Interactive Analysis of the Structure and Organization of a Large Database of Model Neurons

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IGERT Summer Program
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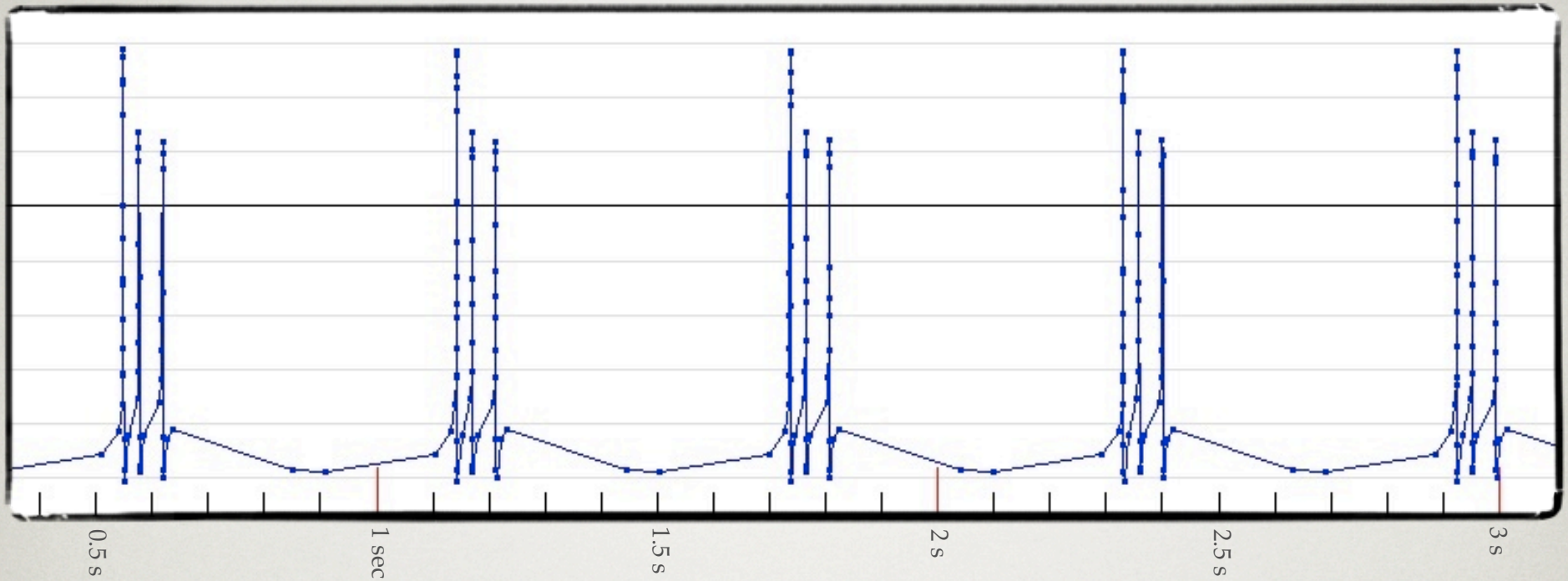
Timothy Hickey, sponsor



What is this database?

- Original database built by Astrid Prinz
- Includes aspects of model behavior for a family of 1.7 million model neurons
- model family varies 8 input parameters over 6 values each
- Model based on the lobster stomatogastric ganglion neuron studies from Professor Marder's lab

Timeline of Goals

Long Term Goals

- dynamic auto-classification
- understanding detailed structure of 8-dimensional space
- create helpful tools for studying database

