Iteratively Refined Image Reconstruction

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On this poster, I discuss a framework for the learning of filter-based regularizers for image data. These can be deployed within a variational reconstruction ansatz for solving generic inverse imaging problems (universality of the regularizer). This ansatz ensures data consistency. Moreover, we are able to derive stability guarantees. Both are very important when working in critical applications such as medical imaging, since false diagnosis can have fatal consequences. Interestingly, the learned regularizers closely resemble traditional hand-crafted ones.

After introducing the baseline architecture, I will discuss a refinement of this architecture by conditioning the regularizer on the given measurements based on the initial reconstruction. This mechanism allows to compensate for the rather simple fields-of-experty architecture of the regularizer and adapts it to the actually observed measurements. By carefully designing the conditioning mechanism, we can preserve many of the favorable properties of the initial approach. In particular, learning the conditioning networks (which we will identify as strcture extractors) remains independent of the data. In the last part of the talk, I will present numerical results for denoising and MRI. These indicate that even relatively restricted architectures can achieve highly competitive performance.

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