

Uni- and Multivariate Analysis of Dendritic Ca²⁺ Data

In a Stimulus Detection Task

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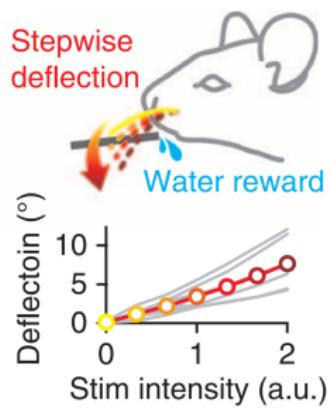
BCCN Berlin

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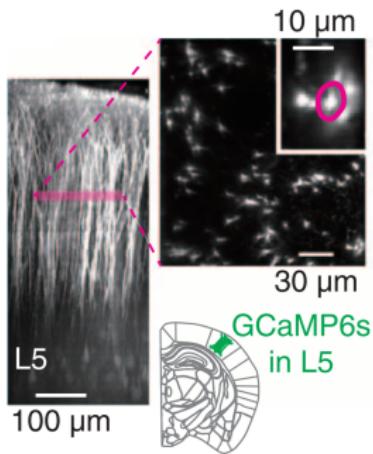
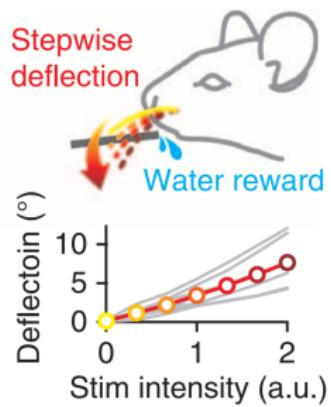
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Introduction

