Summary of example:

The data trace was obtained from a biophysically accurate reconstruction of a CA1 layer pyramidal cell, by stimulating the somatic section with a 200 pA current stimuli. The experiment lasted for 1000 ms and the stimuli started at 200 ms and lasted for 600 ms (ended at 800 ms). The sampling frequency was 5kHz.

WARNING: the data is given in V not in mV

The model was created by clusterizing the branches of the detailed model into 6 compartments, the parameter values of the channels were obtained by averaging the values in the detailed model.

The somatic parameters are the subjects of optimization.

The additional mechanisms required by the model are in the mod_files folder. You must run the nrnivmodl command to obtain the necessary files (you should select the folder containing the files obtained by nrnivmodl as the special folder in the program)
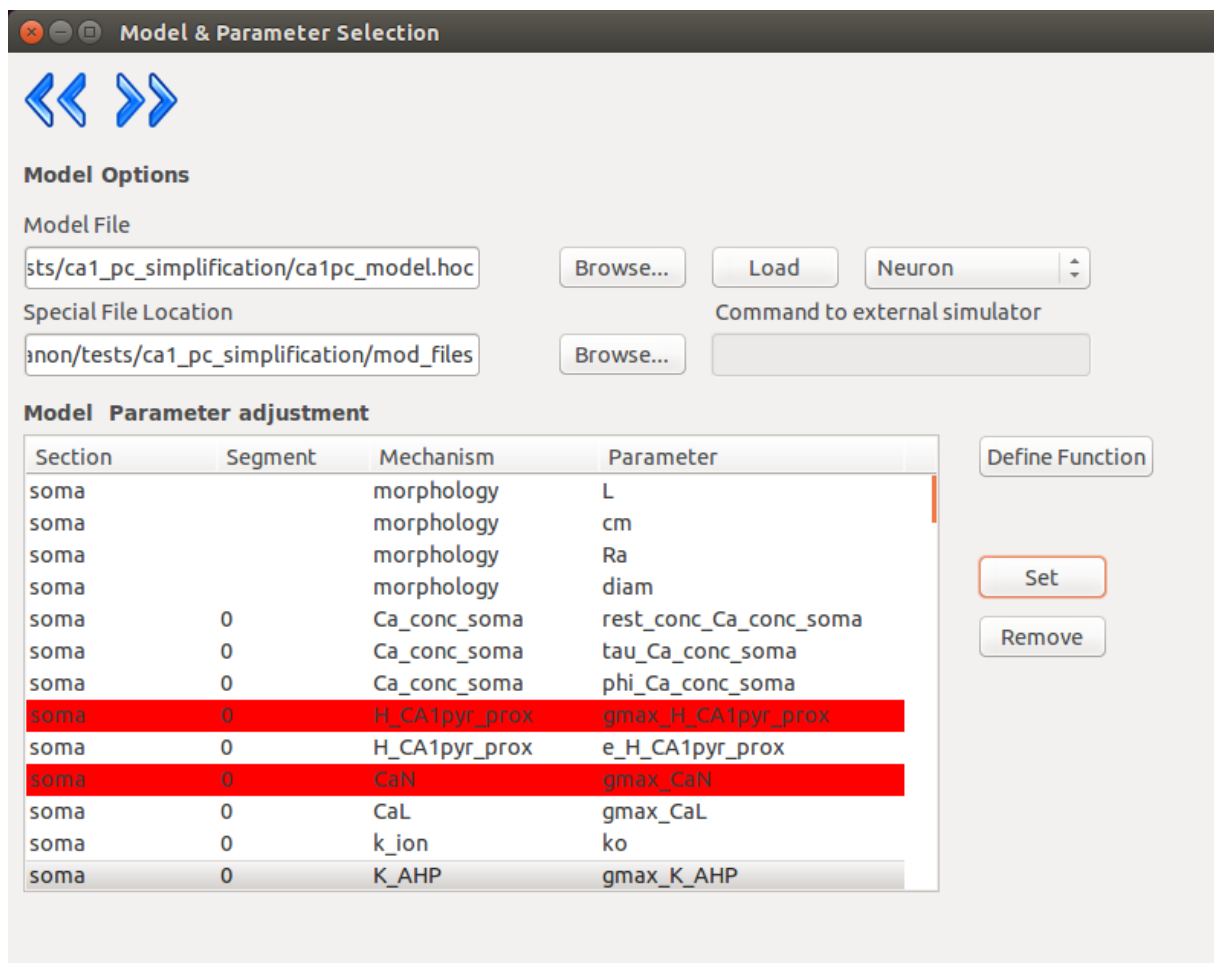
input file: Vinj48_2c_1.dat

model: ca1pc_model.hoc

Step-by-step instructions to run the example from the Optimizer GUI:

Run „python optimizer.py -g" to start the GUI
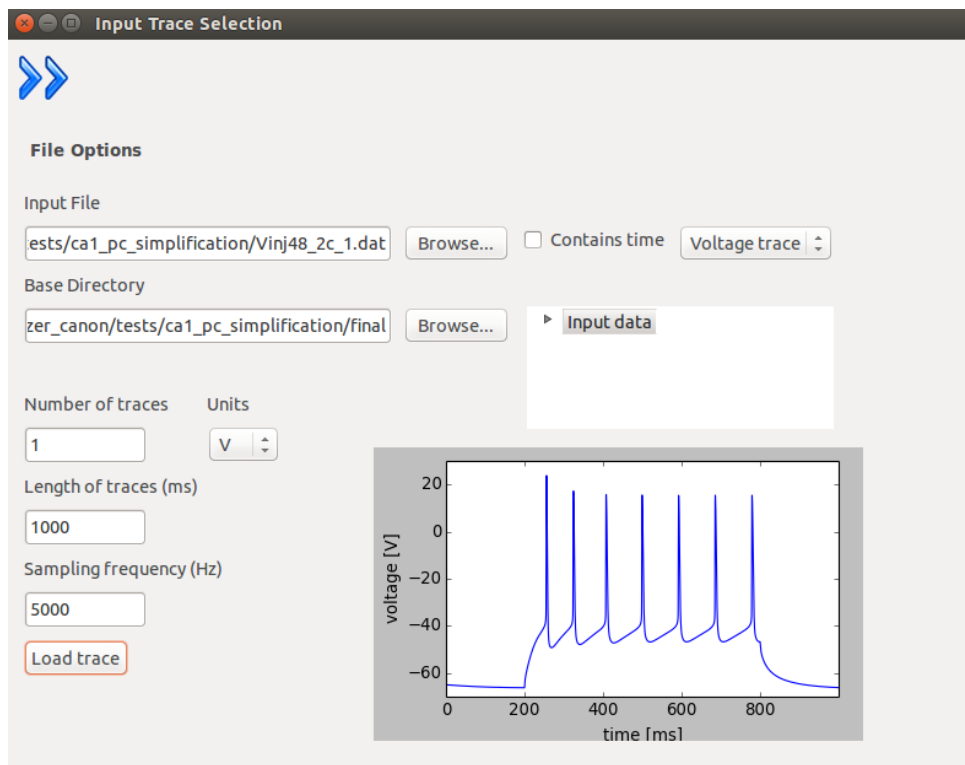
At 'Input File' load the target data, at 'Base Directory' choose the directory where you wan't to save the results. Fill out all the cells and press 'Load trace'. Go on by pressing the blue arrow.

Browse to the model file and to the directory containing the mod files, then load the model. To select a parameter click first on the parameter, then press 'Set'. Repeat it to select a new parameter.

Select the following parameters:

soma 0 H_CA1pyr_prox gmax_H_CA1pyr_prox

soma 0 CaN gmax_CaN

soma 0 CaL gmax_CaL

soma 0 K_AHP gmax_K_AHP

soma 0 K_C_1D gmax_K_C_1D

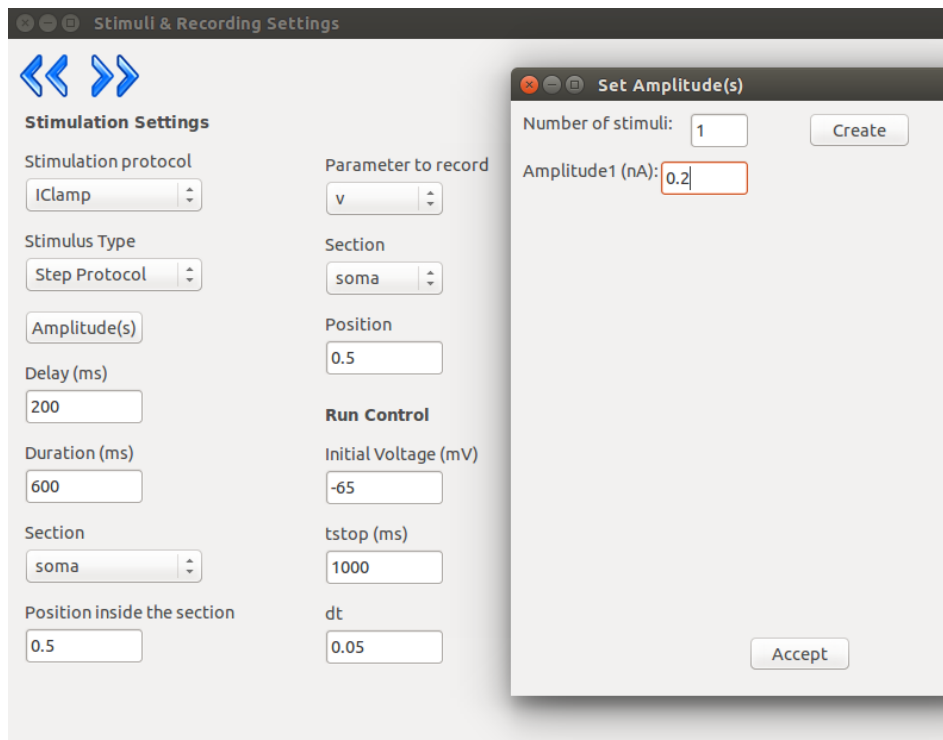soma 0 K_M gmax_K_M
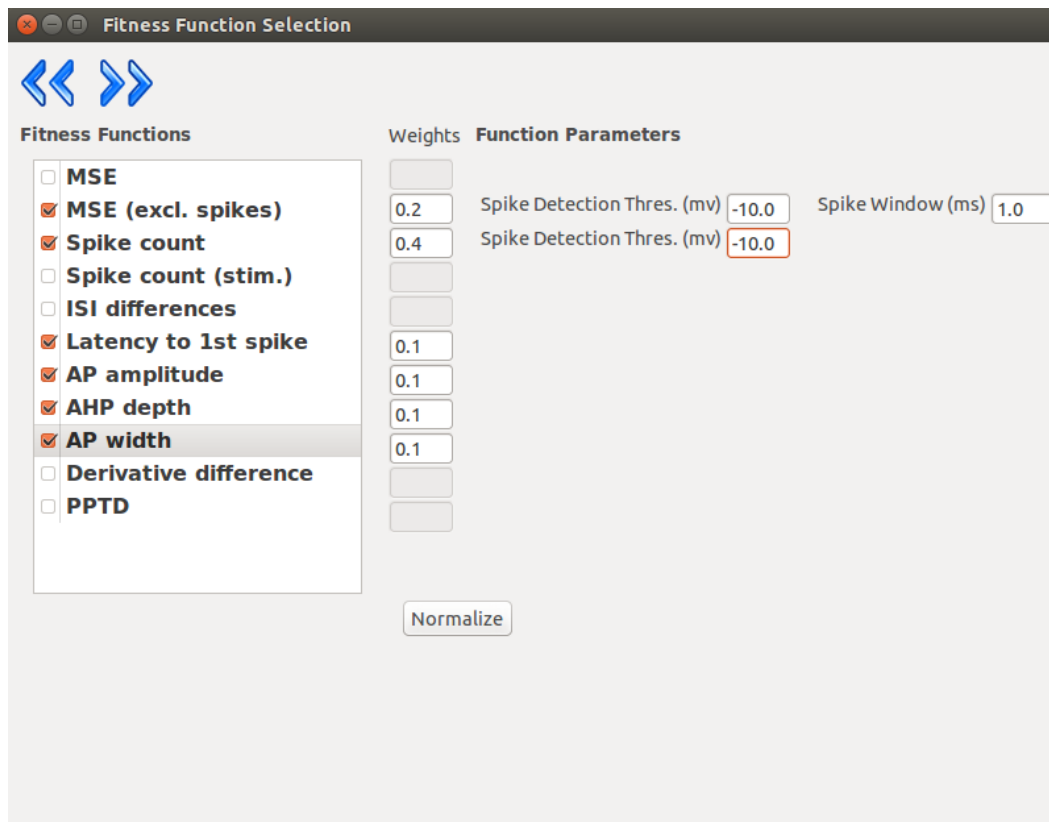
soma 0 K_A_prox gmax_K_A_prox

