Longitudinal Synapse Detection *in Vivo*

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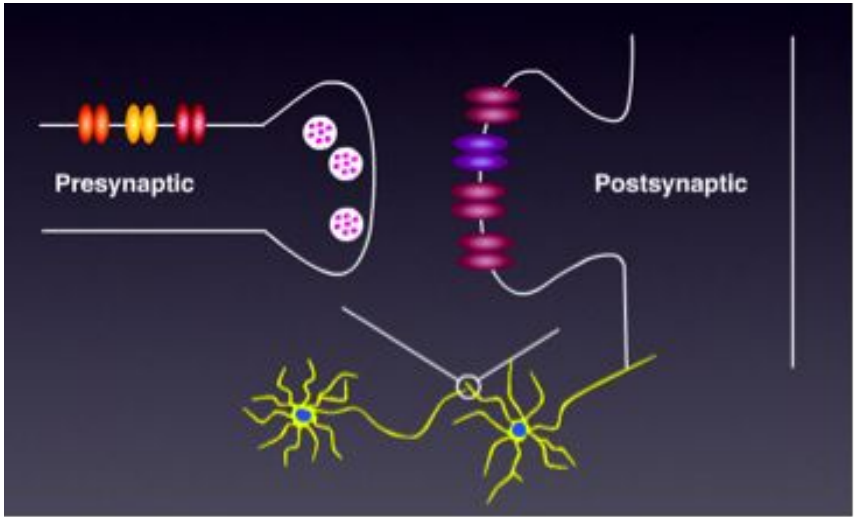
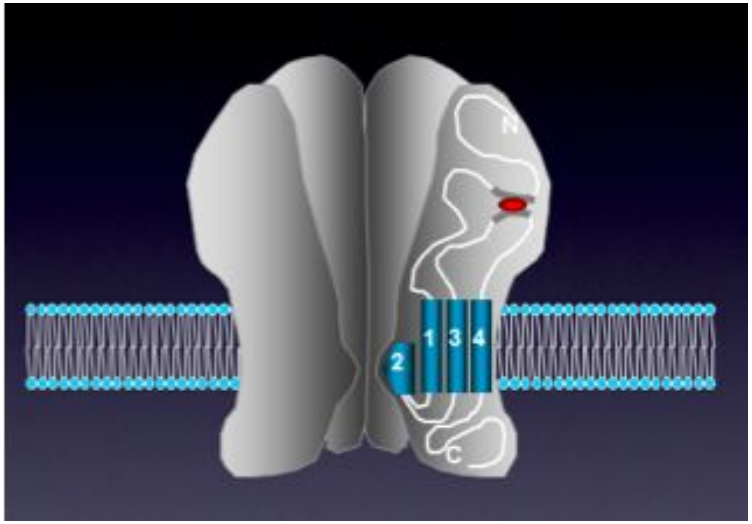
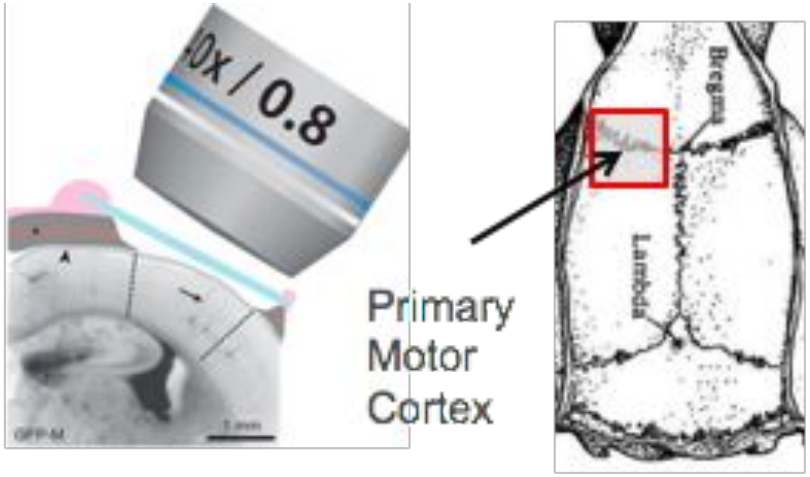
AMPA Receptors - What are they?

