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(I) Disorder and spin fluctuations: the case of electron-doped cuprates

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In conventional metals like aluminum or copper, the behaviour of electrons is well described by traditional methods of solid state physics. However, these methods cannot be used to study strongly correlated materials in which the interactions between electrons are significant. It instead becomes important to take into account large classical and quantum fluctuations. This is the case in the electron-doped cuprates, in which electron-electron interactions lead to significant antiferromagnetic spin fluctuations. In this talk, I will explain the role spin fluctuations play on the physical properties of the electron-doped cuprates. I will then discuss our recent work on the interplay of spin fluctuations and disorder in a theoretical model of electrons on a two-dimensional lattice where the temperature, the interaction strength the number of electrons can be varied. More specifically, we apply this model to the study of the electron-doped cuprates and show that disorder suppresses spin fluctuations.

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