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## **Geometric Multilevel Optimization**

In this talk I will present a geometric multilevel optimization approach choosing as case study a regularised inverse problem. In particular, the approach is motivated by variational models that arise as the discretization of some underlying infinite dimensional problem. Such problems naturally lead to a hierarchy of discretized models. We employ multilevel optimization to take advantage of this hierarchy: while working at the fine level we compute the search direction based on a coarse model. By utilising concepts of information geometry in our formulation, we propose a smoothing operator that only uses first-order information and incorporates constraints smoothly. We show that the proposed algorithm is well suited for ill-posed reconstruction problems and demonstrate its efficiency on several large-scale examples.



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