

## MASTER'S THESIS

### Numerical methods for classification and image restoration

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# Numerical Methods for Classification and Image Restoration

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# Abstract

We study numerical methods for total variation image restoration. We also consider algorithms for multi-label classifications.

For total variation (TV) image restoration, We study selection of spatially varying regularization parameters. We develop a TV image restoration method with an automatic selection of spatially varying regularization parameters scheme to restore blurred and noisy images. The method exploits the generalized cross-validation technique adaptively to determine how much regularization to be used in each local area of an image at each restoration step. By updating the regularization parameters in each iteration, the restored image can be obtained. Our experimental results shows that the proposed method is effective and stable even without prior knowledge of noise.

For classification, we propose a more efficient method for solving systems of linear equations with multiple right-hand sides arising from multi-label classification problems. The proposed method is the classical block generalized minimal residual (BGMRES) method. We compare the numerical performances of BGMRES and the originally proposed fixed-point iteration method for solving the linear systems. Our experimental results show that BGMRES is more efficient.

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