

# Analysis of Electrophysiological Data

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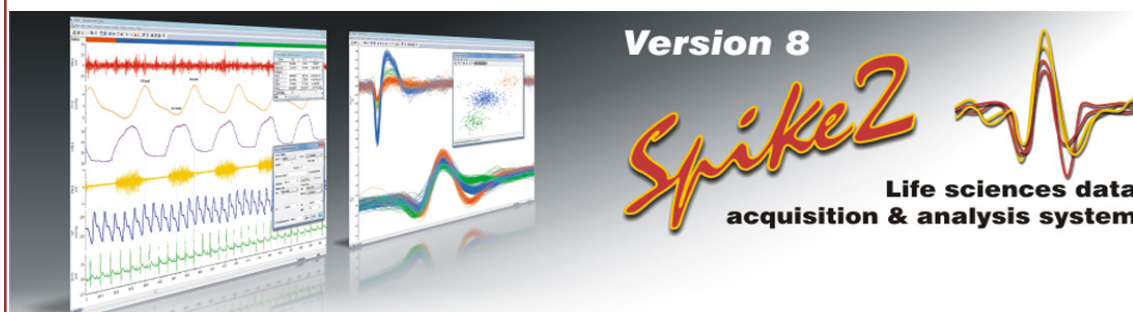
Cornell  
ECE

## INTRODUCTION

Data including respiration and neural activity of mice has been acquired in Spike2. The main task for the MEng project is processing the data with Python to extract relevant information such as number of spikes during each trial (a few seconds of recording), respiration phase and coefficient of variation for each cell. If infusion or stimulation was used, the data should be separated in before and after. The Python program is supposed to produce output, which carries information for each recording file. As a functional module, the program will be applied to electrophysiological research repeatedly.

## HOW DO WE DO?

- Data is acquired by Spike2 from CED (which is a multi-channel continuous data acquisition and analysis package).



- The Spike2 data files can be read using **NEO.IO** and then we will process them in Python.
- Design our own analyses functions in **python** to meet our specific goals.



