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Cellular automaton models for analyzing the collective migration of heterogeneous cell populations

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Cell migration and cell proliferation are fundamental processes of tissue dynamics. They essentially determine the spatio-temporal density patterns which are observed in populations of interacting cells but often depend themselves on the cell density profile as well as the composition of the extracellular matrix in the local neighborhood of the cells. Probabilistic cellular automata and their extensions provide a model framework which allows to numerically and analytically study the tissue dynamics which results from the feedback between scales. Considering specifically heterogeneous cell populations where cell plasticity plays a major role, it is shown that cell-based cellular automaton modeling allows to estimate the contribution of heterogeneity on the dissemination and growth the whole cell population at the tissue scale.

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