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Optimization Meets Information Geometry: Applications to Image Labeling

In the first part of the talk, I will introduce three complementary viewpoints on the local classification of metric data: a variational approach, a Markov random field (MRF) approach, and a dynamical systems approach based on information geometry. Starting from the first two viewpoints, I will outline how local decisions are coupled into non-local interacting decisions through regularization, and briefly discuss limitations with regard to learning model parameters from data.

In the second part, I will discuss the design of a dynamical system on an elementary statistical manifold, called the assignment flow, for the contextual classification of metric data given on a graph. I will then discuss learning its parameters from data using a linearization of the assignment flow and low-rank exponential integration. Finally, I will briefly present a geometric multilevel optimization approach to the labeling problem in a variational formulation, exploiting a natural hierarchy of models at different discretization levels.