

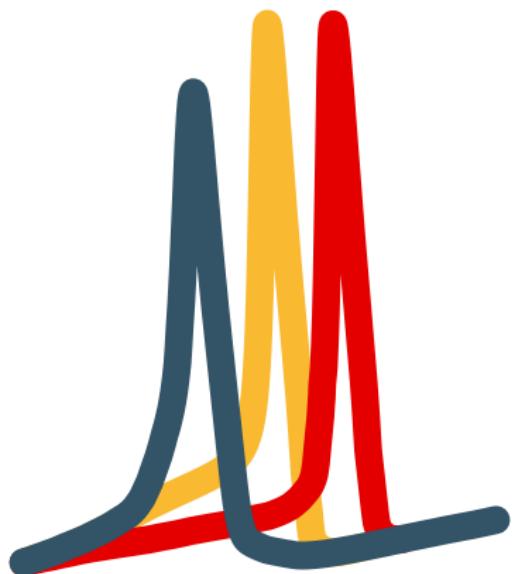
How to model effects of uncertain model parameters with Uncertainpy

Simen Tennøe

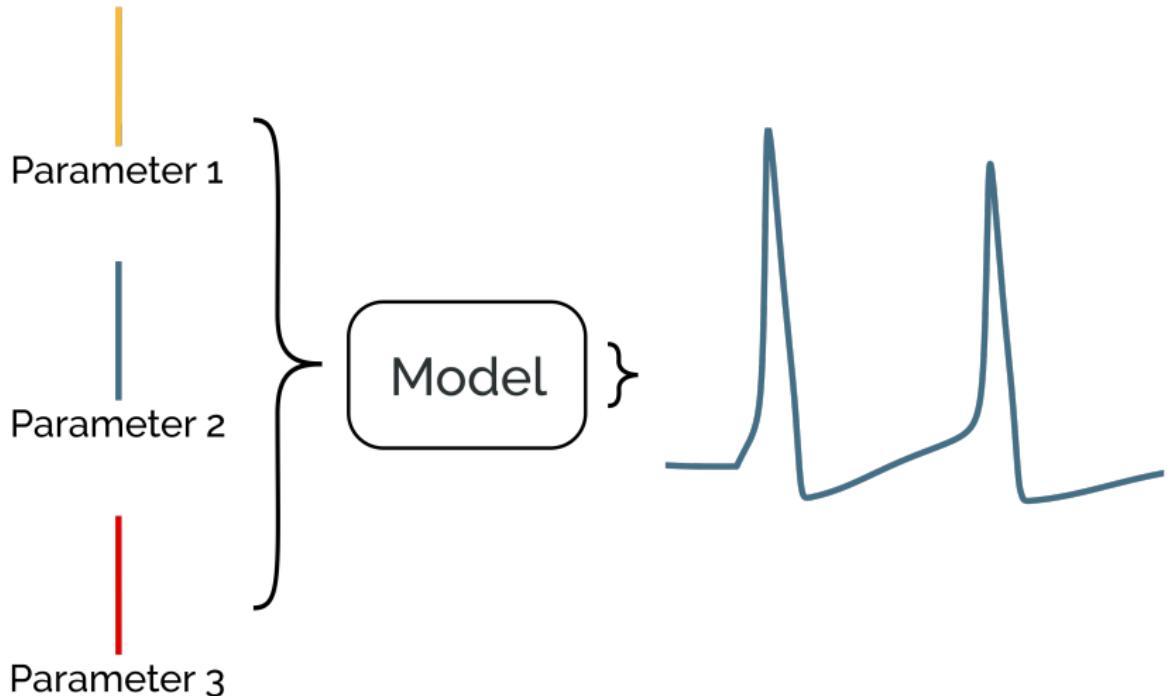
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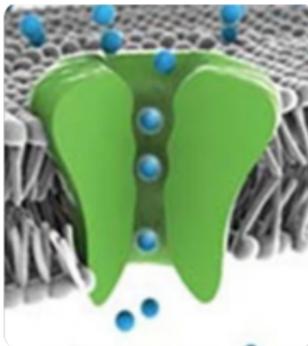
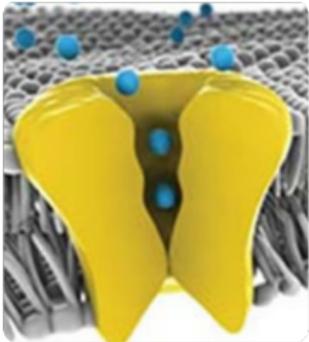


