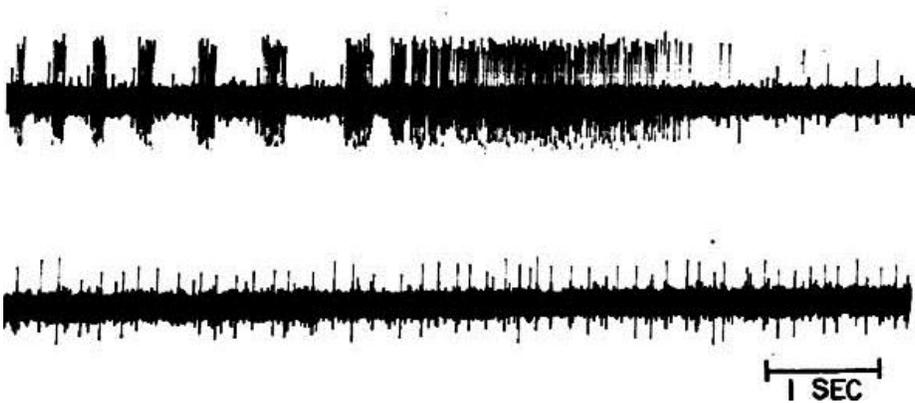


LECTURE 5

In both exercise there several calculations which can be done in matlab.

EXERCISE 1. MODELING THE FREQUENCY OF NERVE SPIKES USING THE POISSON PROCESS



An longitudinal intra-fascicular electrode is used to record the nerve spikes under mild and heavy contraction of a muscle.

By an experimental study it was found that in average the 20 spikes occurred per second under mild contraction and 250 spikes per second under heavy contraction.

1. Estimate the $P(X(t)=k)$ ($k=1,3,4,5$ and 6) using the Poisson Process for both mild and heavy contraction at after 10 ms and illustrate them as density functions.
2. Estimate the First order distribution $F_k(k;t)$ after 30 ms
3. A classifier to discriminate between mild and heavy contraction should be constructed. To detect heavy contraction the k threshold for heavy contraction must exceed the 95% percentile of the k values from mild contraction (meaning larger than 95% of all possible k values from the mild process). What is the value of the k threshold at time 30 ms?

EXERCISE 2. MODELING INFECTIOUS DISEASE RISK USING A MARKOV CHAIN

The task is to build a Markov chain for modeling the risk infection with Influenza.

There is three states, Healthy (H), Infected (I) and post Infected (PI).

In the beginning of the season all persons are Healthy. Very day the risk of getting Infected is 20%. When a person is Infected the change of getting well (PI) is 30% per day. When a person is post Infected the person cannot become infected again

- a) Draw the state diagram of the Markow chain, include the Transition probabilities.
- b) What is the change of not having or have had Influenza at day 4?
- c) What is the risk of having Influenza at day 2,4 and 6?
- d) At what time is the dose the risk of being ill peaks?