

A Guided Variational Network for Image Decomposition

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We introduce Guided Variational Network (GVN) a learned bilevel optimization framework that overcomes the limitations of manual parameter tuning through a bilevel optimization approach. The core of the method lies in integrating spatially adaptive, pixel-wise weights within a quadratic variational formulation. These weight maps are learned dynamically either through local probabilistic statistics or via a lightweight neural network. By iteratively alternating between weight estimation and solving the variational subproblem, this scheme ensures an interpretable, numerically stable, and entirely self-tuning model. When applied to cartoon-texture image decomposition, the GVN framework demonstrates superior robustness and structural detail preservation compared to both classical and state-of-the-art methods.