Correlated $e_g$ electrons exhibit a series of fascinating properties, in particular in cuprates and nickelates. Here we present simple calculations meant to estimate the phase diagram of the two-band Hubbard model. It is known to be very rich, in particular for $e_g$ electrons in the vicinity of quarter-filling \cite{1,2}. Indeed, in mean-field theory, various orbitally polarized ferromagnetic and antiferromagnetic phases appear when the Hubbard $U$, the Hund’s rule coupling $J_H$ and the crystal field are varied. In particular ferromagnetism (antiferromagnetism) is favored for $J_H/U < (>) 0.2$.

Here we show that the same tendency is reproduced when diagonalizing small clusters. Moreover the phase diagram is very sensitive to the type of considered orbitals, being $e_g$ or $t_{2g}$. The limits of a hopping expansion are also discussed.