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Deep learning in turbulent convection networks

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The paper focuses on large-scale structures in Raleigh-Benard convection, where a liquid layer is heated from a bottom surface and roll-cell structures associated with upwelling and downwelling motions are generated by buoyancy effects. The main purpose of this study is to decompose the velocity and thermal fields into quasi-stream large-scale roll cells and the remaining random fluctuations and evaluate each of their contributions to the overall heat transfer. For that purpose, they apply U-net, a kind of CNN, to the temporally-filtered thermal field obtained from numerical simulation and successfully extract the large-scale structures. Based on the decomposition, they discuss how the contribution of the large-scale structures is changed as the Rayleigh number increases. it is a nice work combining machine learning techniques with massive simulations of turbulence.