soma 0 K_DR gmax_K_DR

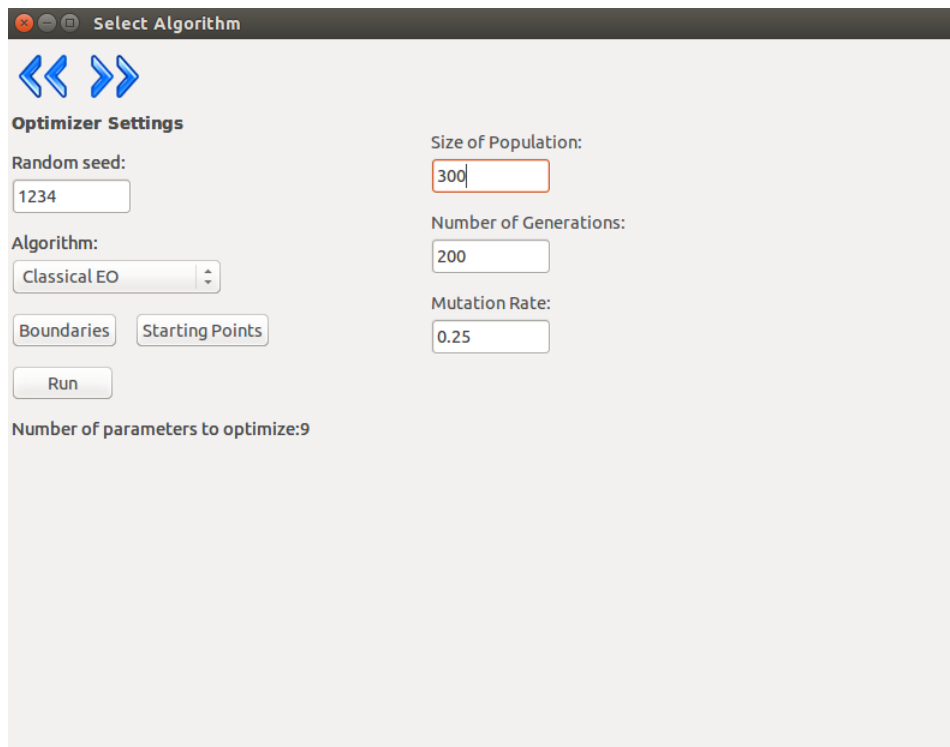soma 0 Na_soma gmax_Na_soma

Go on by pressing the right arrow.

Stimuli & Recording Settings

Stimulation Settings

Stimulation protocol
IClamp

Stimulus Type
Step Protocol

Amplitude(s)

Delay (ms)
200

Duration (ms)
600

Section
soma

Position inside the section
0.5

Parameter to record
v

Section
soma

Position
0.5

Run Control

Initial Voltage (mV)
-65

tstop (ms)
1000

dt
0.05

Set Amplitude(s)

Number of stimuli: 1   Create

Amplitude1 (nA): 0.2

Accept

Fill in all the cells. Press 'Amplitude(s)' to open the 'Set Amplitude(s) window.

Go on by pressing the right arrow

Fitness Function Selection

Fitness Functions   Weights   **Function Parameters**

☐ MSE
☑ MSE (excl. spikes)   0.2   Spike Detection Thres. (mv) -10.0   Spike Window (ms) 1.0
☑ Spike count   0.4   Spike Detection Thres. (mv) -10.0
☐ Spike count (stim.)
☐ ISI differences
☑ Latency to 1st spike   0.1
☑ AP amplitude   0.1
☑ AHP depth   0.1
☑ AP width   0.1
☐ Derivative difference
☐ PPTD

Normalize

Choose fitness function(s), and define their weights. Go on by pressing the right arrow.
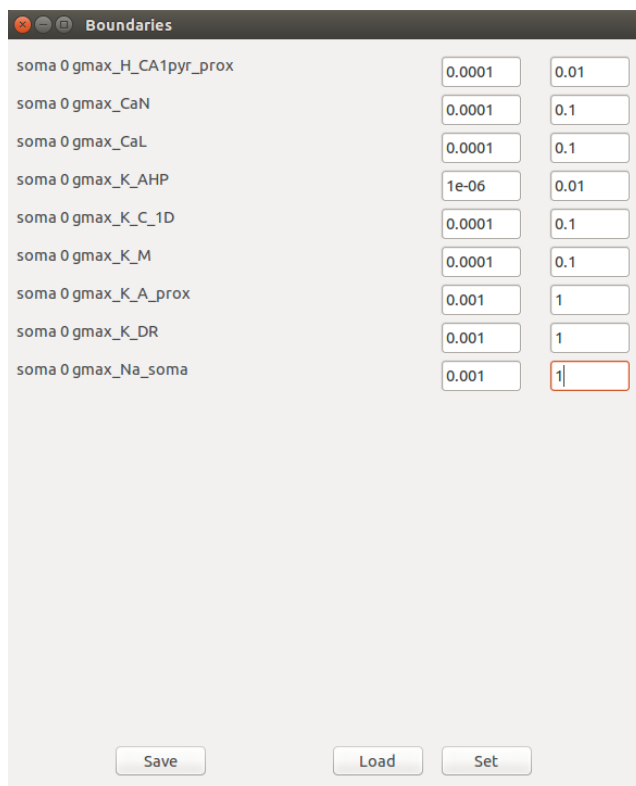
Select an algorithm, and press the 'Boundaries' button to define the boundaries of the parameters to be optimized:

Press 'Set'.

Start the optimization pressing the 'Run' button. Boundaries can also be loaded from a file.