The Experiment

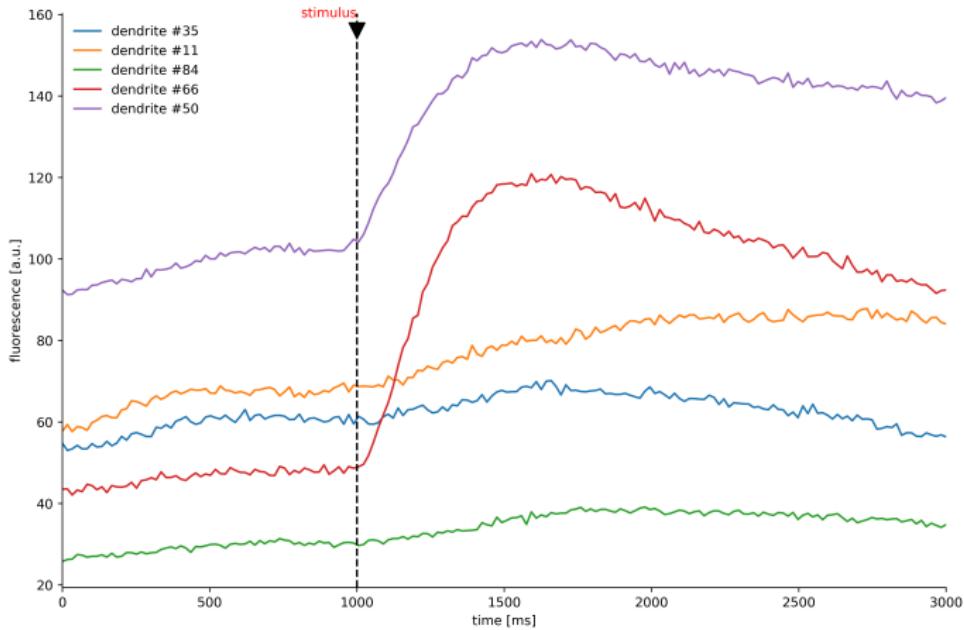


The Experiment

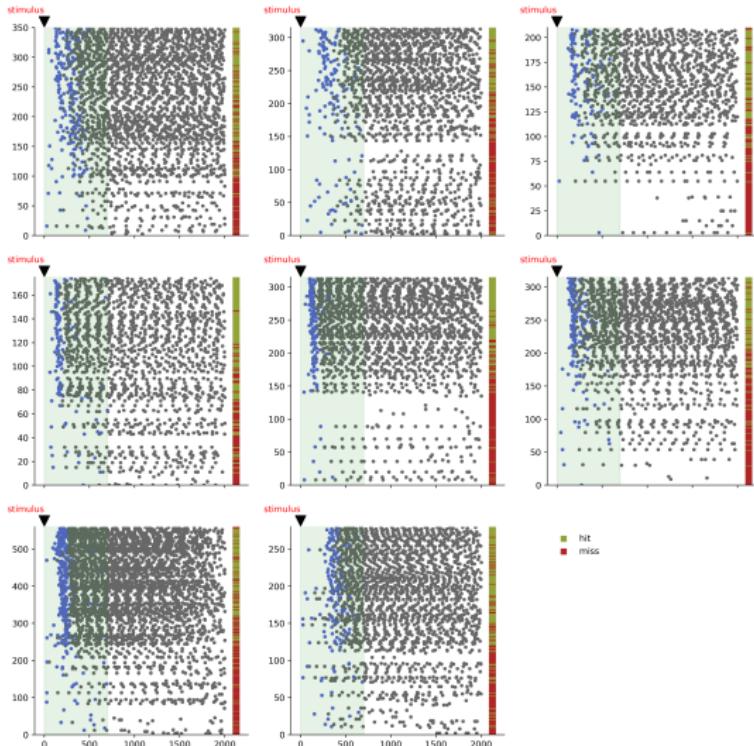


The Data - Neuronal

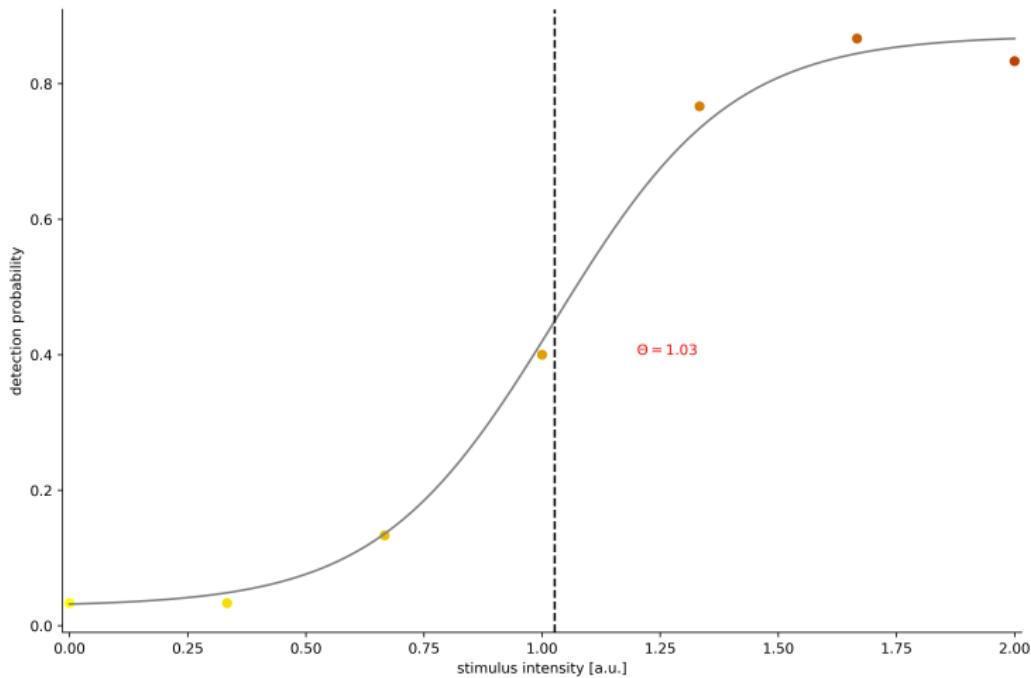
Trial-averaged Ca^{2+} fluorescence traces of random dendrites



The Data - Behavioral



The Data - Psychometric Curve



Goal

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The goal of this project is to investigate the following:

- What information can we extract from the data?