Computational models contain parameters

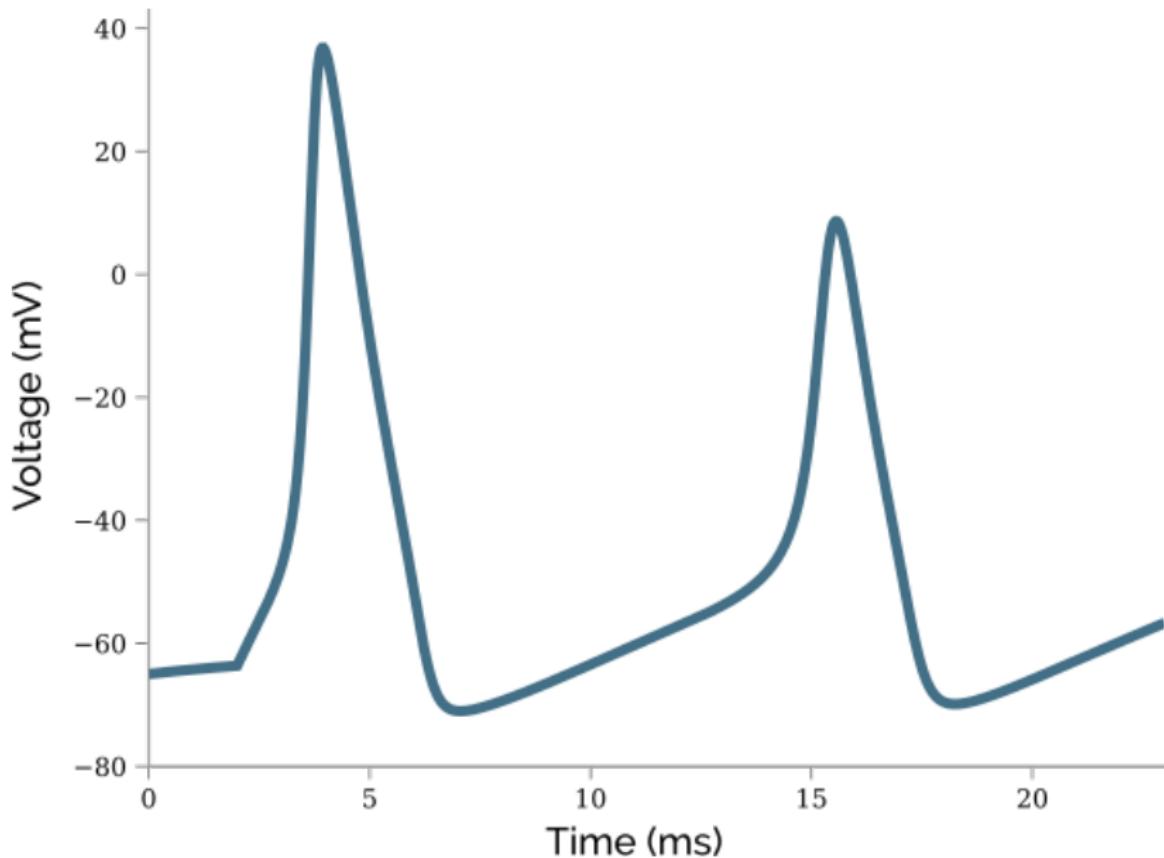


Example: the Hodgkin-Huxley model

$$I = C_m \frac{dV_m}{dt} + I_K + I_{Na} + I_I$$

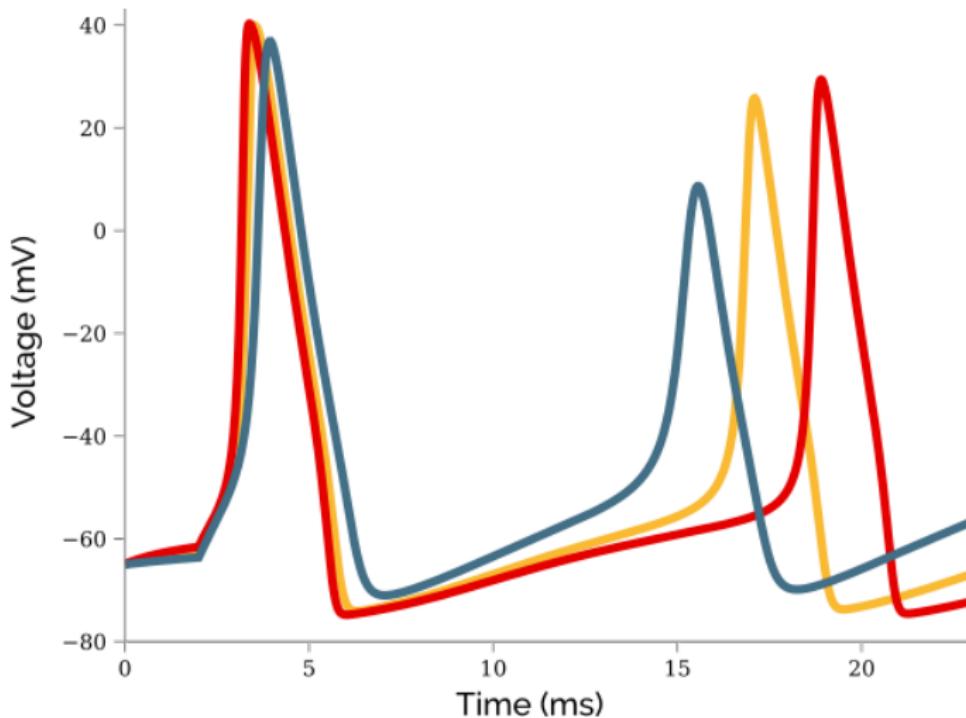
 I_K  I_{Na}  I_l

Example: the Hodgkin-Huxley model

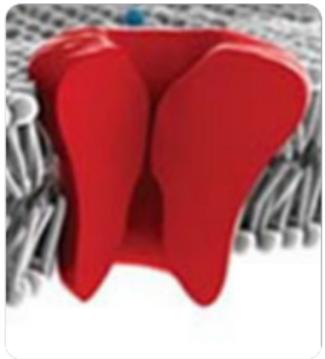
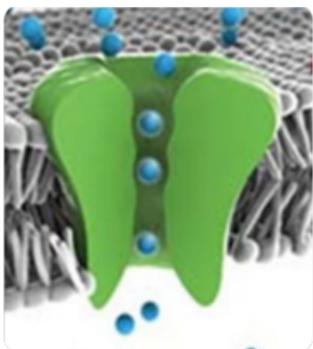
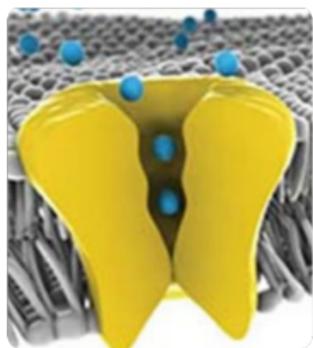