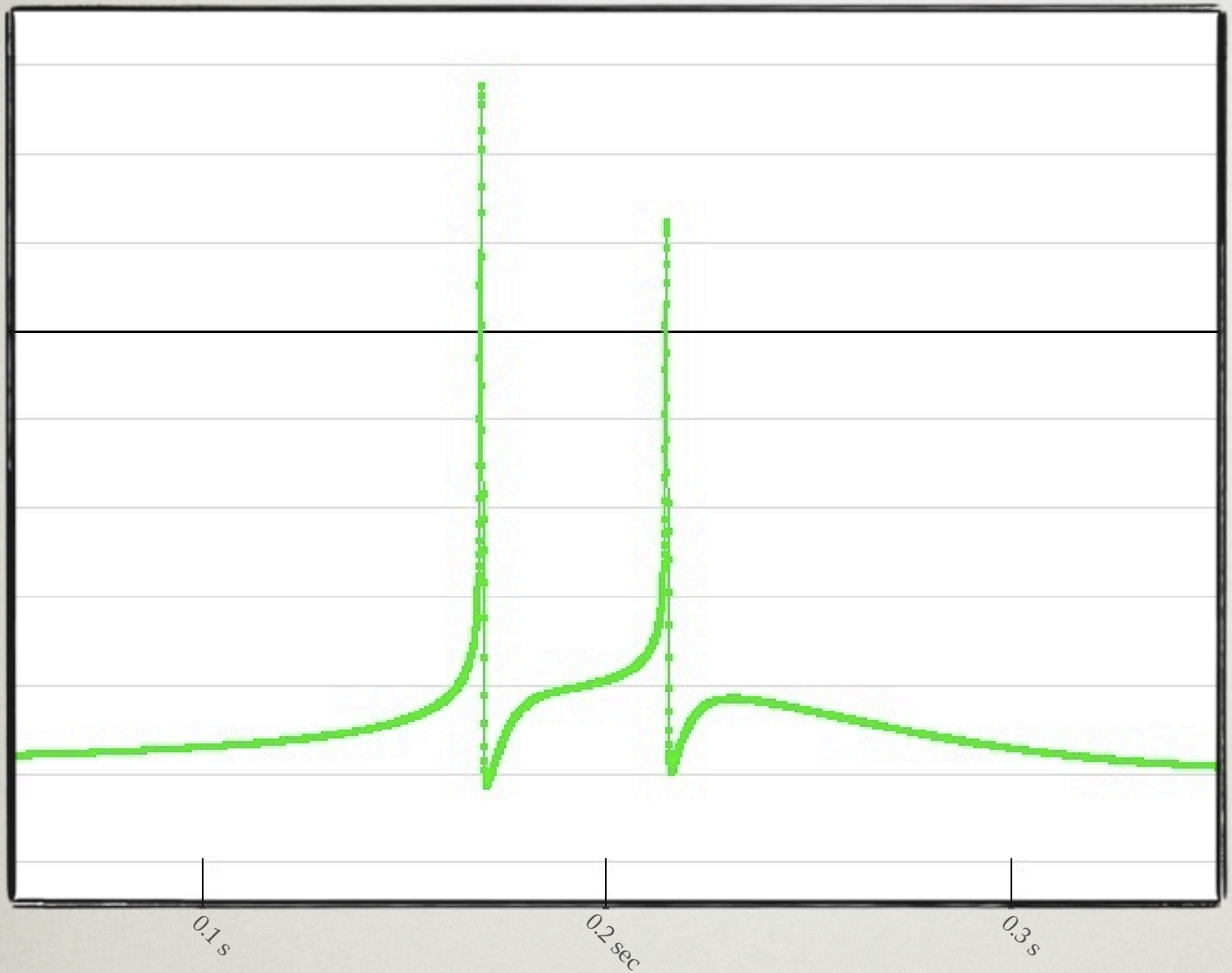
Summer Goals

- build practice database
- construct limited classification rules
- build tools to facilitate database exploration

Making the Database Manageable

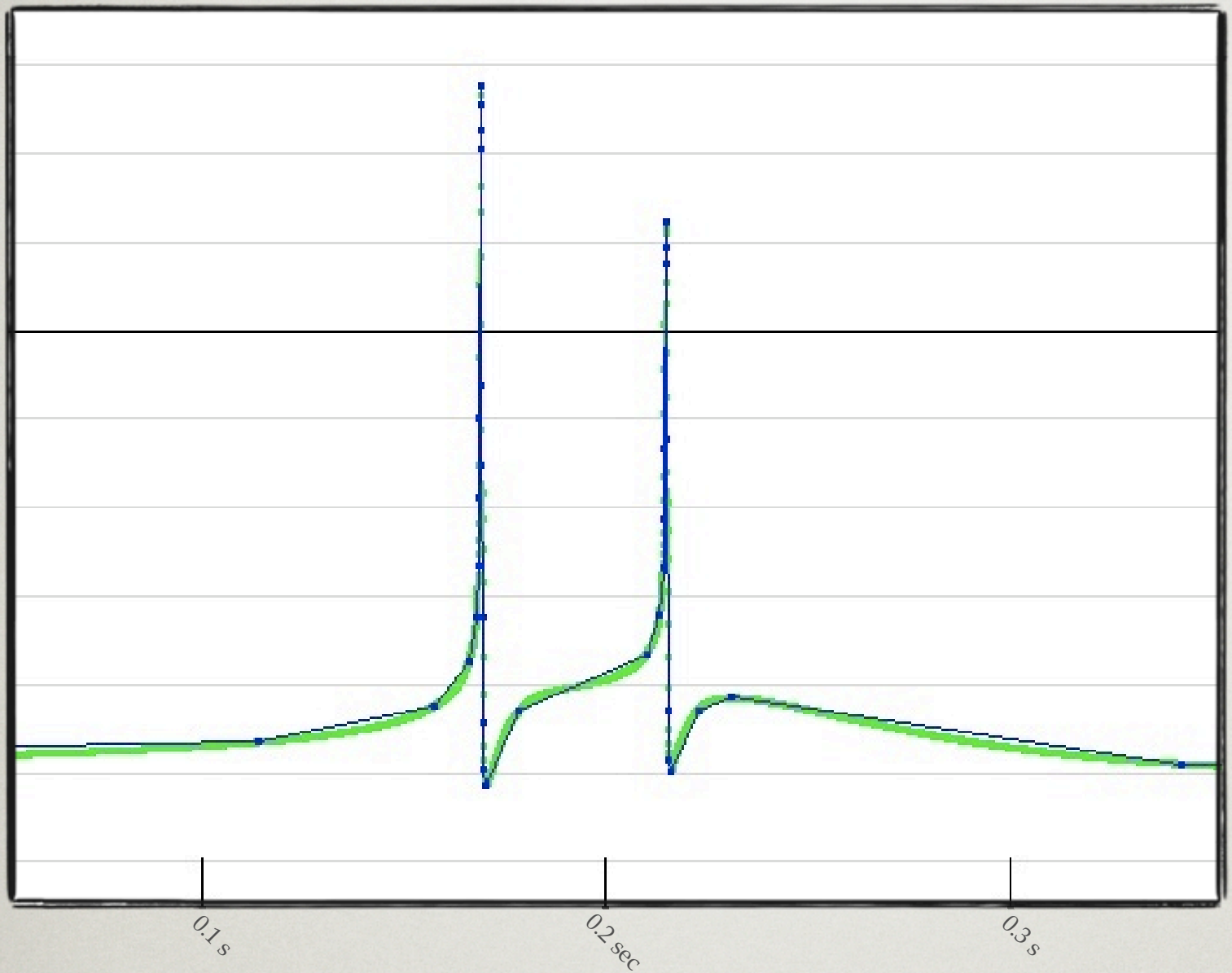
Without compression, the entire 1.7 million model database would take approximately 35 terabytes to store.