## KEY ISSUES

### *Single cell & multiple cells:*

**Rates1 & 2:** How many spikes each cell fired during each trial and we also want to know the frequency(number/time).

**Rate3:** Coefficient of variation

**Rate4:** Interspike interval distribution

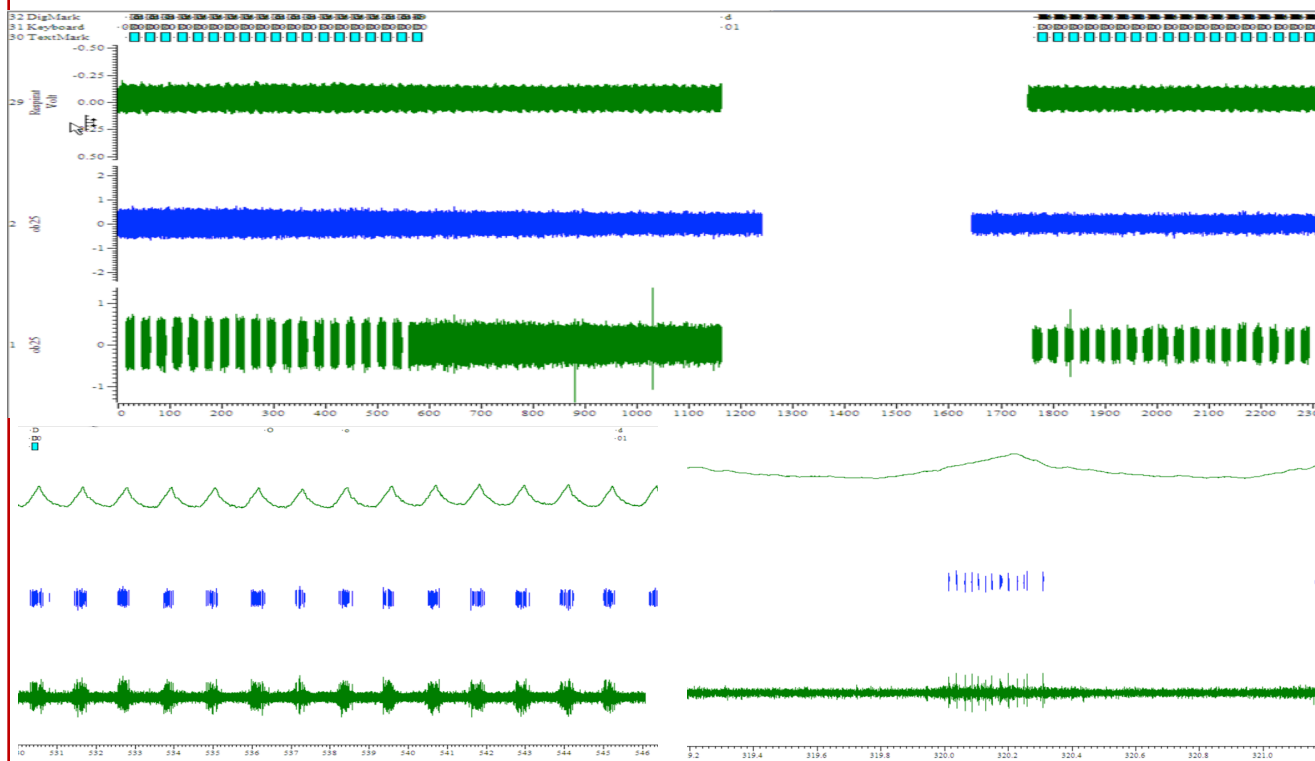
**Rate5:** Phase of respiration

**Rate6:** Coherence and co-variation between spike trains and respiration.

## DATA FORMAT & RESULT

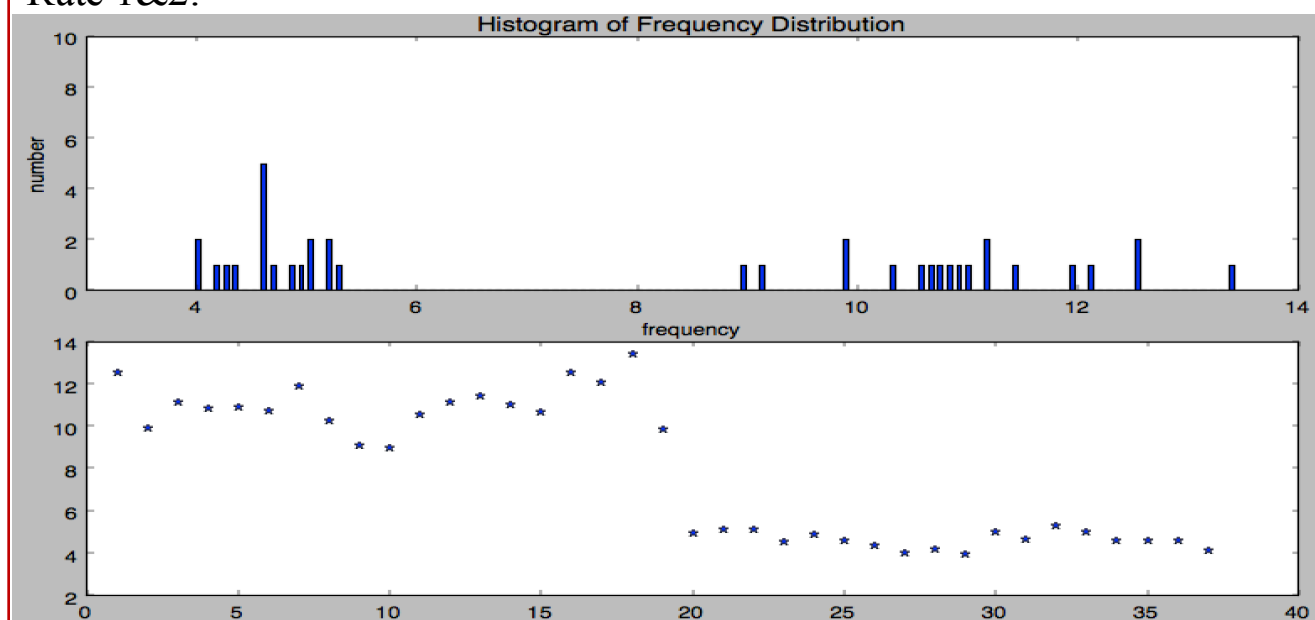
In a single data file, (eg. Laura\_example.smr), there are 39 **AnalogSignal** channels in which 2 of them are Respiration, and the rest 37 channels are split parts of a single cell signal; three **EventArray** channels and 1 **SpikeTrain** channels, and they can be tracked by their annotations within each channel.

The following pictures are the raw data file, which displayed in Spike2.