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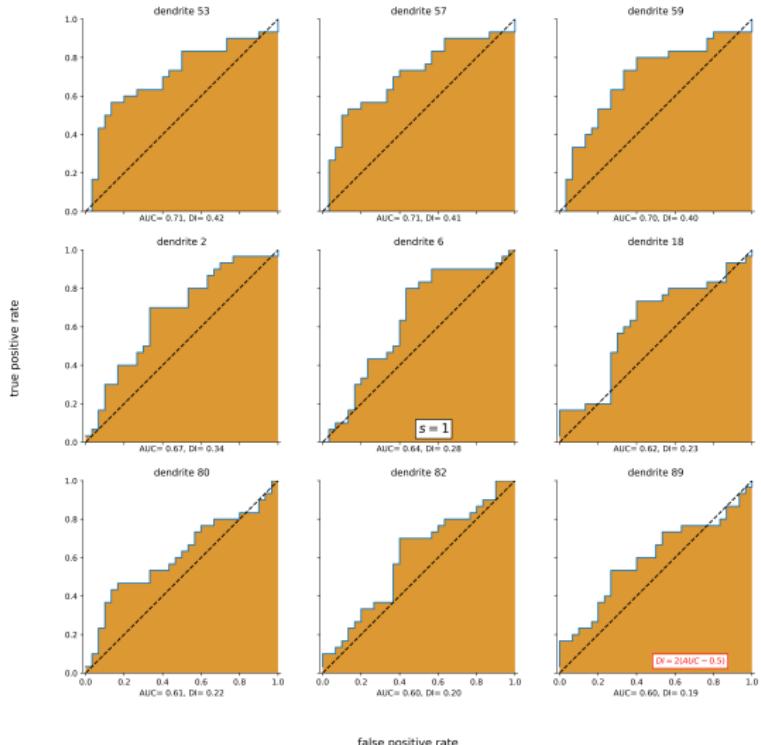
- What information can we extract from the data?
- What can we gain by doing multivariate analysis as opposed to univariate?
- Can we say something about population coding?

Univariate Analysis

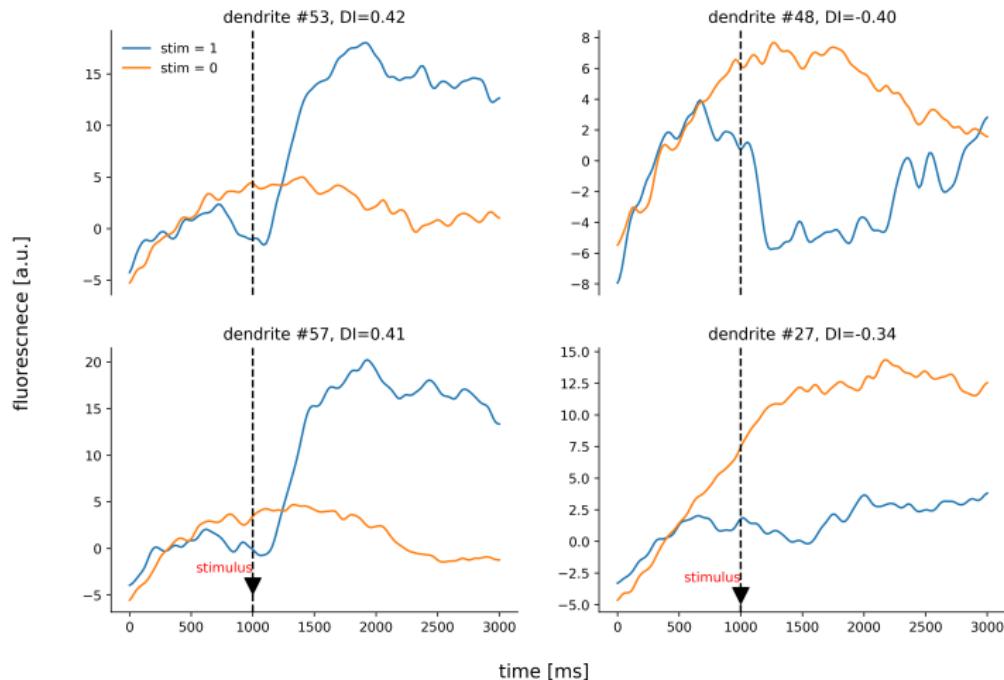
Stimulus Presence Detection

- Feature: mean activity of dendrite over one second after stimulus
- Class one: all trials with stimulus strength 0
- Class two: all trials with selected stimulus strength ($\neq 0$)

ROC



Ca^{2+} -Trace of Largest $|\text{DI}|$ -Dendrites



Near threshold-stimulus (≈ 1)