It takes roughly 90 seconds to generate 30 seconds of data.



Compression

- 200,000 data points in original plot, down to average of 3000
- error is never more than 1% away from the original plot
- every maximum and minimum point is saved



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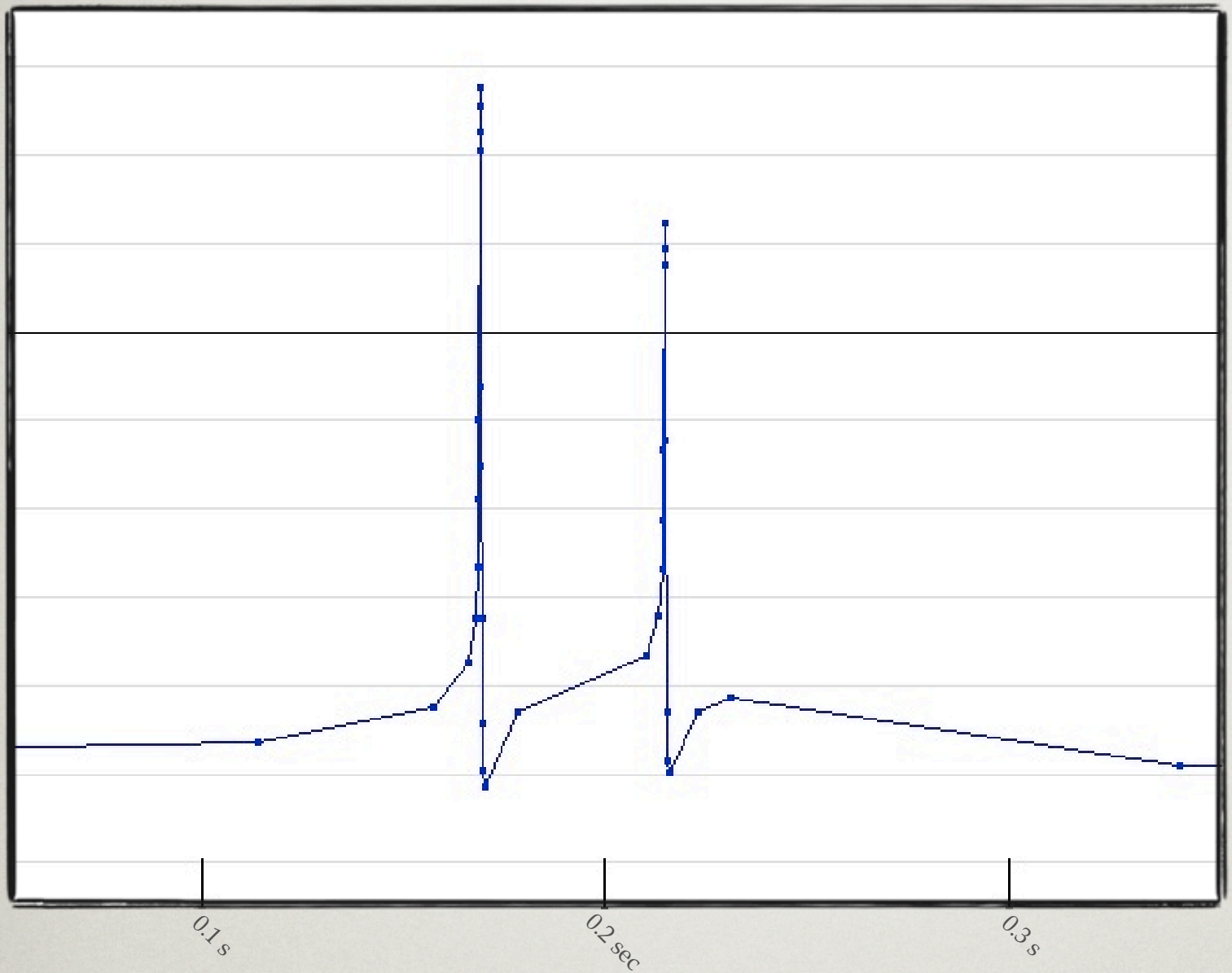

