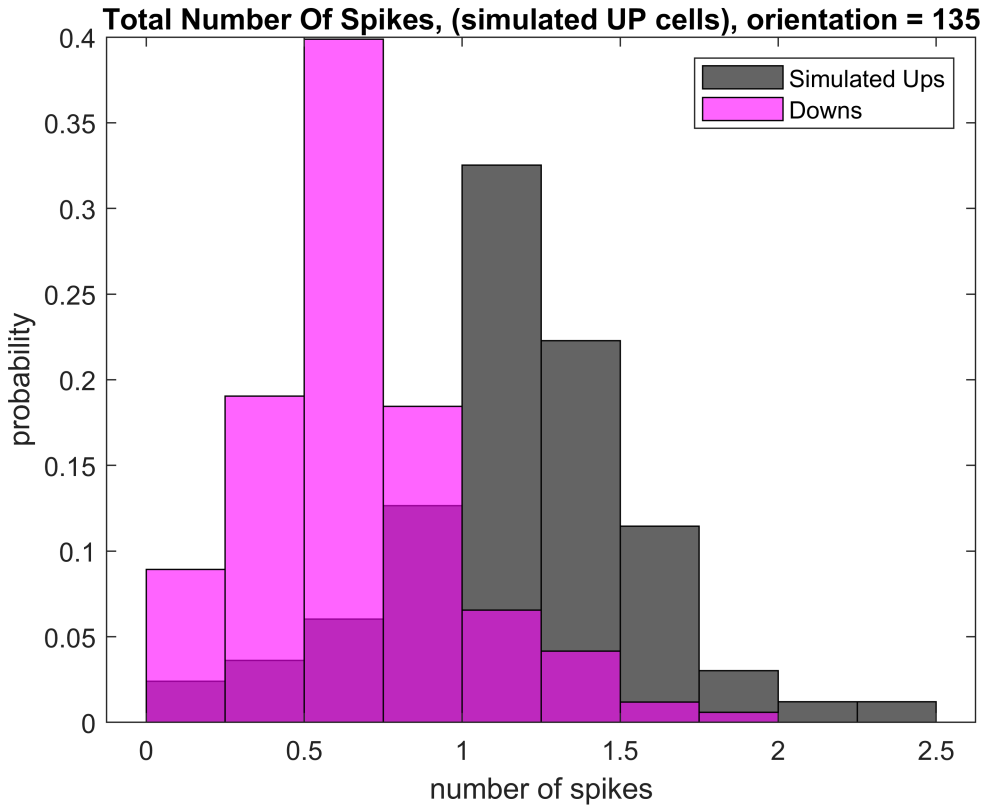

```
ROC AUC = 0.58186
```



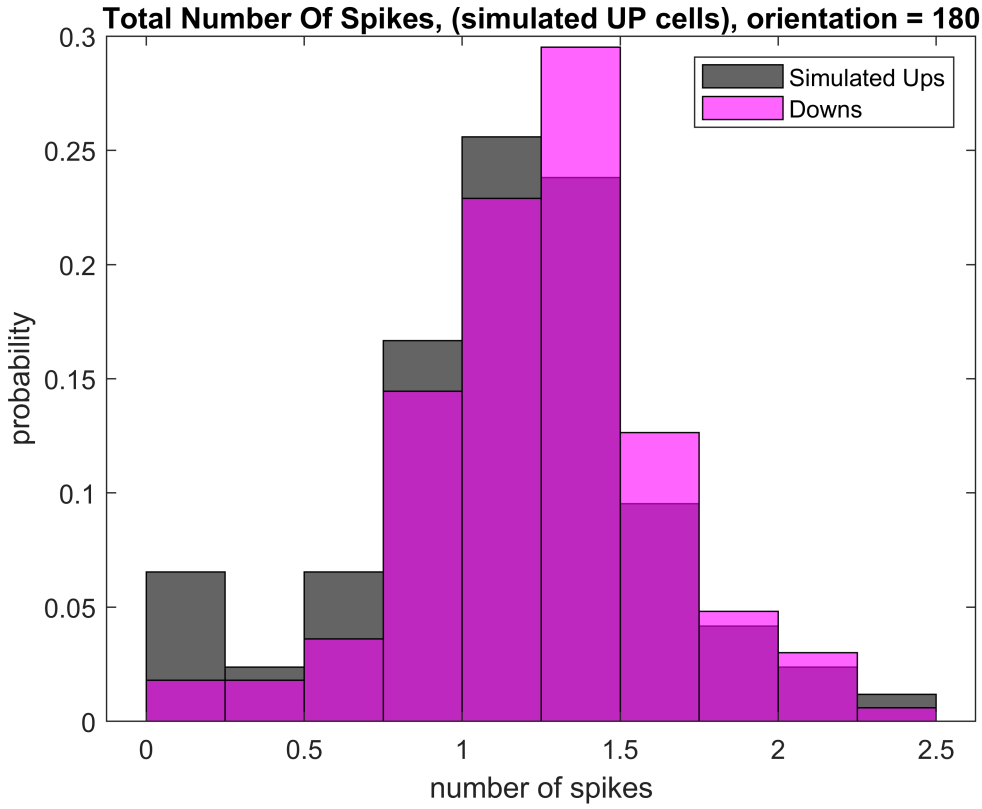

```
ROC AUC = 0.90068
