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Are the input parameters of white-noise-driven integrate-and-fire neurons uniquely determined by rate and CV?

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Integrate-and-fire (IF) neurons have found widespread applications in computational neuroscience. Particularly important are stochastic versions of these models where the driving consists of a synaptic input modeled as white Gaussian noise with mean μ and noise intensity D. Different IF models have been proposed, the firing statistics of which depends nontrivially on the input parameters μ and D. In order to compare these models among each other, one must first specify the correspondence between their parameters. This can be done by determining which set of parameters (μ, D) of each model is associated to a given set of basic firing statistics as, for instance, the firing rate and the coefficient of variation (CV) of the interspike interval (ISI). However, it is not clear {\em a priori} whether for a given firing rate and CV there is only one unique choice of input parameters for each model. Here we review the dependence of rate and CV on input parameters for the perfect, leaky, and quadratic IF neuron models and show analytically that indeed in these three models the firing rate and the CV uniquely determine the input parameters.

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