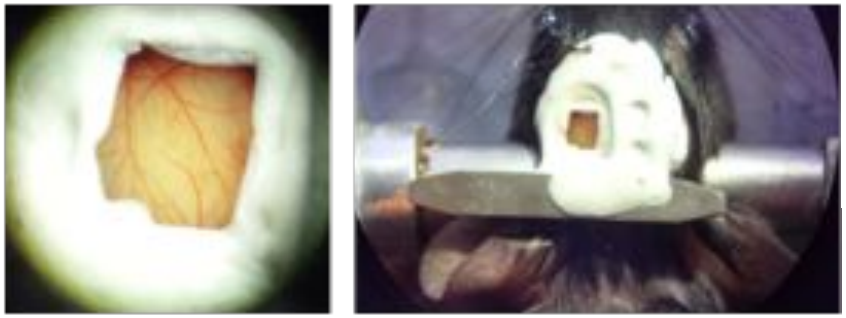
- Postsynaptic glutamate receptors
- Mediate the majority of fast excitatory synaptic transmission

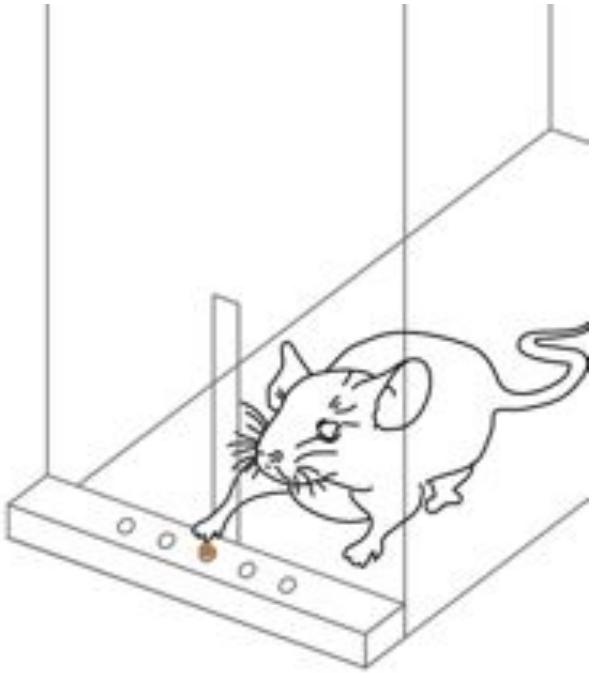




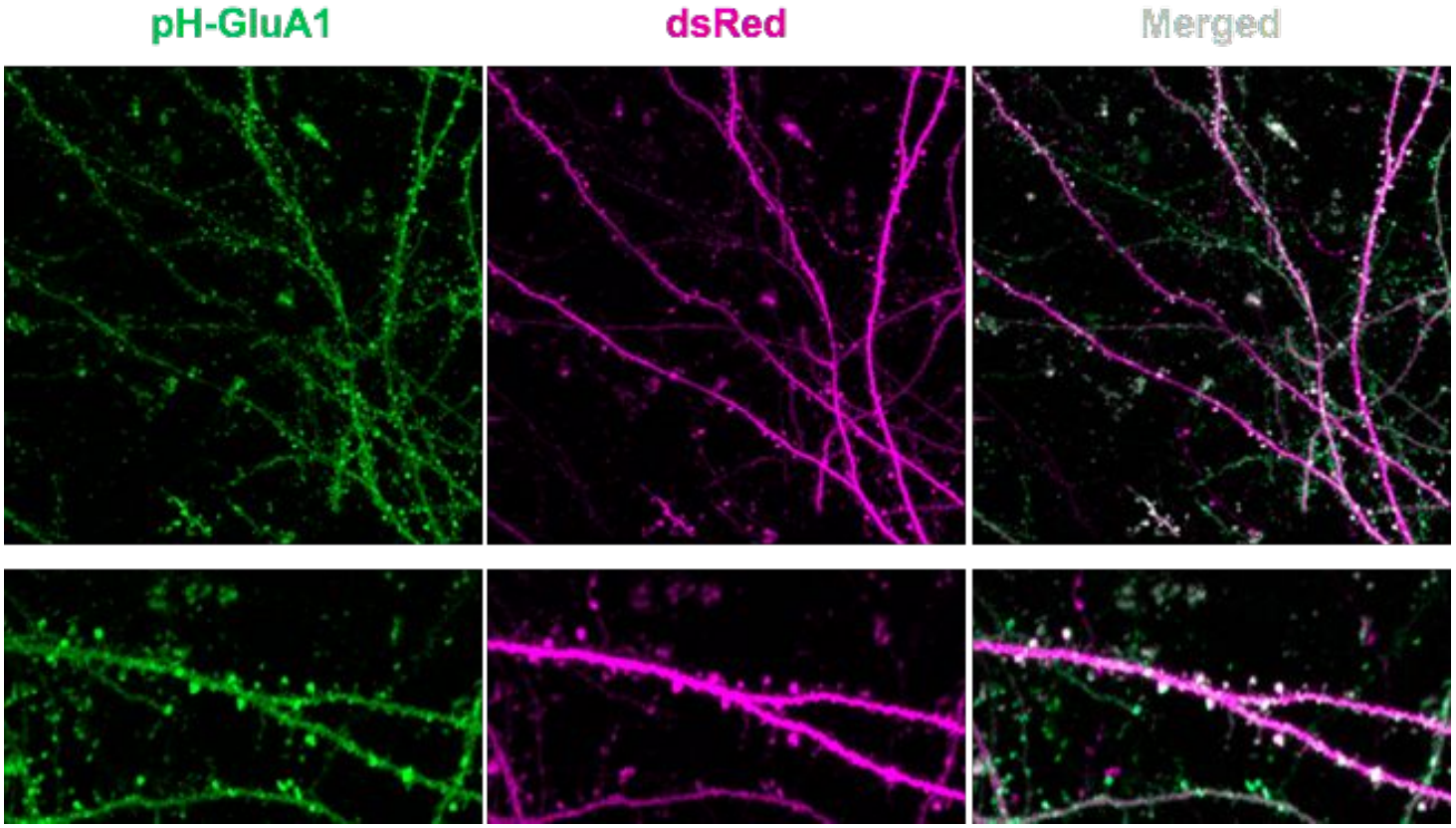
Cranial Window



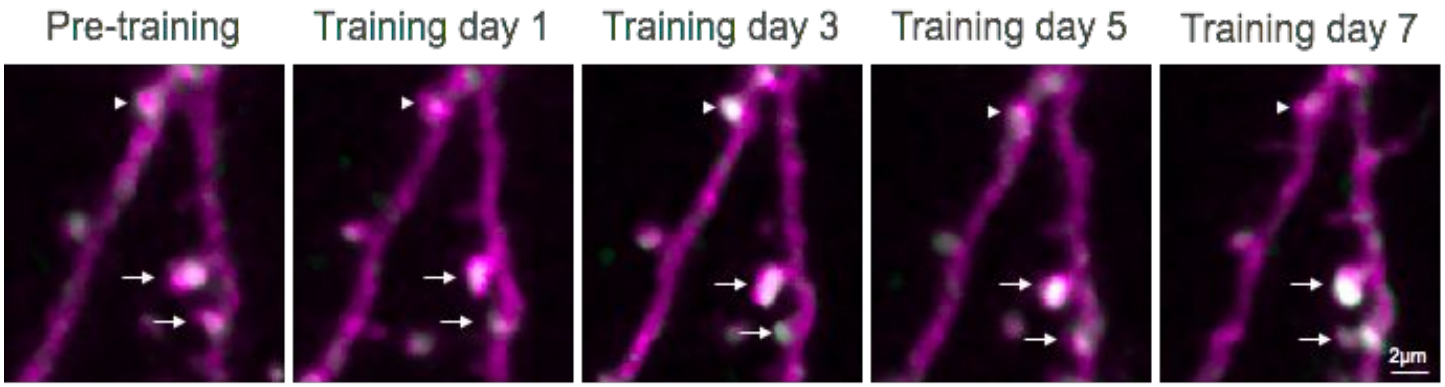




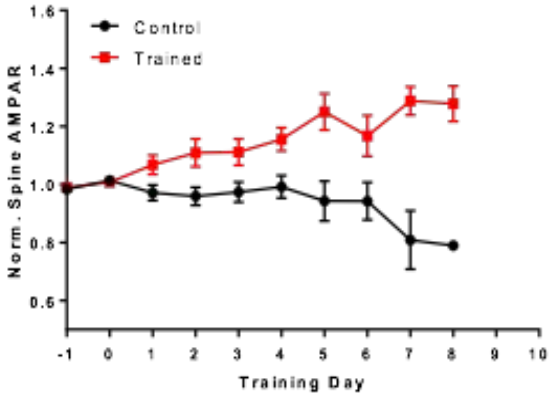