```



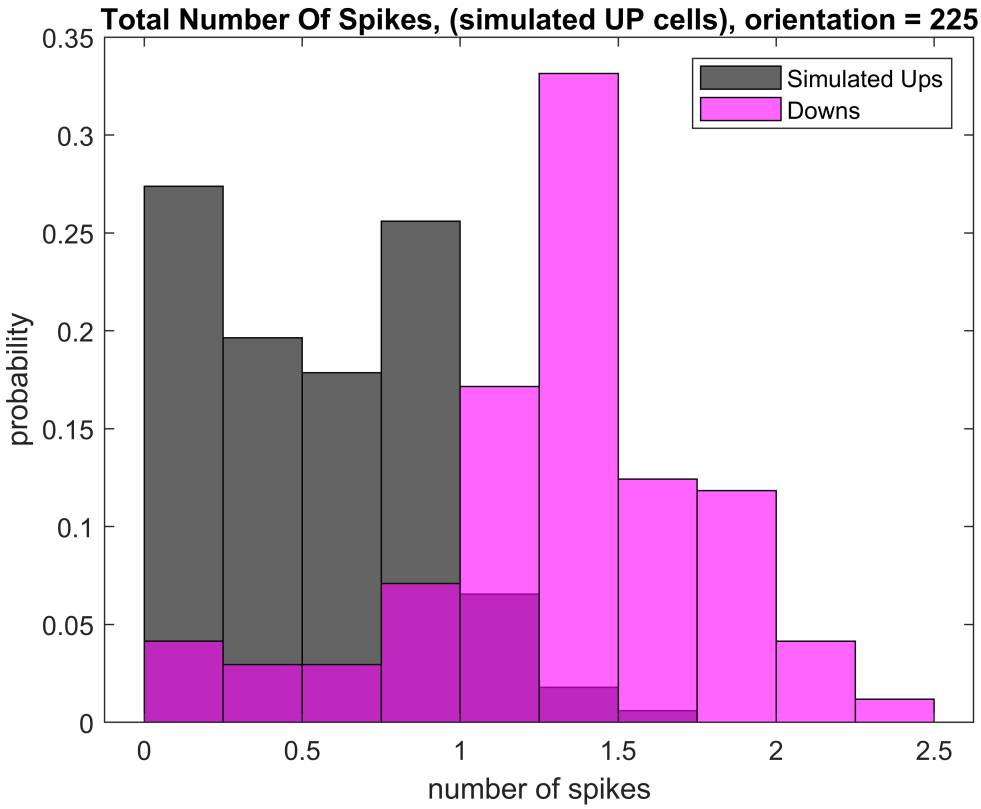

```
ROC AUC = 0.95844
```



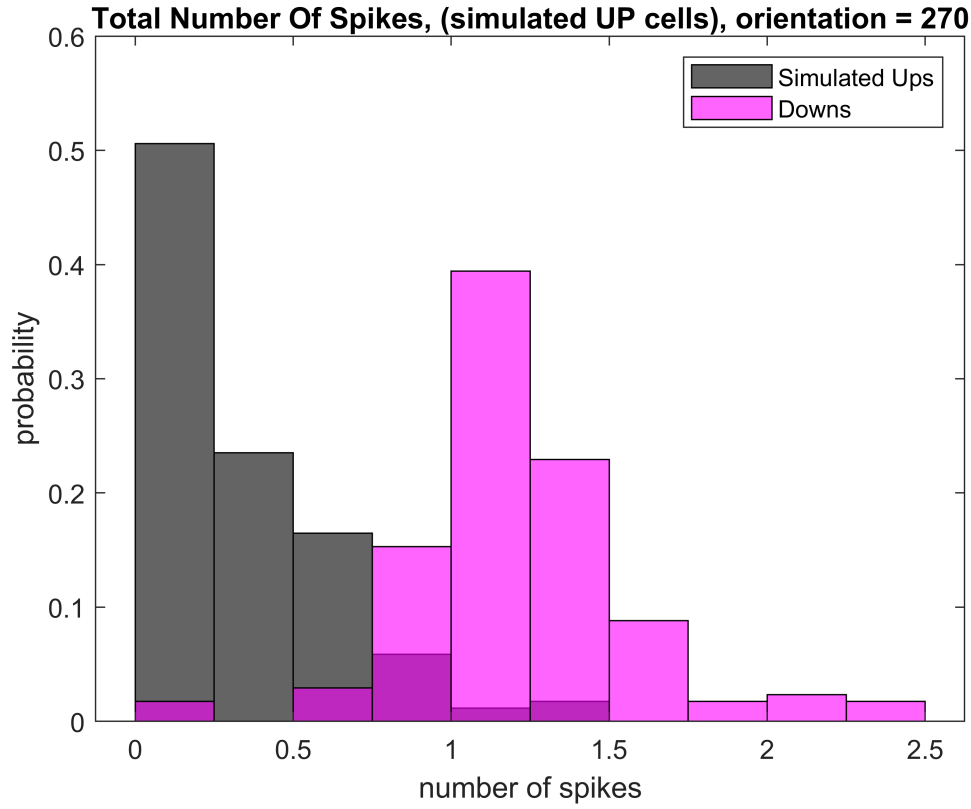