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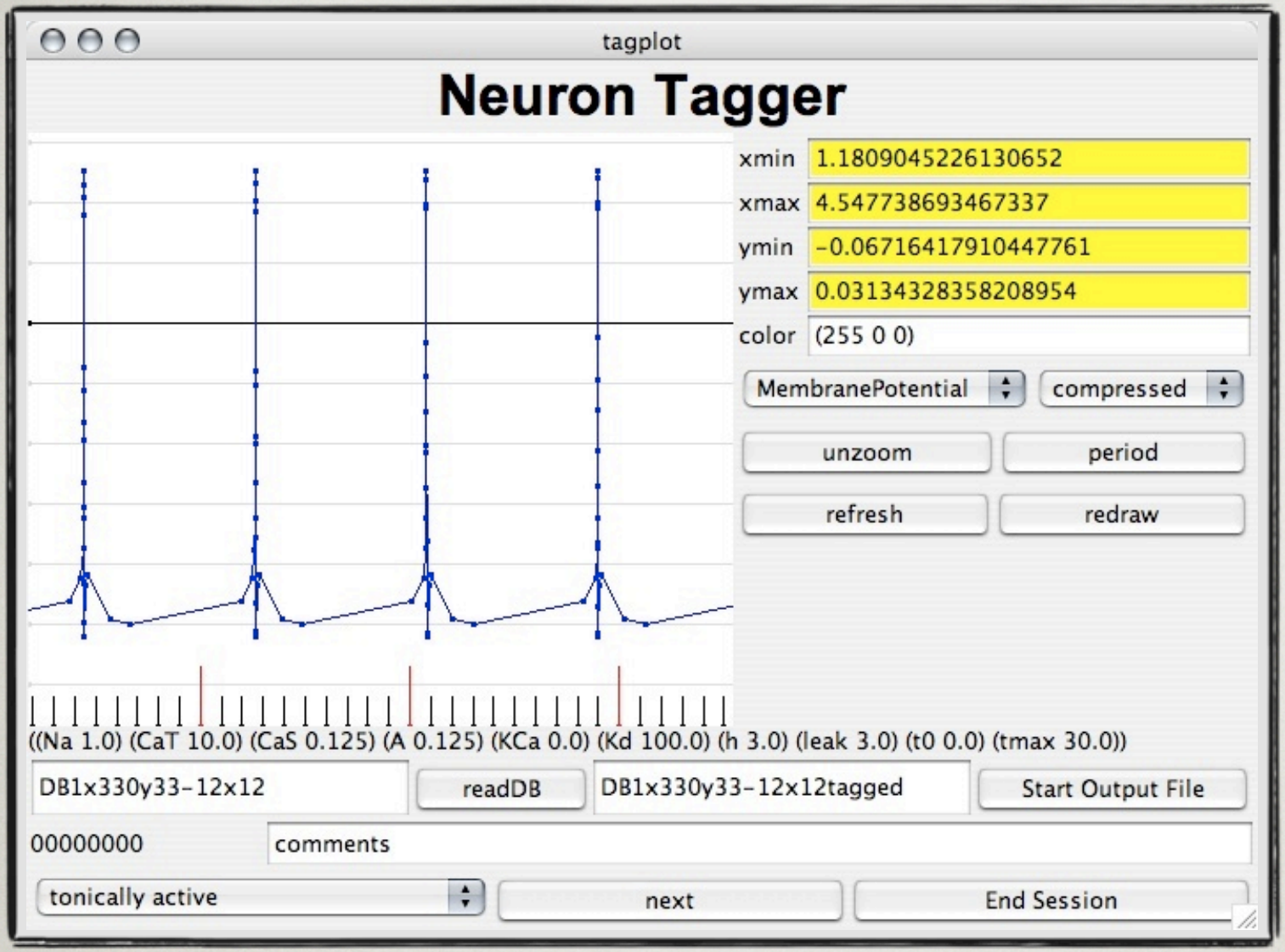
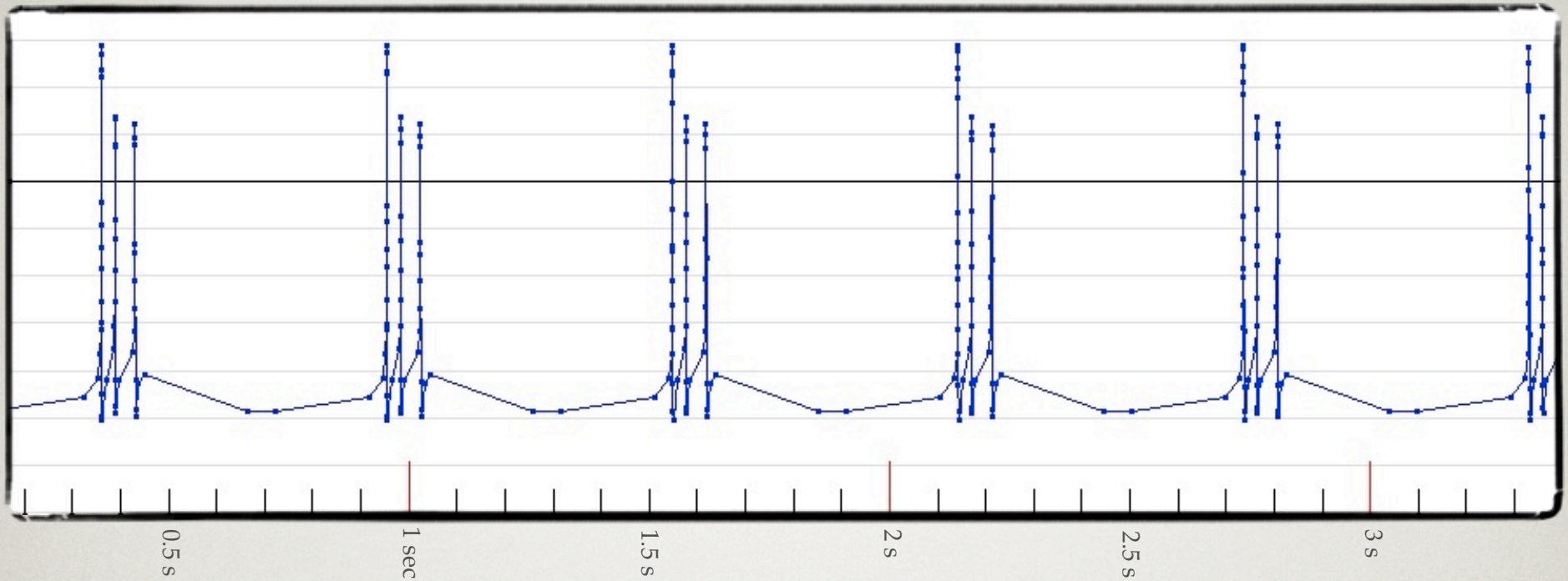


