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Inferring phenomenological models for dynamics of Purkinje neurons[1] CATALINA RIVERA, DAVID HOFMANN, ILYA NEMENMAN, Department of Physics, Emory University — Purkinje neurons are typically described by multi-compartmental models that try to reproduce their complex dendritic structure. These models are very hard to solve computationally, and due to the high number of parameters they are likely to overfit, and therefore are not predictive. Here we build an effective phenomenological model to describe the inter-spike interval probability distribution of a highly complex Purkinje neuron model data set as a function of the injected current. From a hierarchical set of Markov models we select the simplest model able to explain the data, where each state in the Markov model represents an effective state of the neuron. This procedure allows us to construct a coarse-grained model of the system in an automated manner directly from data, without having to build a microscopically accurate description of the system first. We found that a Markov model with about 10 states provides a good fit for the data generated by a morphologically accurate model with about 1000 compartments.

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