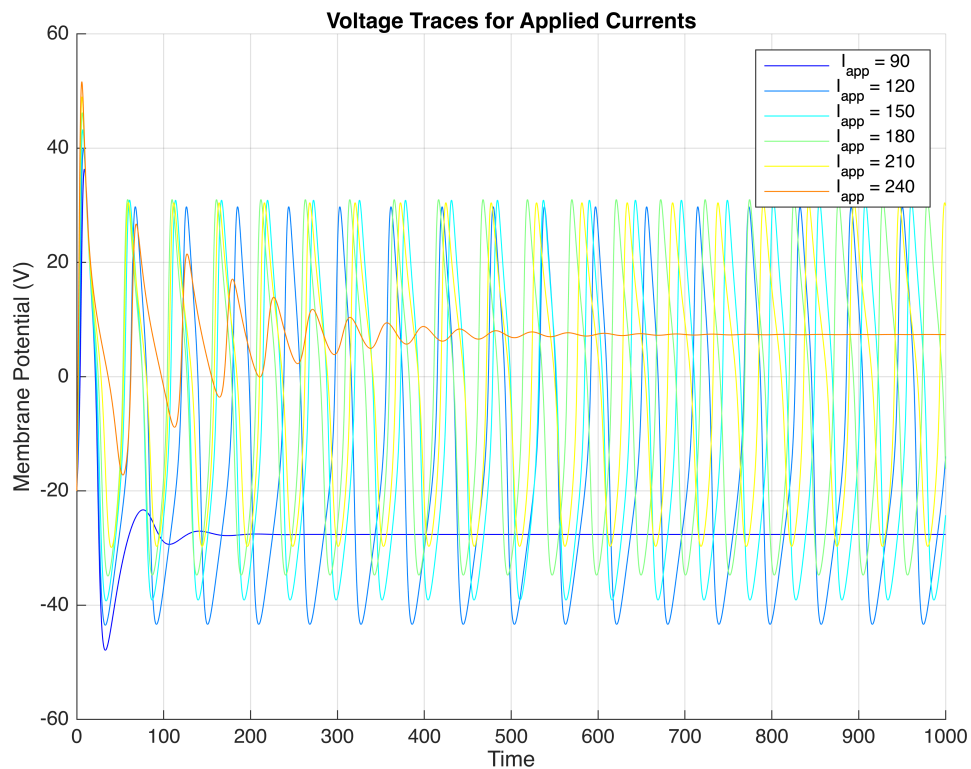
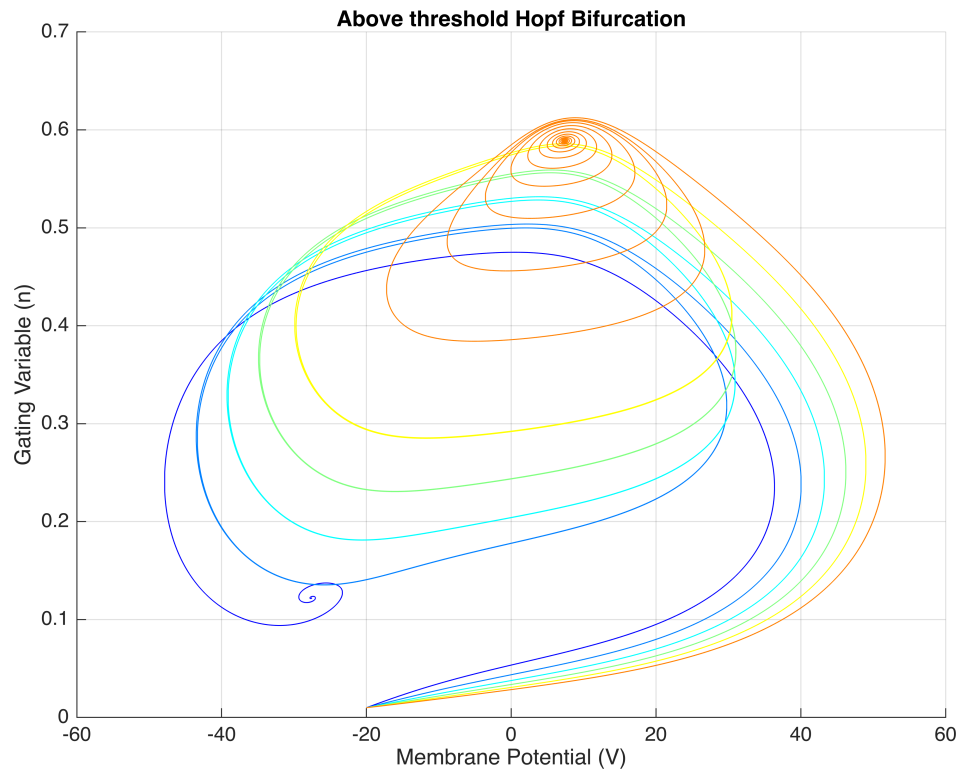


Above Threshold Hopf Simulation

```
phase_portrait(1,90,30,240,true,"Above threshold Hopf Bifurcation");
```



% Hopf bifurcations are characterized by the onset of oscillatory behavior (or regular spiking) after a certain point known as the bifurcation point which, is 100 picoamps in this simulation. This is supported by the graph because below this value, the dynamics behave like a sink, and then abruptly become a limit cycle. This could be confirmed via nullclines and linear stability analysis and classified as a stable limit cycle. This transition is a bifurcation point. Eventually, we encounter another bifurcation point where the limit cycle collapses into another sink at around 110 picoamps, and the voltage trace shows that spiking stops after this point, and the calcium currents at this point likely stay open chronically and cannot be hyperpolarized back to rest and instead come to steady state at some new threshold value. Perturbations above and below this value will eventually lead back to this value. These dynamics are characteristic of class II neurons.