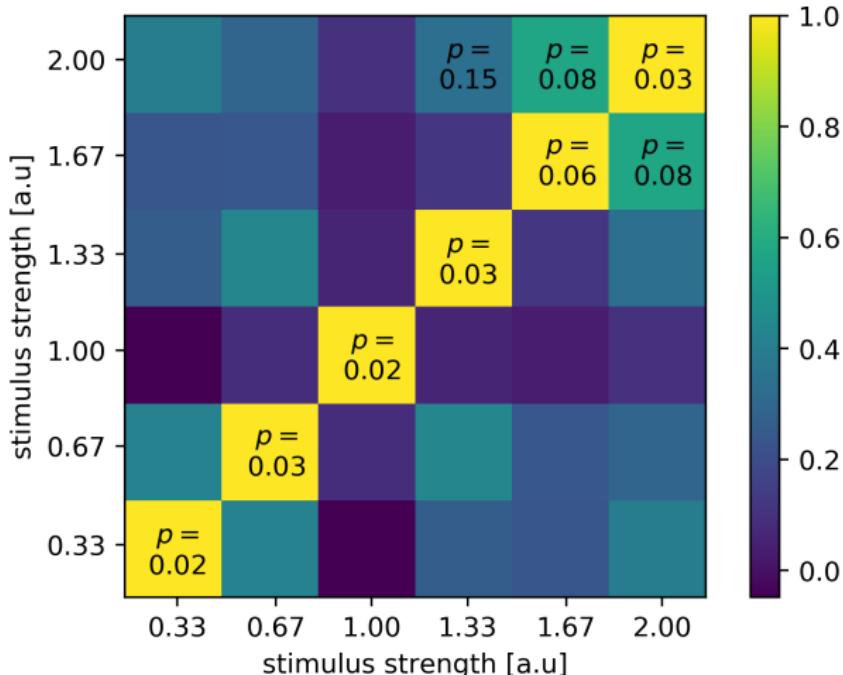
SVM - Most Accurate Dendrites

Stimulus strength 1 (near threshold)

Dendrite #	μ_{acc}	σ_{acc}
57	0.70	0.12
53	0.68	0.14
48	0.63	0.13
27	0.62	0.08

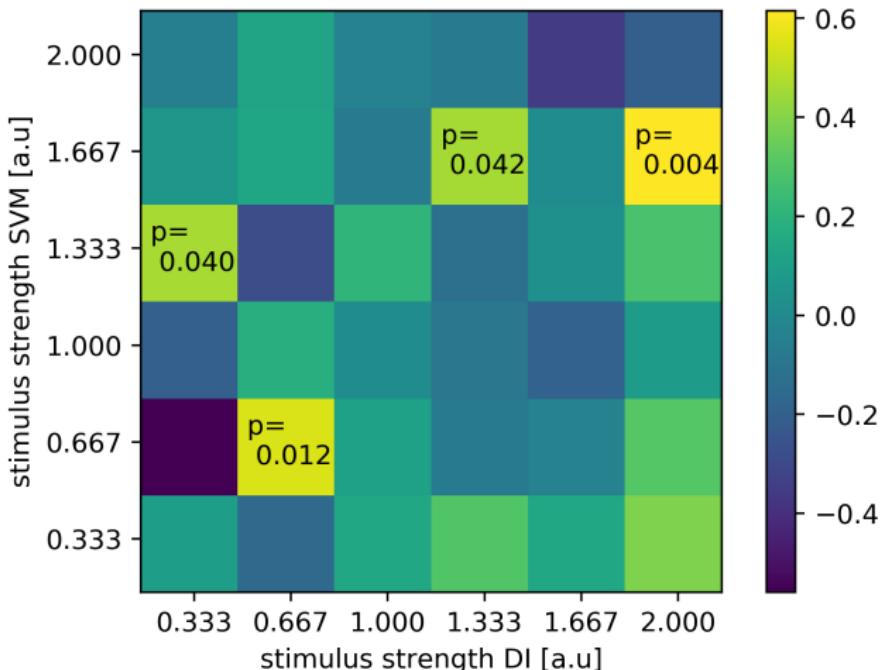
Rank Order Correlations of Dendrites Over Stimuli

Weighted rank coefficient ρ_ω (todo: find more optimal weights)

