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Bifurcations of neural fields on the sphere

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Neural Fields are dynamical models which are used to study pattern formation in large groups of neurons. These differential equations combine a diffusion term, modelling gap junctions, with a nonlinear distributed delay term, modelling the synaptic connections. We investigate if there is a connection between the strenght of the diffusion term and synchronous waves of activations, seen in Parkinsonian patients.

A key feature is the spherical domain on which this neural field is defined. Therefore, we look at the periodic orbits which are generated by Hopf bifurcation in the presence of spherical symmetry. For this end, we derive general formulas to compute the normal form coefficients for these bifurcations up to third order and predict the stability of the resulting branches.