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Synchronization in a non-uniform network of excitatory spiking neurons. RODRIGO ECHEVESTE, CLAUDIUS GROS, Institute for Theoretical Physics, Goethe University Frankfurt — Spontaneous synchronization of pulse coupled elements is ubiquitous in nature and seems to be of vital importance for life [1]. Networks of pacemaker cells in the heart [2], extended populations of southeast asian fireflies [3], and neuronal oscillations in cortical networks [4], are examples of this. In the present work, a rich repertoire of dynamical states with different degrees of synchronization are found in a network of excitatory-only spiking neurons connected in a non-uniform fashion. In particular, uncorrelated and partially correlated states are found without the need for inhibitory neurons or external currents. The phase transitions between these states, as well the robustness, stability, and response of the network to external stimulus are studied.

[1]Strogatz & Stewart, **Sci. Am.** 269(6): 102-109, 1993.
[2]Peskin, **Mathematical aspects of heart physiology**, Courant Institute of Mathematical Sciences, New York University, 1975.
[3]Buck, **Quarterly review of biology** 265-289, 1988.
[4]Buzsaki & Draguhn, **Science** 304(5679): 1926-1929, 2004.

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