```
ROC AUC = 0.84099
```



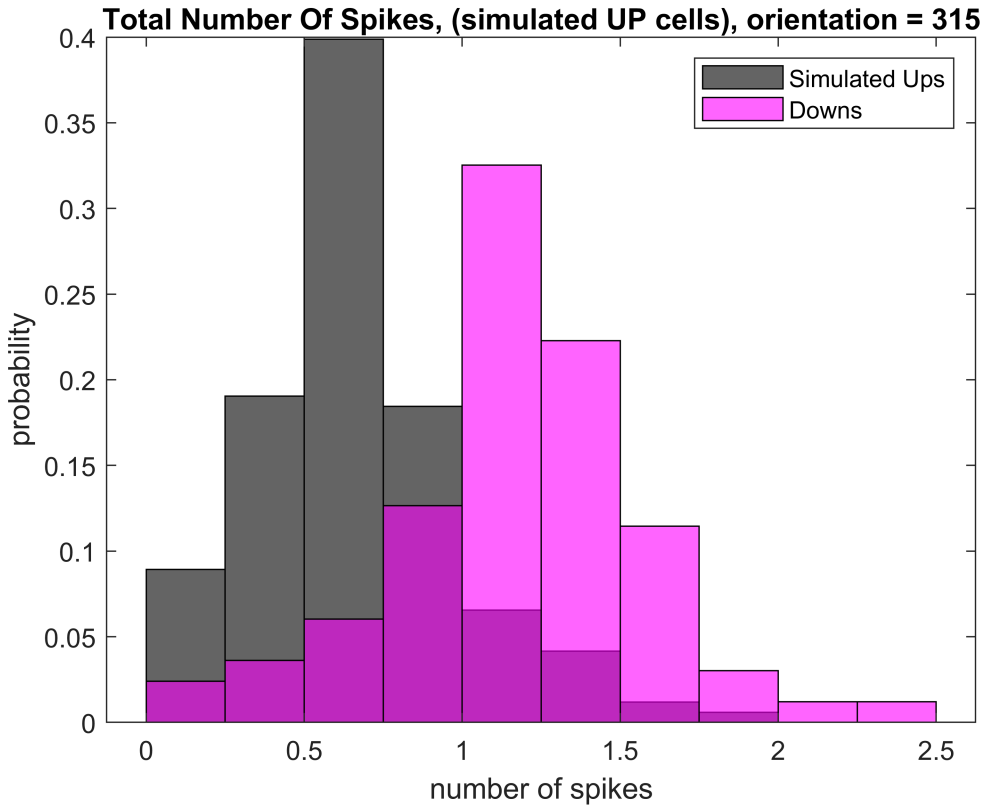

```
ROC AUC = 0.58186
```




```
ROC AUC = 0.90068
```