Changing parameters give different results

$$I = C_m \frac{dV_m}{dt} + I_K + I_{Na} + I_I$$



Problem: The parameters are uncertain



I_K

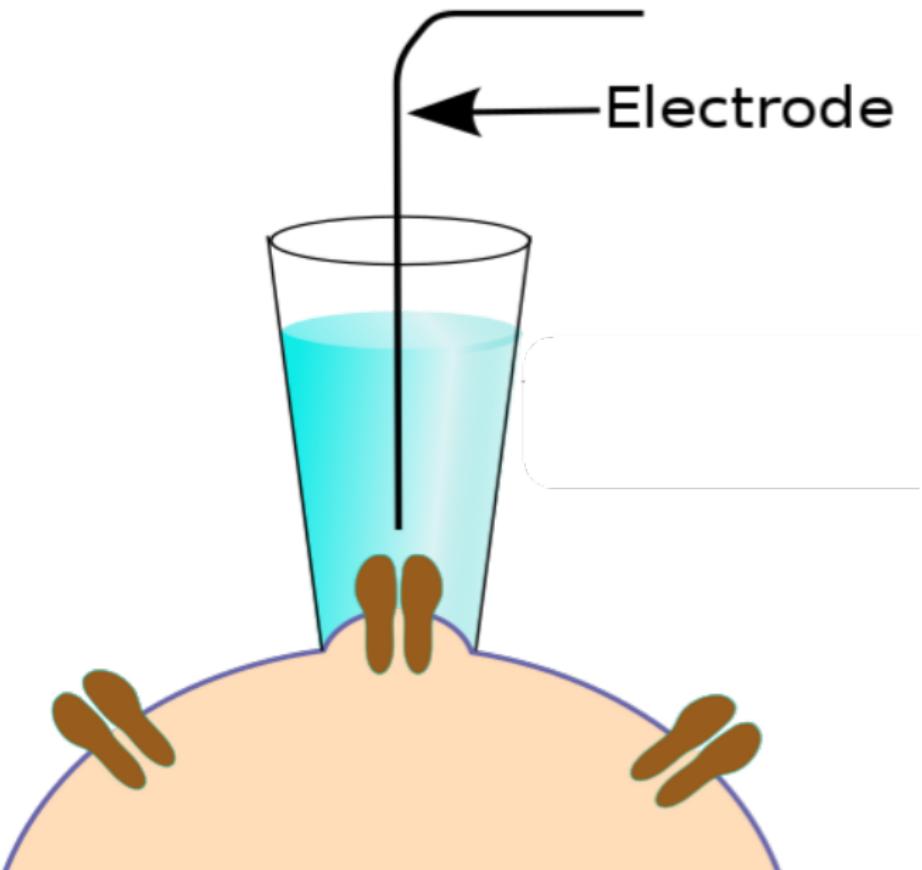


I_{Na}

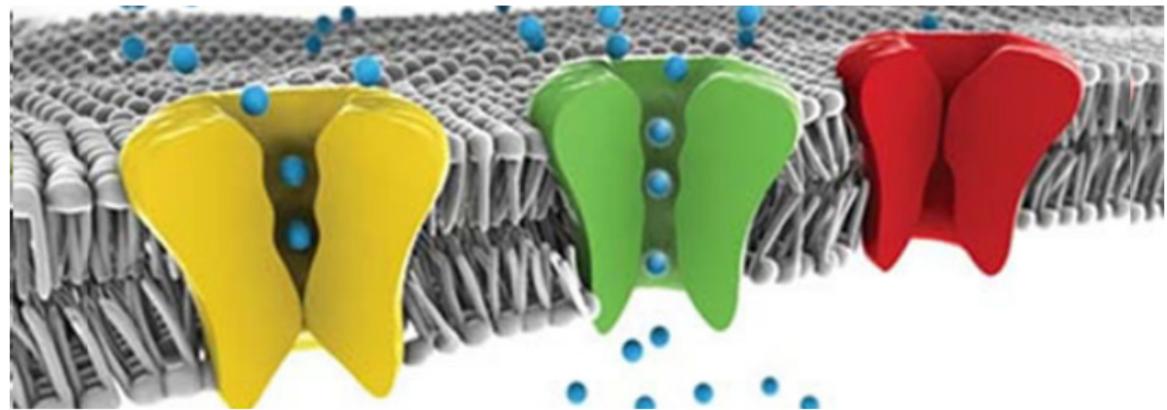


I_l

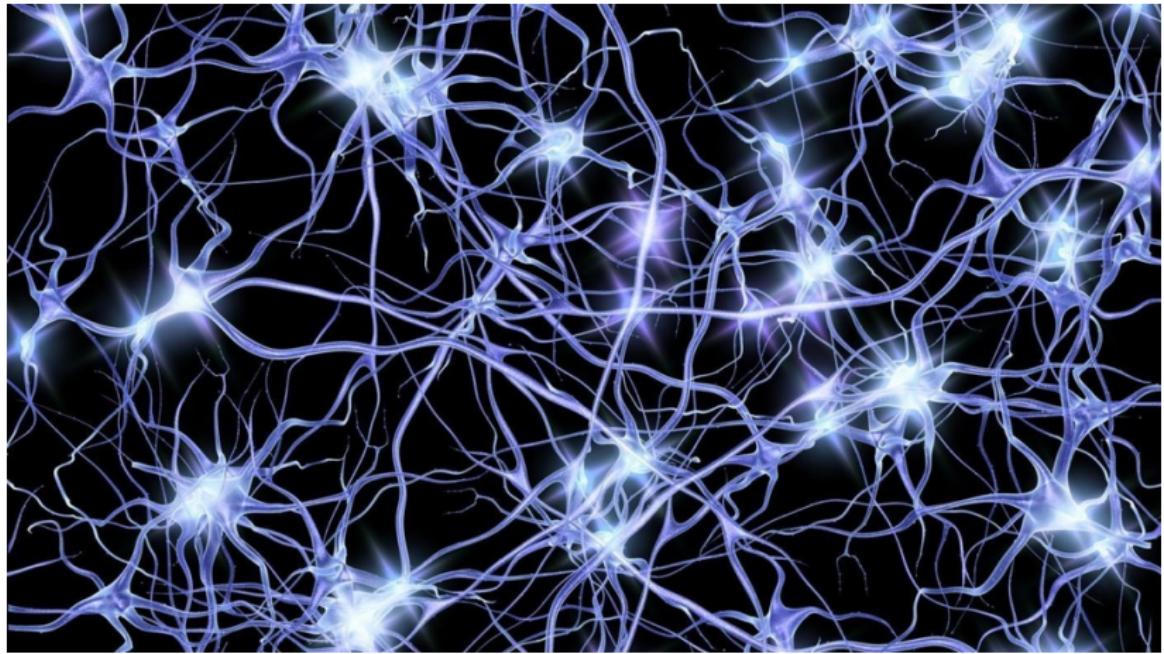
Cause of uncertainty: measurement uncertainty



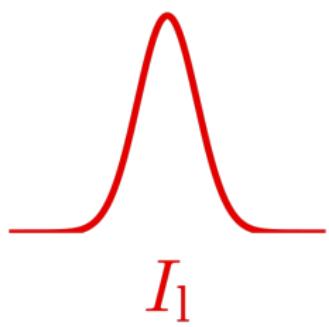