Human Classification Tool

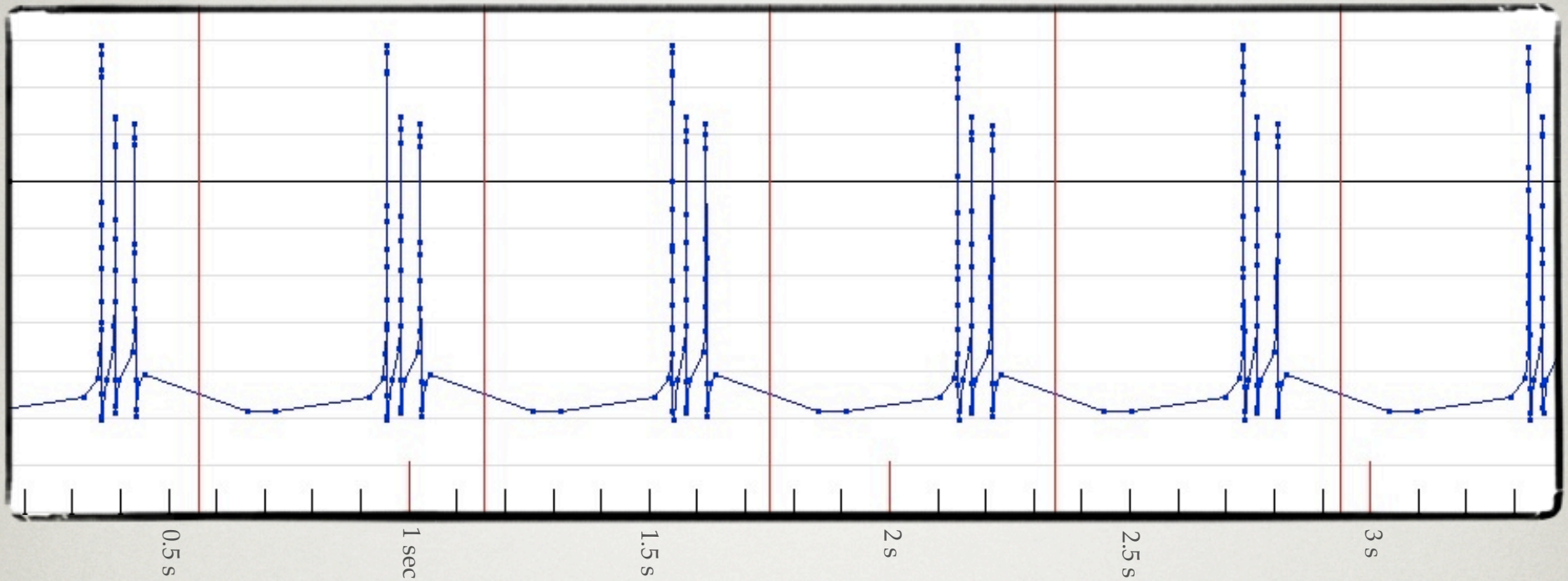
Refining Astrid's Classifier

- Now that the framework is established, we want to look at more ways to classify and identify trends in the database
- Being able to see changes over the function of inputs rather than single instances would help show patterns or trends



Feature Extraction

A computer can be taught to detect attributes of a particular model and use them to assign a classification more quickly than a human can calculate them.