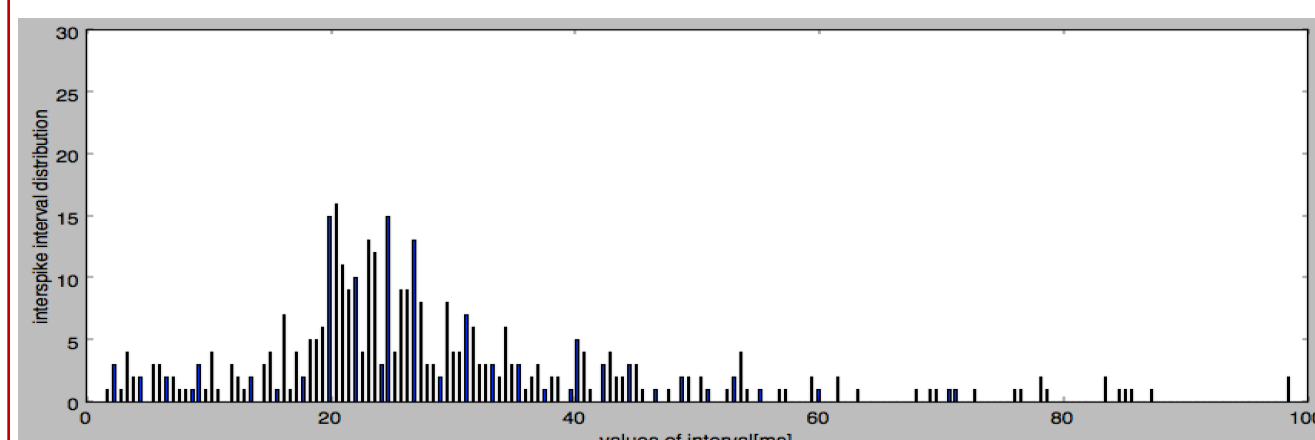


Result & graphs for each rate:

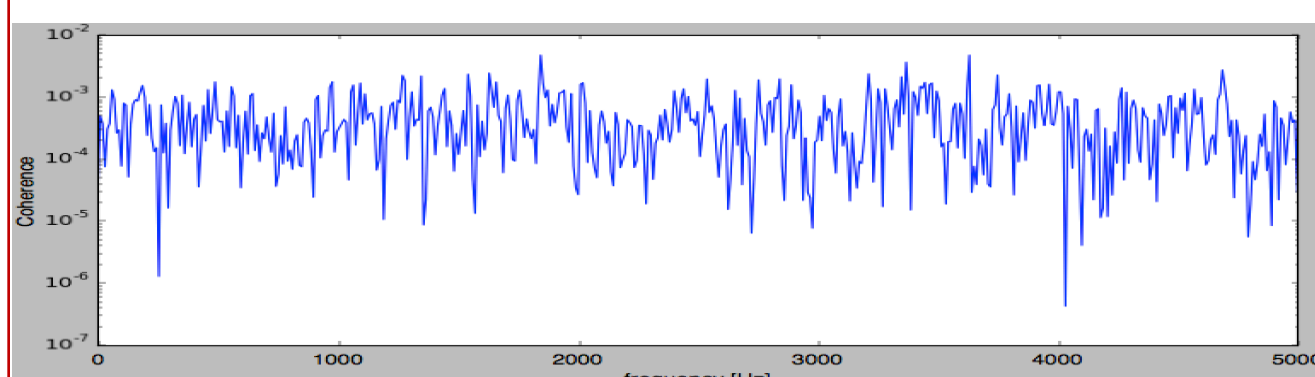
Rate 1&2:



Rate 3&4:

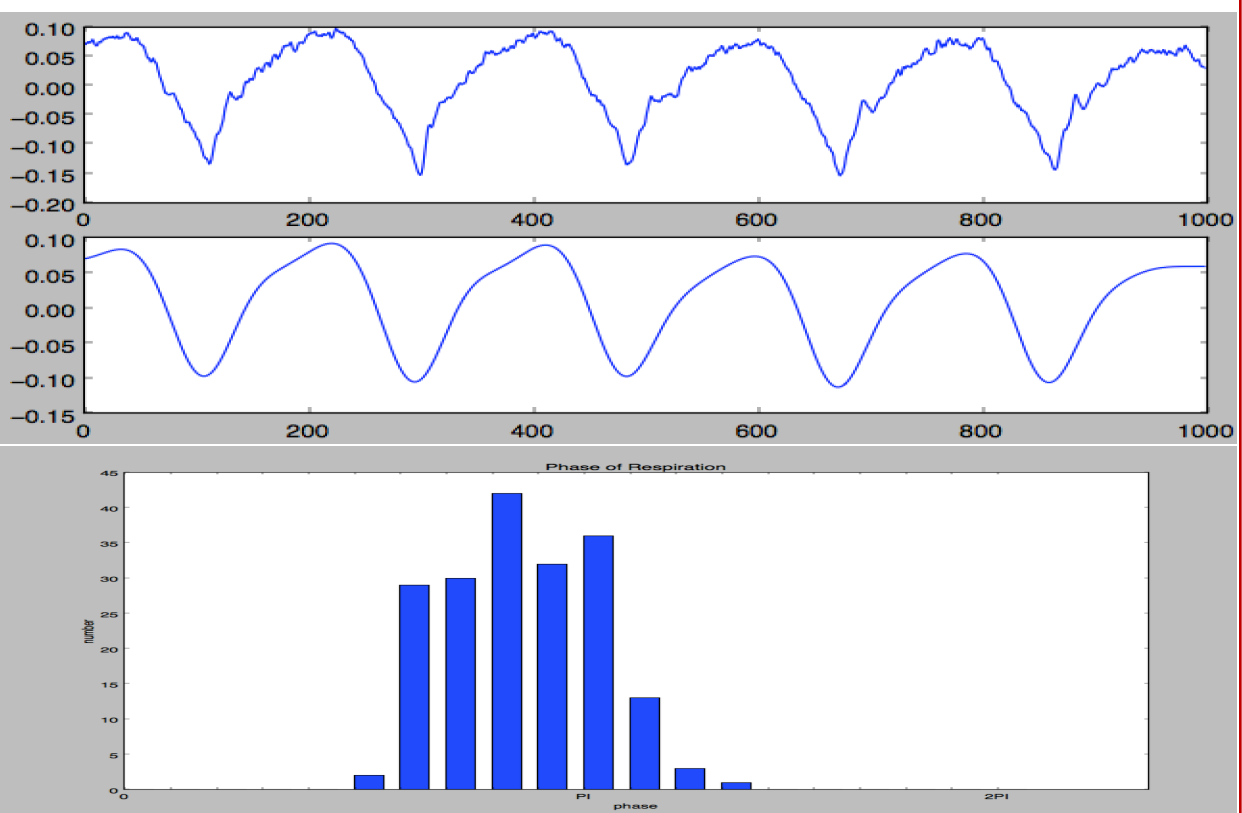


Rate 6:



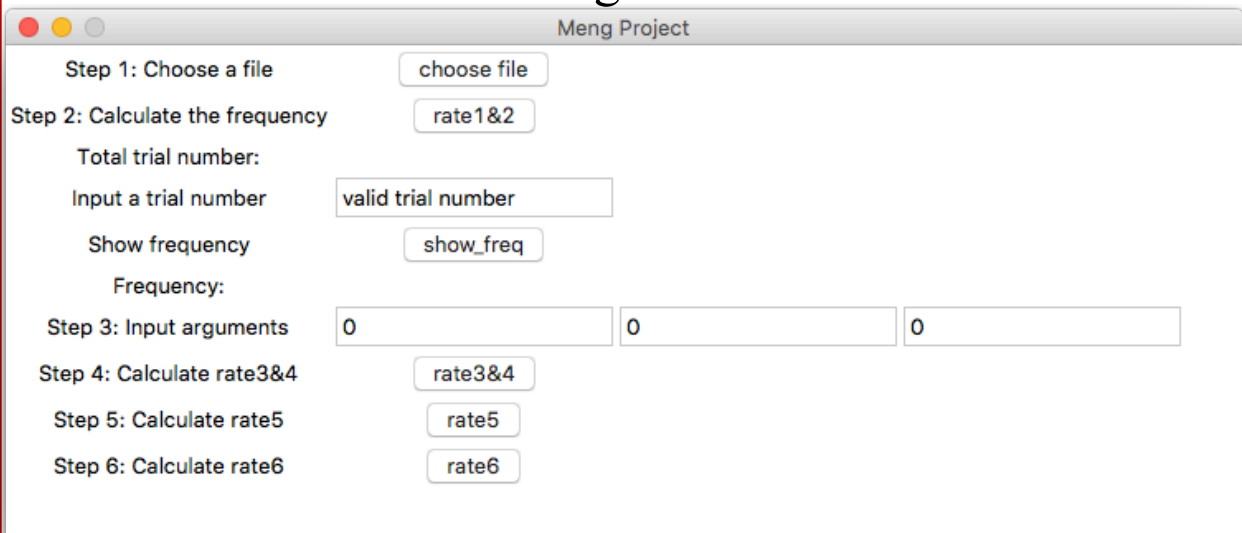
## RESULT CONT.

Rate 5:



## GUI

Use a python GUI toolkit, Tkinter, to build a user friendly GUI. This GUI will help the users who are not familiar with software using the functions much easier.



## SUMMARY & Acknowledgment

The main task in this project is designing Python modules which can be used to acquire relevant information about data collected from mice. To achieve this goal, several analysis methods are adopted. In the last semester, there are several intermediate results and remaining questions, and we have finished them in this semester, which we have more time than last fall semester. Finally, we also create a user friendly GUI, and we expect these function modules can be reused as API in further electrophysiology research.

We would like to thank our advisors: Bruce R. Land, Christiane Linster for their guidance, and Matthew C. Stockton for his assistance.