Single Neuron Model (3):

Dynamics Analysis

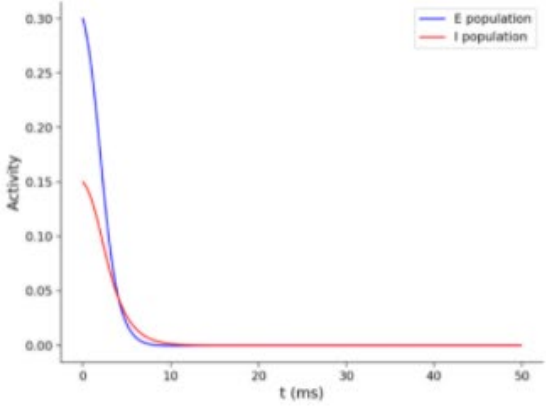
Neuron models	HH neuron model
	Dynamics Analysis
	LIF neuron model
	Exponential IF model
Synapse models	AMPA/GABA/NMDA synapse
	Exponential synapse
Network Models	E/I balance network
	Continuous attractor network
	Working memory model
	Decision making model

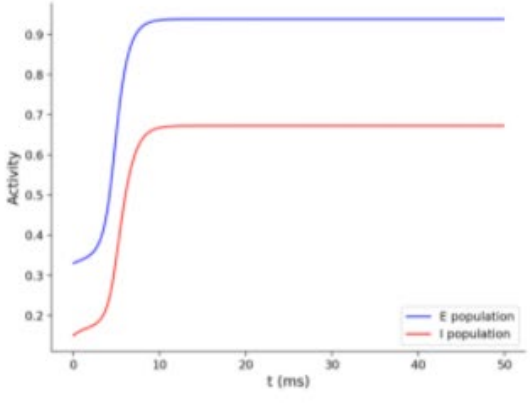
The Wilson-Cowan model describes the dynamics of two coupled populations of excitatory (E) and inhibitory (I) neurons:

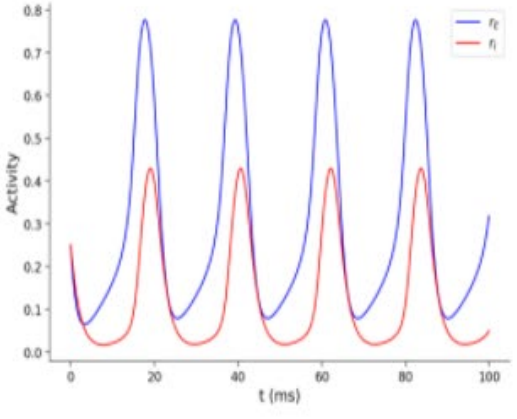
$$\tau_E \frac{dE}{dt} = -E + (1 - rE)F(w_{EE}E - w_{EI}I + I_{ext}; a, \theta)$$
$$\tau_I \frac{dI}{dt} = -I + (1 - rI)F(w_{IE}E - w_{II}I; a, \theta)$$

The E and I population activity evolves with time, it's a dynamical system!

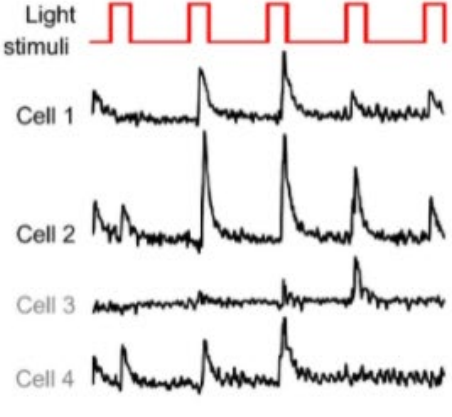
Model behavior with different initial condition or model parameters

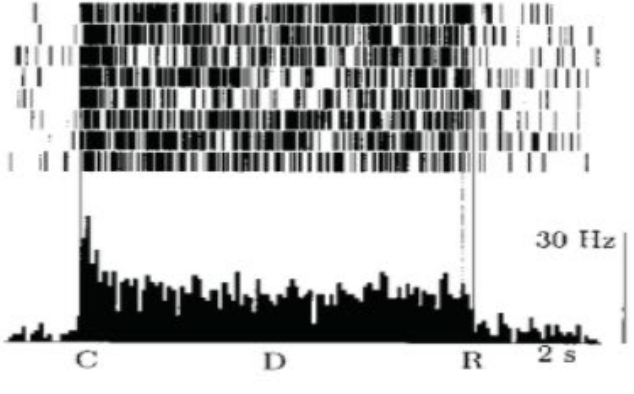


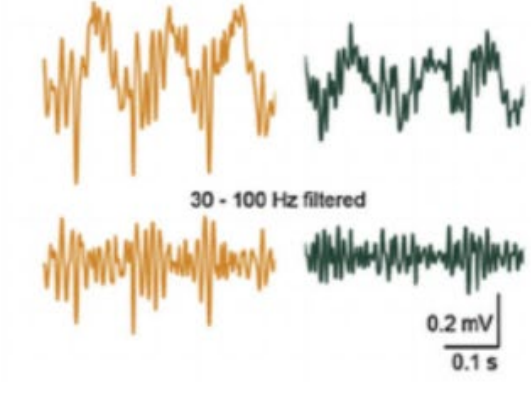




Experimental observations







What determines the steady state of the model?

Exercise

1. Dynamical systems analysis of the Wilson-Cowan model