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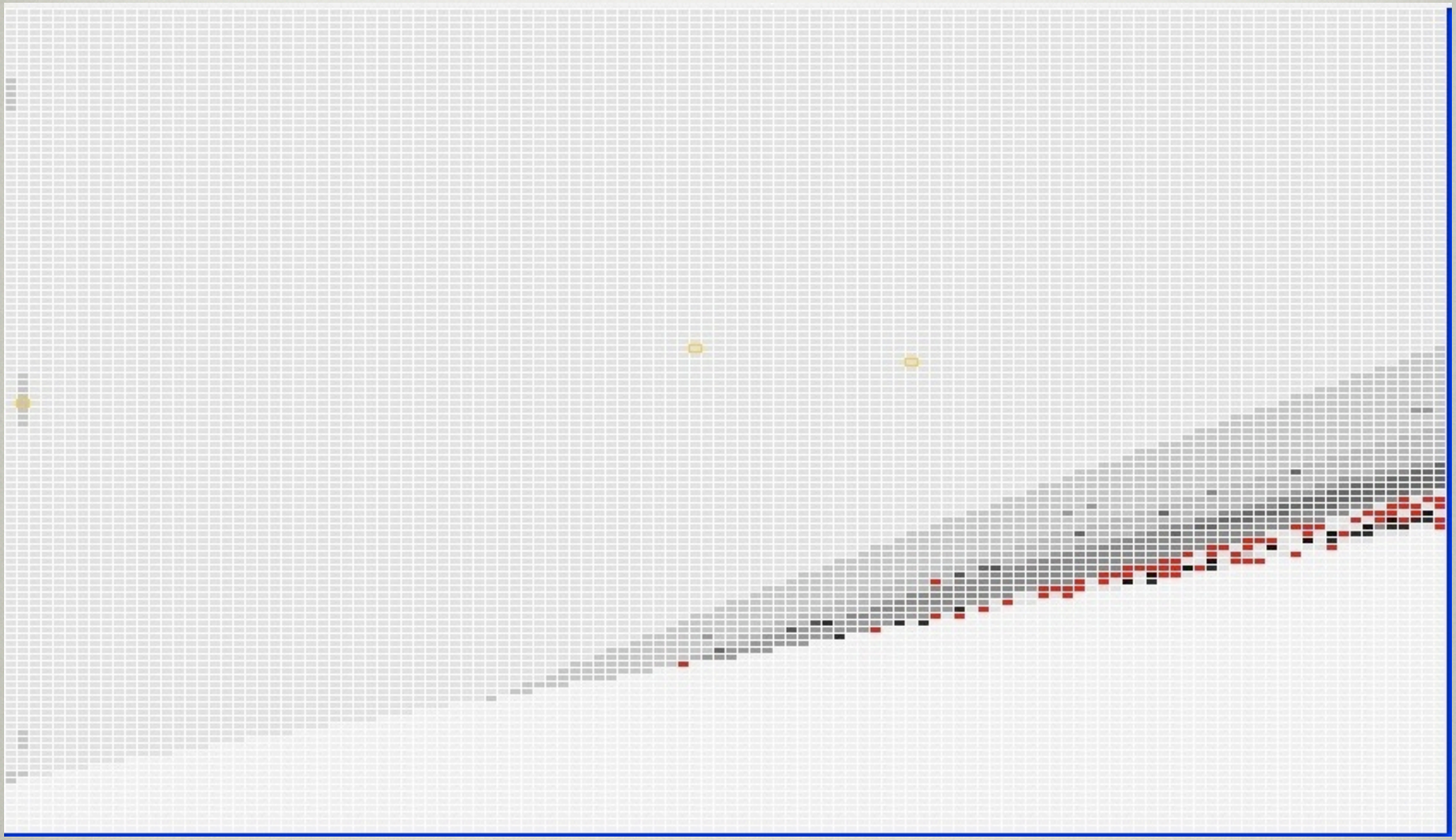
