Model of mitochondrial motility (MM) written with Python 3.6.

Results were averaged over 10 runs with 500 mitochondria per run.

Each mitochondrion was initialized with a recovery time drawn from a normal distribution. We ran simulations varying recovery time distribution means over 1-25 minutes (σ = 2.5 minutes in each condition).

All mitochondria began in the motile pool at the beginning of the simulation run.

Stimulation of the mitochondria was modeled using spikes generated from a homogeneous Poisson process (from the Elephant library) with stimulation frequencies ranging from 0.001-0.5 Hz. We ran each stimulation frequency for 1500 seconds to allow the population of mobile/immobile mitochondria to reach steady state.

Each stimulating event (spike) immobilized a variable number of mitochondria from the total pool. The proportion of affected mitochondria was drawn from a normal distribution (μ = 0.02, σ=0.002). These values were based on experimental findings suggesting that single spikes affect an area of 1-2 um of a 70 um section of dendrite. Standard deviation was calculated such that 3 s.d. would cover 99% of the distribution. This variable proportion of affected mitochondria was used to calculate the number of mitochondria randomly selected from the population for immobilization. These mitochondria would remain inactive for the duration of the recovery time variable with which they were initialized. If a mitochondrion was already immobilized and selected from the total pool for immobilization by a subsequent event, the immobilization time would be extended by the second event.