In vivo expression of pH-sensitive AMPARs



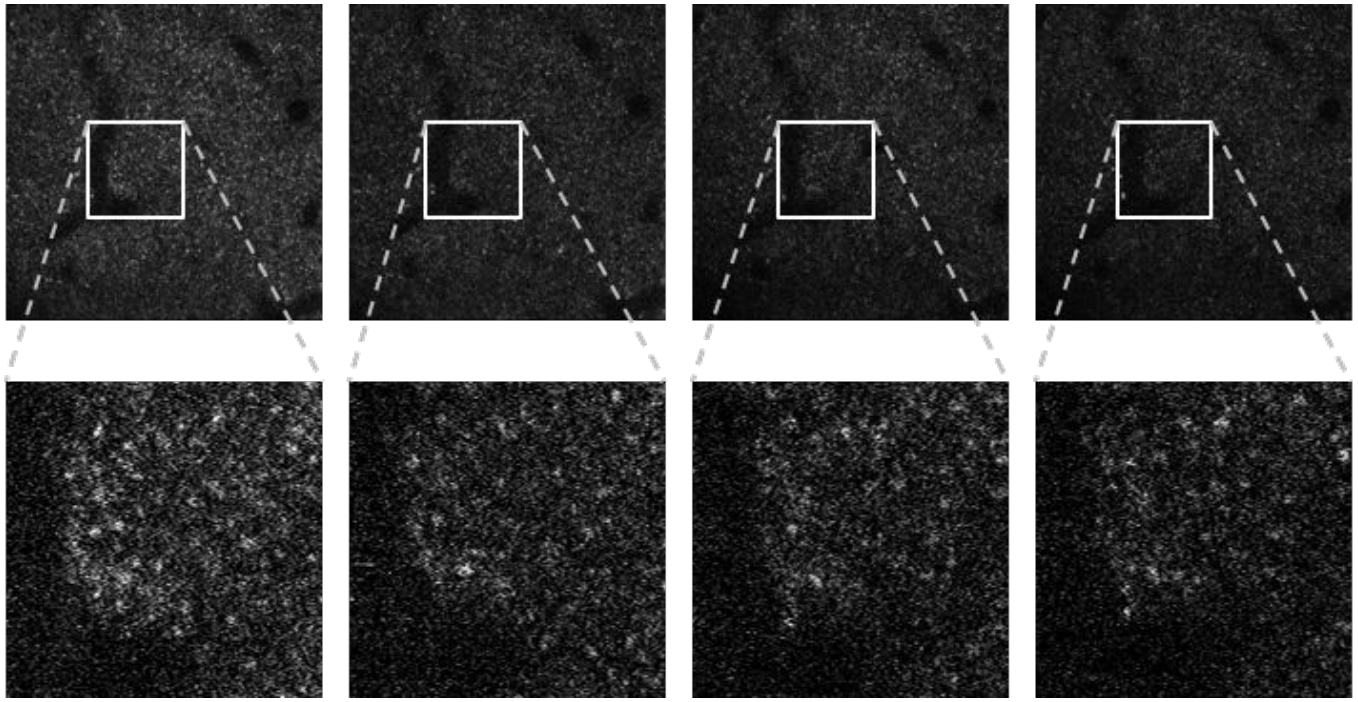
Motor reaching increases density of spine surface AMPARs



