Hybridization and Sensing in Arrays of Plasmonic Nanostructures
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Plasmon hybridization, the electromagnetic analog of molecular orbital theory, provides an intuitive method to describe the plasmonic response of complex nanostructures from the combination of the responses of their individual constituents. In the first part of this talk, we will follow this approach to investigate the optical properties of periodic arrays of plasmonic nanoparticles with multi-particle unit cells. These systems support strong collective lattice resonances arising from the coherent multiple scattering enabled by the lattice periodicity. However, due to the extended nature of these modes, the interaction between them is very different from that among localized surface plasmons. This leads to a much richer hybridization scenario, which can be exploited to design periodic arrays with engineered properties [1].

Sensing is one of the potential applications of plasmonic arrays. In particular, arrays of graphene nanostructures are ideally suited for this task due to their ability to support strong plasmonic resonances in the infrared part of the spectrum, which can be actively tuned using electrostatic potentials. In the second part of this talk, we will discuss the use of the exceptional properties of graphene plasmons to perform infrared detection of molecules with subwavelength spatial resolution [2].