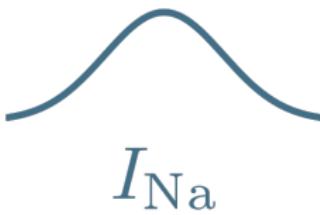
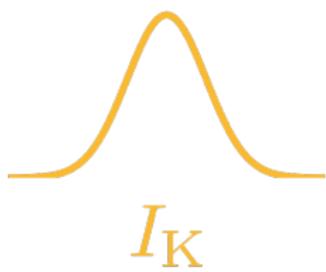
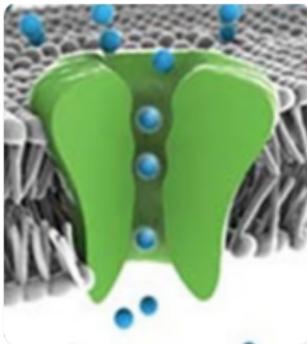
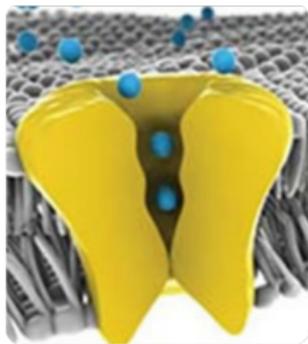
Cause of uncertainty: biological variability



Cause of uncertainty: biological variability



Parameters are best described by distributions



Uncertainty quantification is the process of quantifying the effects of uncertain input parameters