pH-GluA1 dsRed

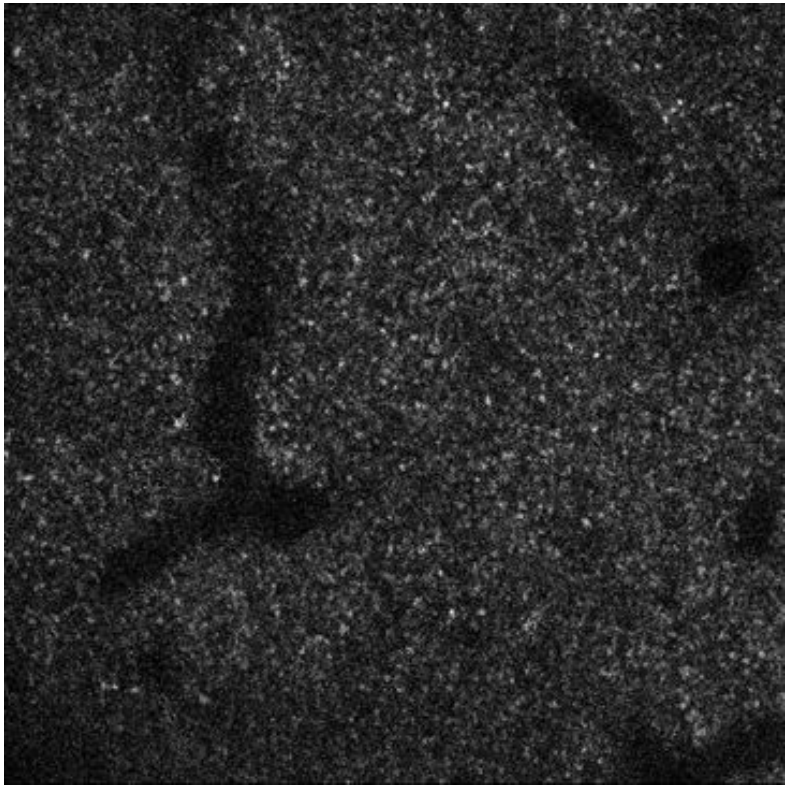


Longitudinal imaging of SEP-GluA1 K1 mouse



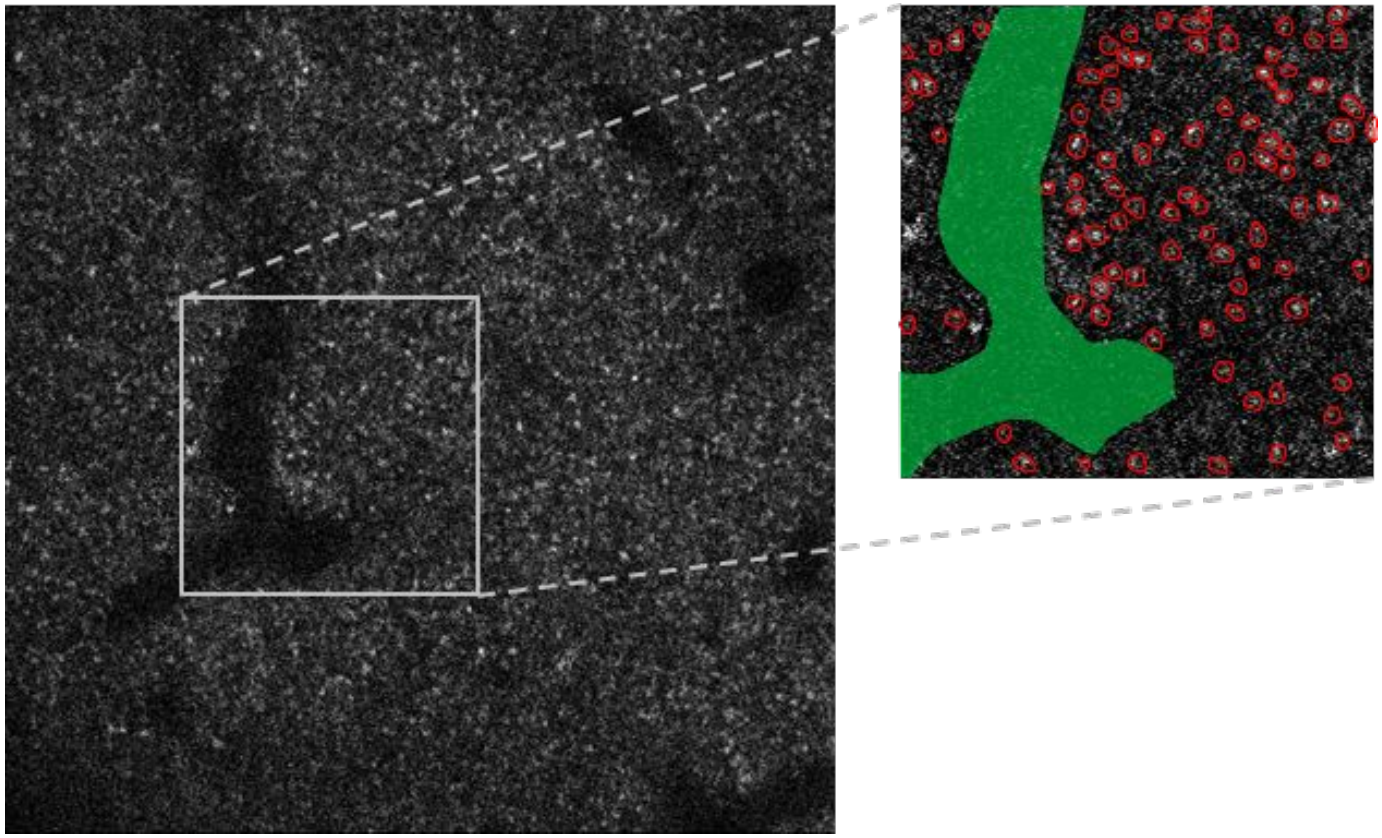
Dimensions, Parameters, Pipeline

- Synapse Detection
  - Voxel Intensity
  - 2D Puncta
  - 3D Puncta
  - Min/Max spine size
- Image Registration
- Synapse Identification

