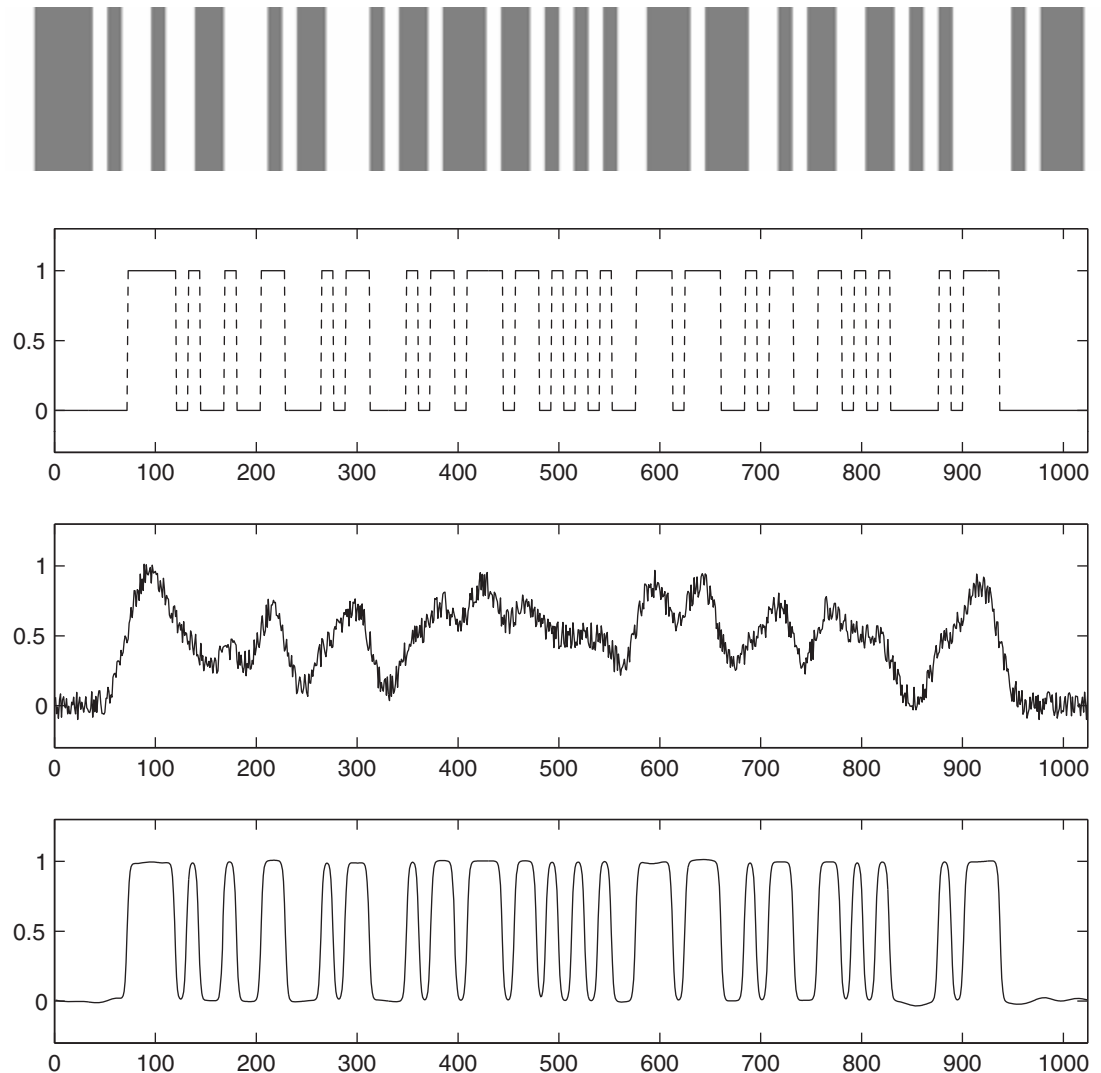


# Blind Deconvolution of Barcode Signals

With increasing distance between a bar code reader and its target, the measured signal representing the bar code may become significantly degraded: Massive levels of blur and noise may cause individual peaks and valleys to merge and become indistinguishable from their neighbors. What is more, complete knowledge of the blurring kernel – or the level of noise – is typically not to be expected: These depend on the distance to the target, ambient light, etc.

We developed an effective model and an efficient numerical algorithm for recovering bar code signals from heavily degraded observations. Our approach involves a variational model that penalizes the number of peaks in the reconstruction. Gradient descent for the penalty function leads to the Allen-Cahn equation with an additional nonlocal term.



Top to bottom: A bar code; a “perfect” signal representing it; the blurred and noisy version of the signal typically encountered by bar code readers when held at a long distance from the target; and the reconstruction of the signal by our algorithm.