

# Coulomb interactions in Van Hove metals

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In designing quantum materials it is often useful to exploit interactions as means to tune the system to its most interesting phases. One way of boosting the effects of interactions is by increasing electron density, *e.g.* by shifting a Van Hove singularity to the Fermi level. In our contribution we analyze the effects of interactions in model systems realizing this scenario.

We start from the case of sparse randomly distributed magnetic impurities in a interaction-free host and show that a typical Kondo spectral peak is absent in the Van Hove-Kondo case, leading to decrease of entropy at finite temperatures and hitherto unrecognized instabilities. An especially intriguing one occurs in the case of a particle-hole asymmetric singularity, such as the one recently observed in  $\text{Sr}_3\text{Ru}_2\text{O}_7$  [1], when despite complete Kondo screening of the impurities, the host becomes magnetically unstable due to their presence, which leads to a ferromagnetic ground state. We further move to analyze dynamical mean-field theory results for a Hubbard lattice exhibiting Van Hove singularity at the Fermi level. We show that the singularity persists in a symmetry-preserving solution, albeit with renormalized spectral weight, and we analyze its magnetic stability.

We hope understanding drew from these models will shed some light on physics of magnetism in realistic Van Hove materials, such as  $\text{Sr}_3\text{Ru}_2\text{O}_7$  or graphene-based systems [2].

## References:

- [1] M. Naritsuka *et al.*, Proc. Natl. Acad. Sci. USA 120 (2023) e2308972120.
- [2] D. Guerci *et al.*, Phys. Rev. Res. 4 (2022) L012013.

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