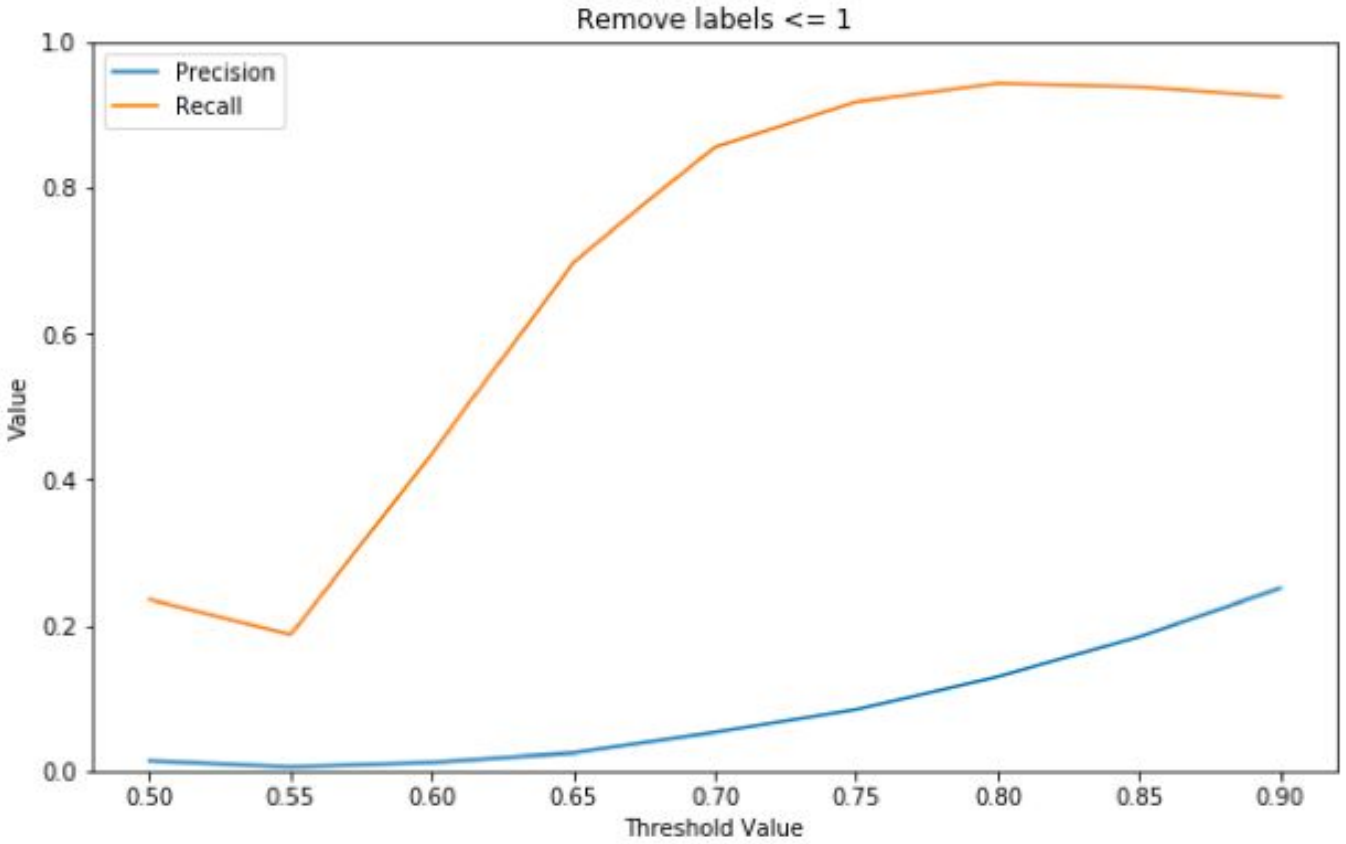


- Single voxel dimensions: 0.09 x 0.09 x 1µm
- Total 3D image dimensions: 1024 x 1024 x 50 voxels
- Diameter of a spine: 1 µm