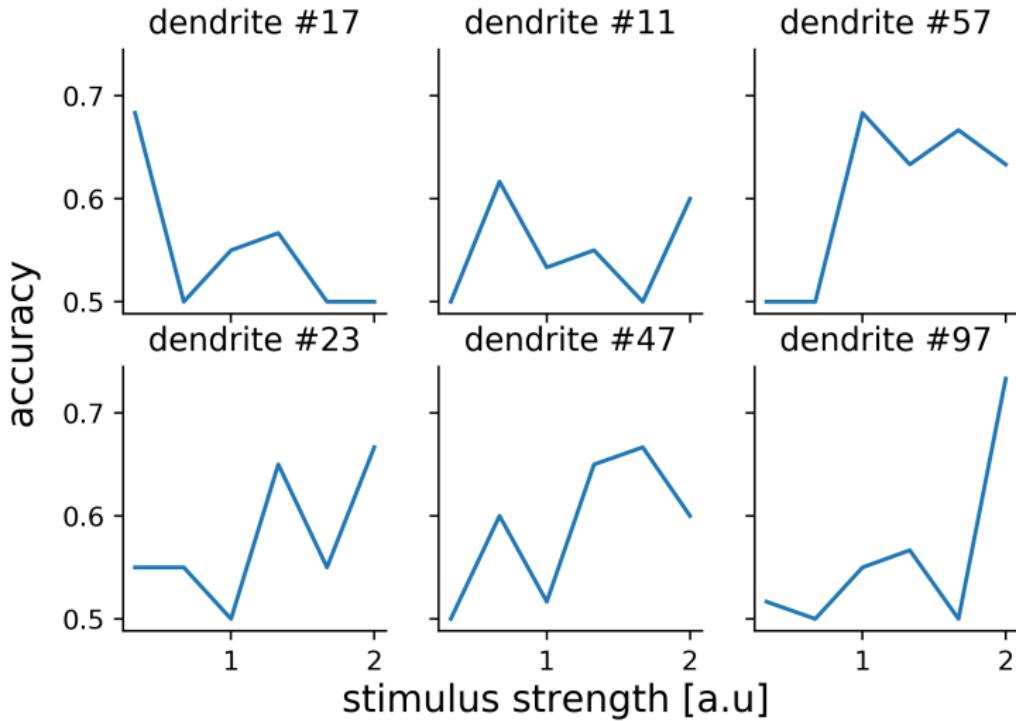


DI and SVM Dendrite Rank Order Correlation

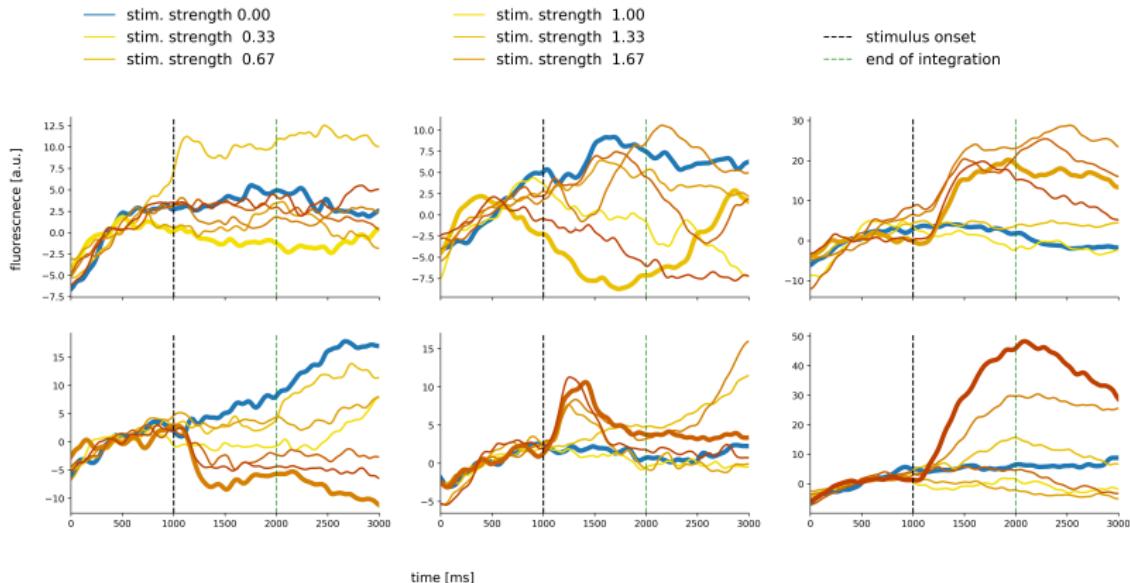
Something is wrong here, should be more correlation



