# Detecting subthreshold neural signals in noisy environments with short-term depression

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Actual neurons codify and process information in a highly noisy environment. For instance, the spontaneous irregular firing of neurons of a network can strongly influence the detection of signals by other neurons. This detection becomes even harder if the signal has a weak amplitude. In this contribution, we present a novel mechanism to enhance the detection of subthreshold signals by neurons in the presence of irregular noisy activity caused by other neurons in the environment. This mechanism strongly relies on the nonlinear effect that several activity dependent synaptic dynamics, such as short-term depression, have on signal processing tasks. We found, employing numerical simulations and analytical procedures, that the signal detection is improved for a wide range of levels of the noisy activity of the neural environment. We also discuss the role that different kind of neural and synaptic fluctuations could have in our findings. Finally, we compare the results obtained with recent experimental data of signal detection tasks in noisy environments in the human brain stem. The level of agreement shown between the predictions of our model and the experimental data suggest that this novel mechanism can play a relevant role in information processing in the brain stem and in other different brain areas, such as the cortex.