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We study a neural network in the form of integro-differential equation with a nonsaturating gain. The network consists of a single layer neurons synaptically coupled by lateral inhibition. Using a specific connectivity function, we project the infinite dimensional equation to a finite order system of ordinary differential equations. By analyzing the invariant manifolds for the corresponding reversible, conservative ODE system, we establish the existence of the Smale horseshoe for an open set of parameters. Consequently, there are countably many symmetric and asymmetric multi-bump standing pulses as well as spatially chaotic stationary solutions. Furthermore, the robustness of the Smale horseshoe implies that all of these solutions persist for nonsaturating piecewise-linear gain functions with small gains and also for smooth gain functions that are “close” to the Heaviside or piecewise-linear case. (Received August 19, 2013)