Tuning Curves



Tuning Curves



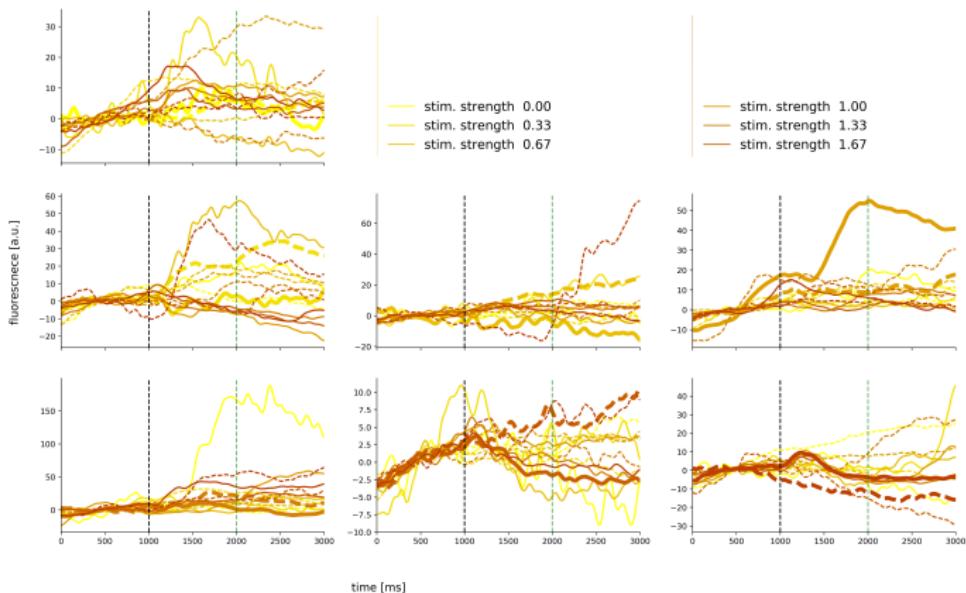
todo:accuracies

Behavoreal Prediction - Most Accurate Dendrites

Stimulus strength 1 (near threshold)

Dendrite #	Mean Accuracy	Standard Deviation
70	0.78	+/- 0.28
47	0.77	+/- 0.32
56	0.73	+/- 0.24
92	0.70	+/- 0.33