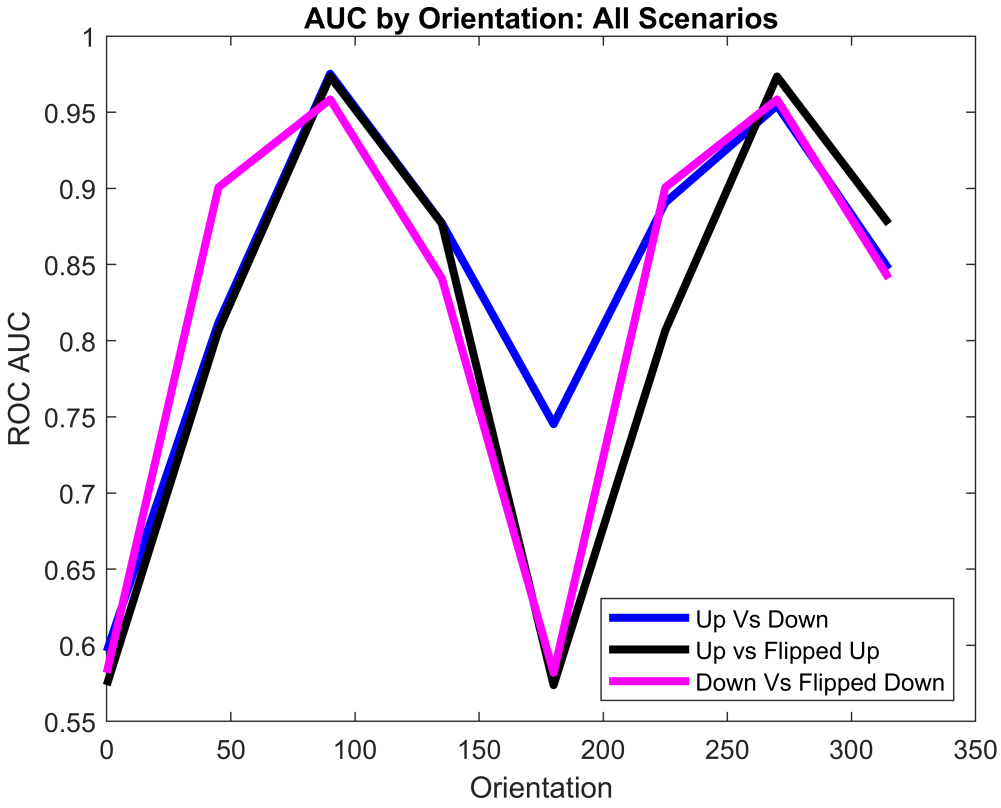



```
ROC AUC = 0.95844
```




```
ROC AUC = 0.84099
```

Comparison of AUC across all scenarios



It looks to me like there are two primary impacts of asymmetry: 1) it makes upward and downward motion differentially discriminable, and 2) it increases the discriminability during horizontal motion (e.g. 180 degrees). Both effects are partially masked when normalizing each cell's responses its maximum or mean firing rate.