

ECE C143A/C243A, Spring 2022

Department of Electrical and Computer Engineering
University of California, Los Angeles

Homework #3

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Due Wednesday, 4 May 2022, uploaded to Gradescope.

Covers material up to Poisson Processes III.

100 points total.

1. (13 points) You are recording the activity of a neuron, which is spiking according to a Poisson process with rate λ . At some point during your experiment, the recording equipment breaks down and begins dropping spikes randomly with probability p .
 - (a) (10 points) Let the random variable M be the number of recorded spikes with the broken equipment. Show that the distribution of M is $\text{Poisson}((1-p)\lambda s)$. (Hint: If N is a random variable denoting the number of actual spikes, what is $\Pr(M = m | N = n)$?)
 - (b) (1 points) What is the rate of the Poisson process in part (a)?
 - (c) (2 points) What is the distribution on the number of spikes dropped within a τ second interval?
2. (35 points) Homogeneous Poisson process
Complete the Jupyter notebook `hw3p2.ipynb`. Print your notebook code and output to a pdf as your submission for this question.
3. (22 points) Inhomogeneous Poisson process
Complete the Jupyter notebook `hw3p3.ipynb`. Print your notebook code and output to a pdf as your submission for this question.
4. (30 points) Real neural data
Complete the Jupyter notebook `hw3p4.ipynb`. Print your notebook code and output to a pdf as your submission for this question.