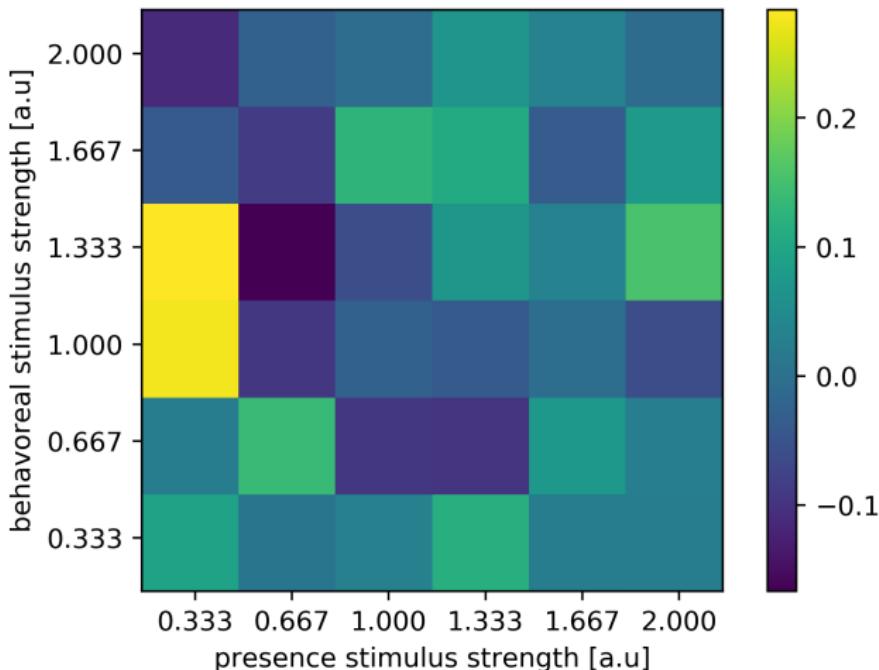
Behavoreal Tuning



todo:accuracies

Rank Correlations of Behavoreal and Presence Dendrites

reduce ndends



Multivariate SMV Analysis

SVM Performance on Combined Dendrites

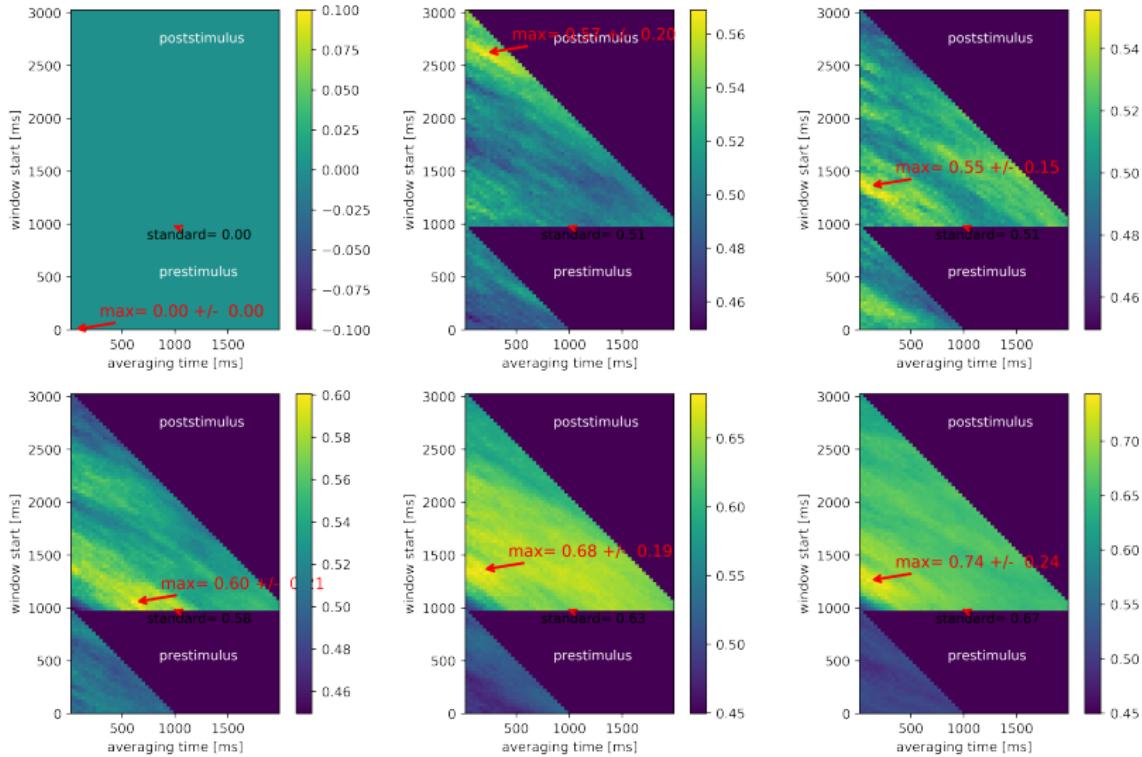
Placeholder - Something wrong when using other files!