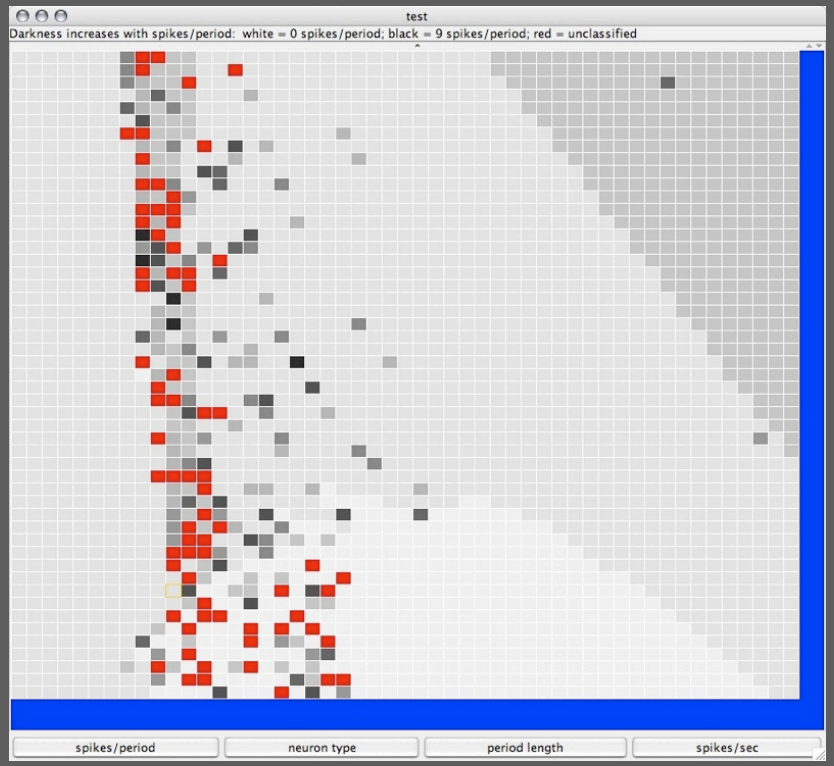
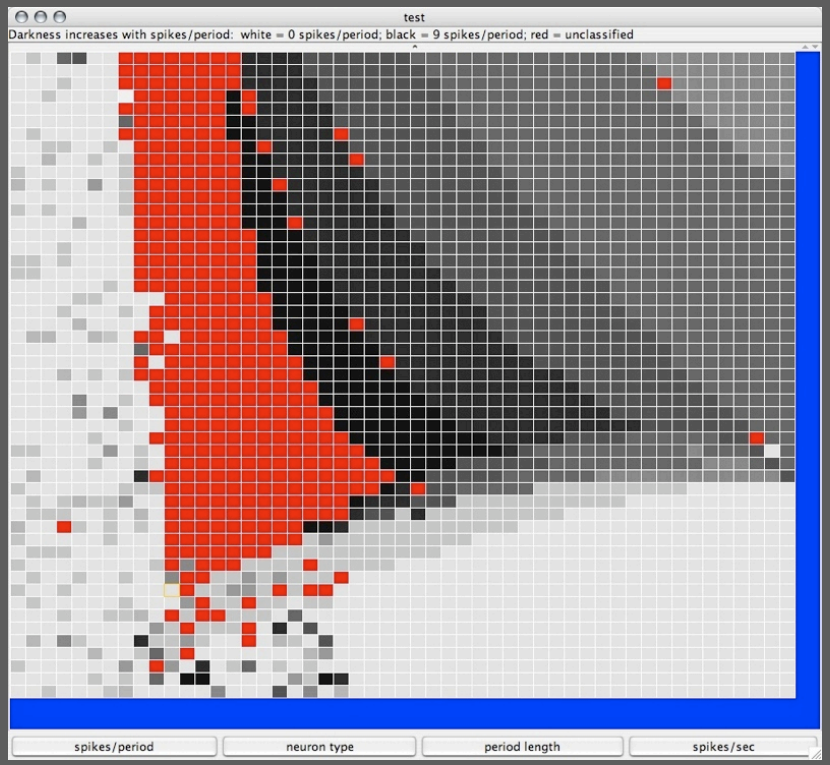
A New View

