1. **Statistics of integrate-and-fire neurons** For the following use different variants of the leaky integrate-and-fire models provided in `lifspikes.m`, `lifouspikes.m`, and `lifadaptspikes.m` do generate some spike train data. Use the functions you wrote for the Poisson process to analyze the statistics of the spike trains.
   (a) Generate a few trials of the two models for two different inputs that result in qualitatively different spike trains and display them in a raster plot. Decide for a noise strength (good values to try are 0.001, 0.01, 0.1, 1).
   (b) The inverse Gaussian describes the interspike interval distribution of a PIF driven with white noise:
   $$p(T) = \frac{1}{\sqrt{4\pi D T^3}} \exp\left[-\frac{(T-\langle T\rangle)^2}{4DT\langle T\rangle^2}\right]$$
   where $\langle T\rangle$ is the mean interspike interval and
   $$D = \frac{\langle (T-\langle T\rangle)^2\rangle}{2\langle T\rangle^3}$$
   is the diffusion coefficient (variance of the interspike intervals T divided by two times the mean cubed). Show in two plots how this distribution depends on $\langle T\rangle$ and D.
   (c) Extent your function plotting an interspike interval histogram to also report the diffusion coefficient D.
   (d) Compare intersike interval histograms obtained from the LIF and PIF models with the inverse Gaussian.
   (e) Plot the firing rate (inverse mean interspike interval), mean interspike interval, the corresponding standard deviation, CV, and diffusion coefficient as a function of the input to the LIF and the PIF with noise strength set to 0.01.
   (f) Plot the firing rate as a function of input of the LIF and the PIF for various values of the noise strength.
   (g) Use the functions for computing serial correlations, count statistics and fano factors to further explore the statistics of the integrate-and-fire models!