Manual Annotations



Validation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Precision
Recall
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0.8
0.6
0.4
0.2
0.0
Value
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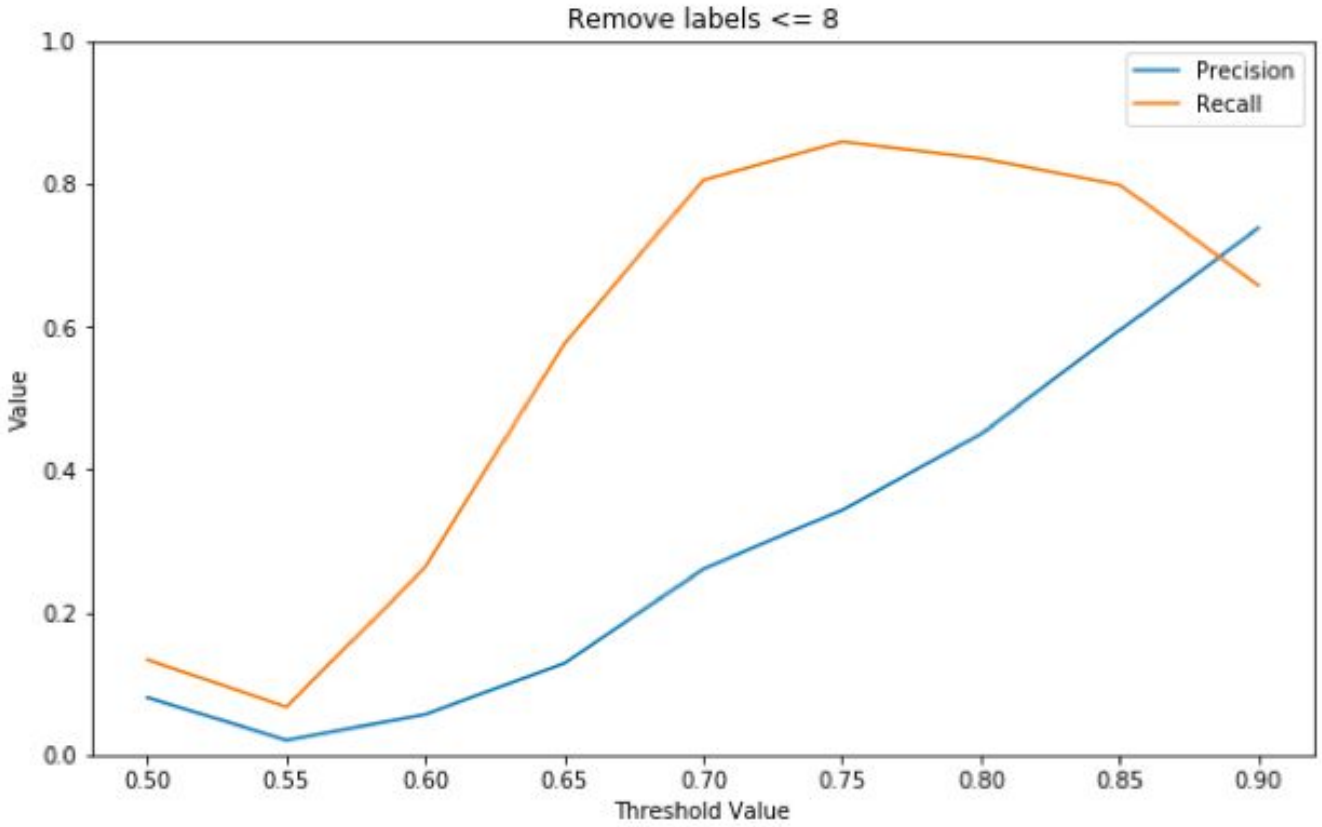
0.55
0.60
0.65
0.70
0.75
0.80
0.85
0.90
Threshold Value

Validation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Recall
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0.8
0.6
0.4
0.2
0.0
Value
0.50
0.55
0.60
0.65
0.70
0.75
0.80
0.85
0.90
Threshold Value

From Last Week

- Create a new team, populate presentation - Josh
- Join a new team, Visit Huganir Lab - Drishti
- Join a new team, Start learning Python - Ananya
- Join a new team, Visit Huganir Lab, Obtain Huganir data - Sharmini

For Next Week

- Make a table summarizing all existing data and data modalities - Josh
- Run existing code on Huganir data - Sharmini
- Create a central web presence for team, using github pages - Drishti
- Keep learning python - Ananya

Sprint 3 Goals

- Get Huganir data into Boss
- Annotate remaining sections of Huganir data
- Compare performance of algorithm on regions of synapses within an image (compute quantitative and qualitative metrics)