SVM Performance on Combined Dendrites - Behavoreal

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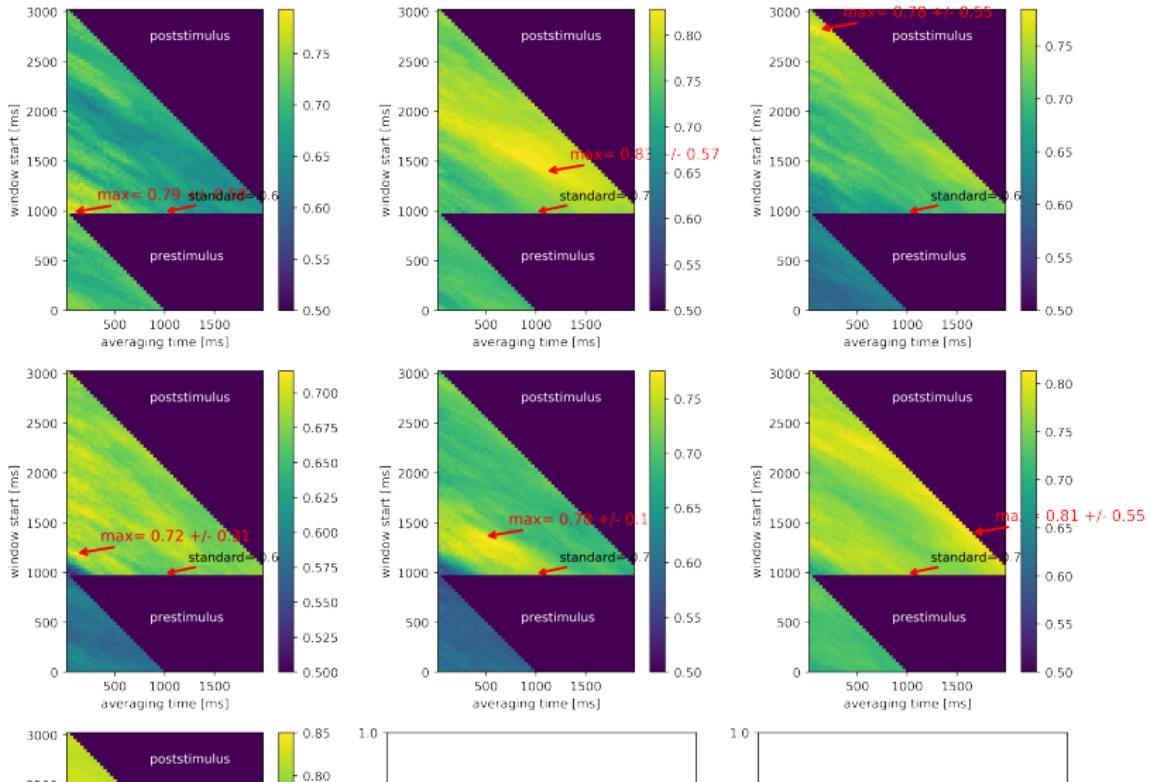
Optimal Averaging Times

Solve Problem with combined SVM first



Optimal Averaging Times - Behavior

Solve Problem with combined SVM first

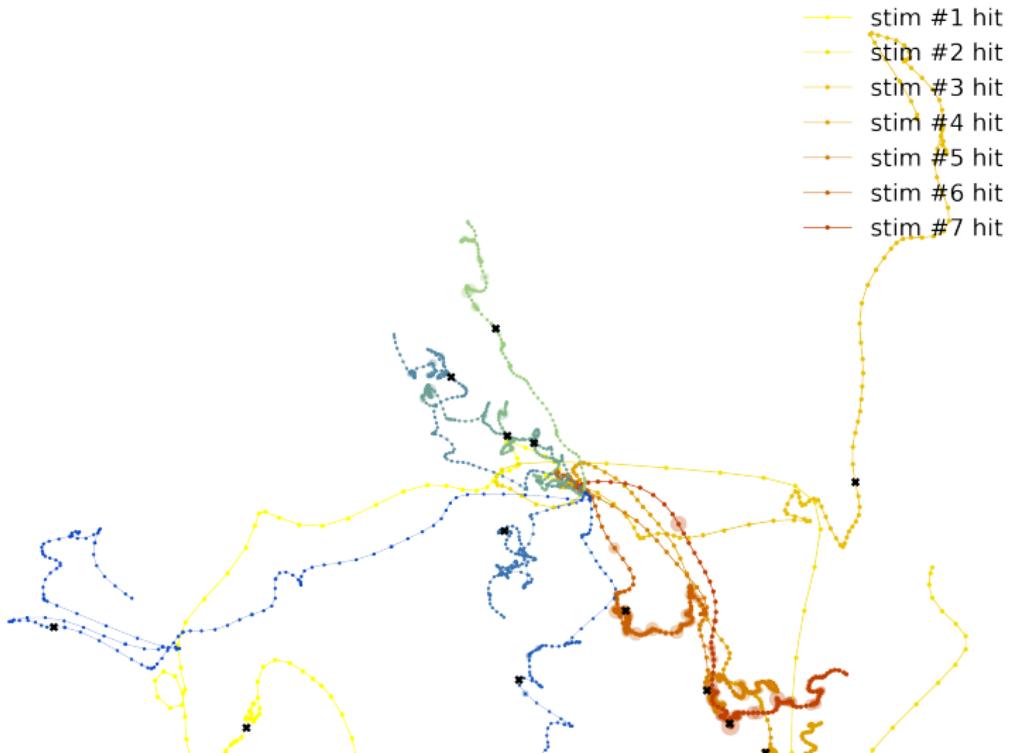


Mante - Approach (Placeholder Title)

Math goes here

Mante - Approach - Results

Solve Problem with combined SVM first



Mante - Approach - Results

Solve Problem with combined SVM first