We want a way to look closely at areas of the database to see how the gradual change of input value affects the behavior of our model.

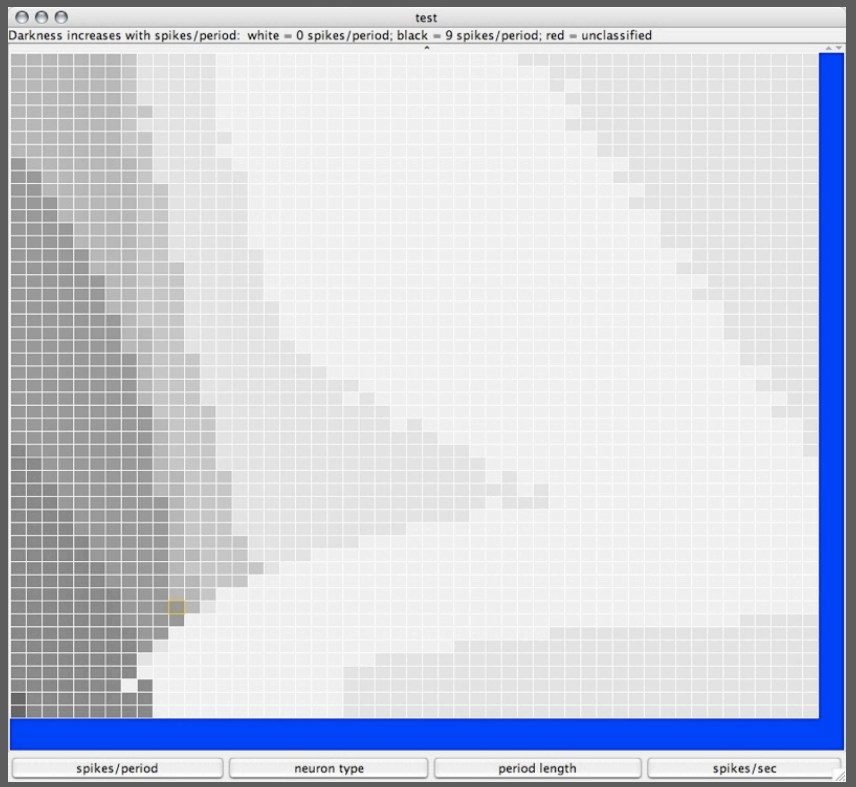




↑ Period Length

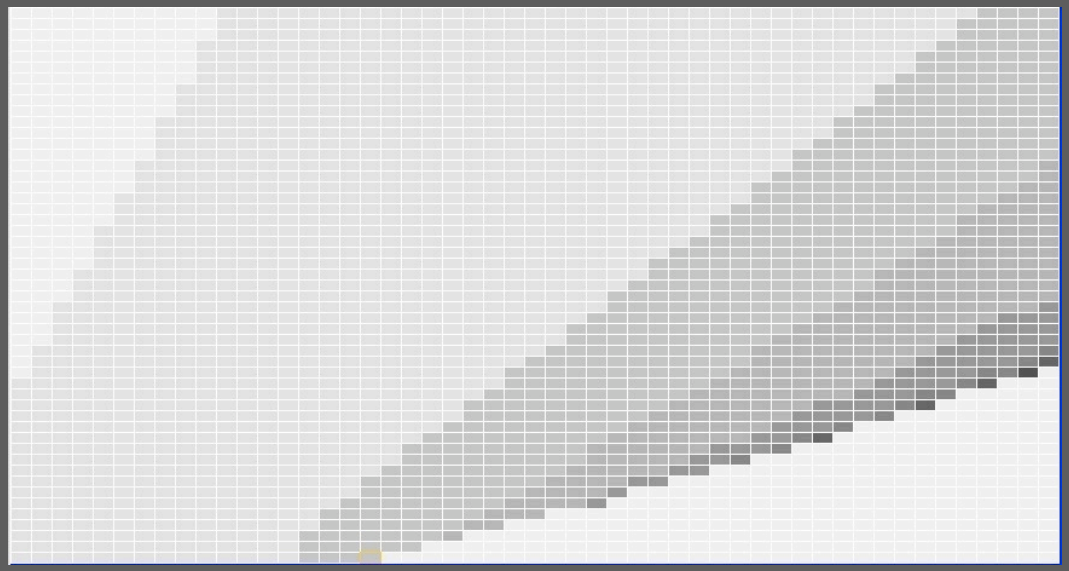


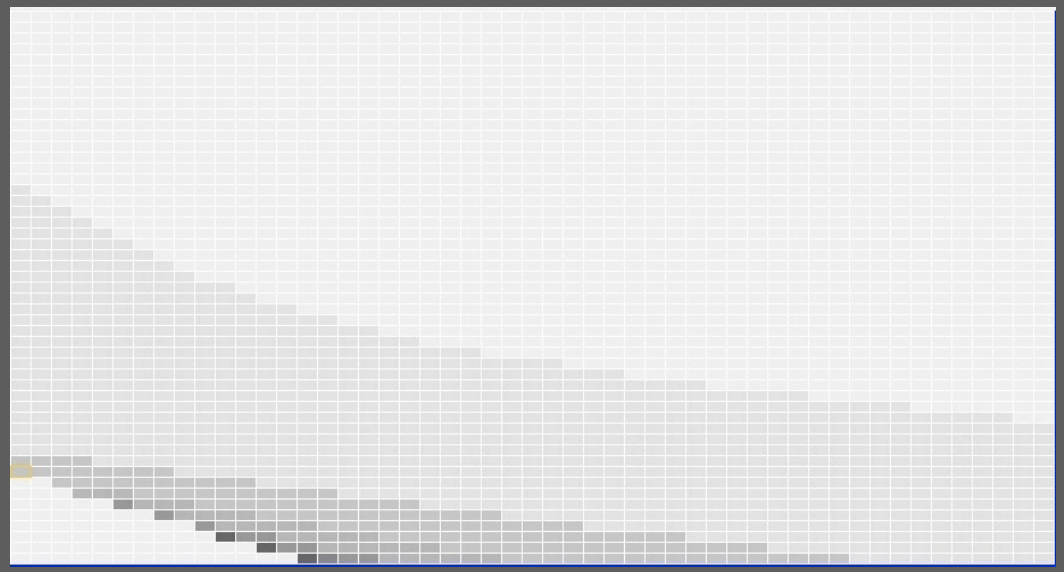
Spikes per Period ↑



Spikes per Second →

Spikes per Period





Where we Stand

- We have some insight into the organization of the database
- Found many areas to improve and expand our classification
- Strong foundation of tools and algorithms to base new research on

Where We're Going

- Further exploration of describable boundaries
- Construct a rule set for further classification
- Expand functionality of current tools

Thank You!

to those who gave assistance in my research, including

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