

# Statistical Image Analysis

## Lecture 10: Image classification

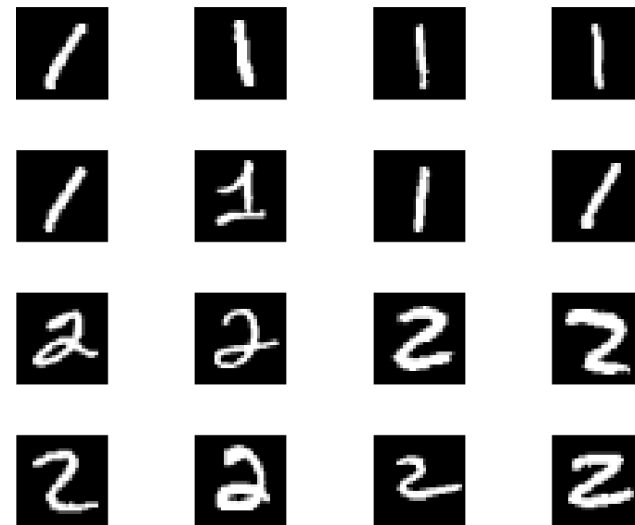
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May 7, 2018



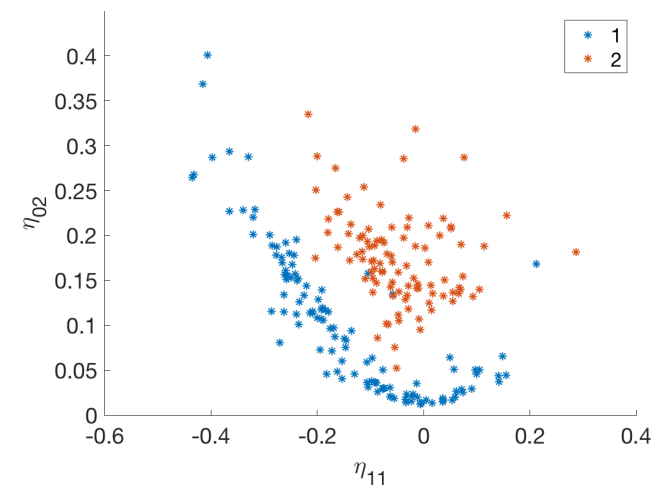
### MINST data



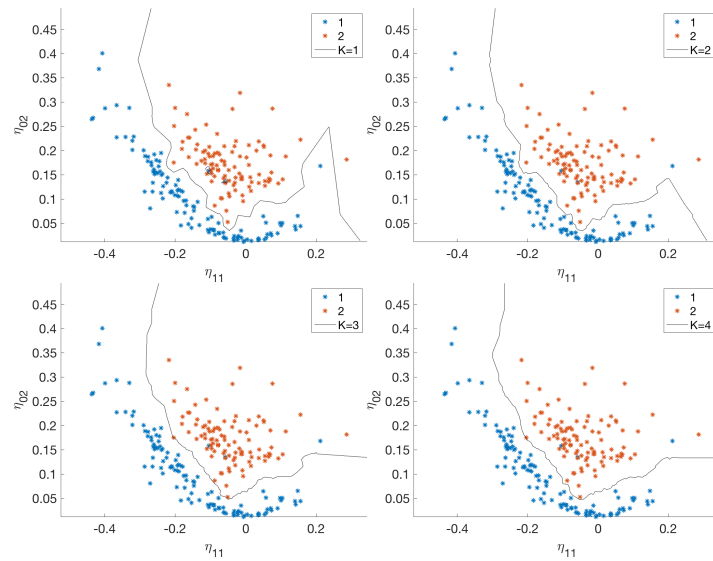
### Image classification

- Training images  $\mathbf{x}_1, \dots, \mathbf{x}_N$  with corresponding labels  $z_1, \dots, z_N$ .
- Extract  $d$  features from each image, giving data  $\mathbf{y}_1, \dots, \mathbf{y}_N$ .
- Goal: train a classifier on the training data, and use it to classify new images.
- LDA and QDA: Fit a Gaussian mixture model to the data and use posterior probabilities to classify.
- KNN approach: Non-parametric approach where for a new image compare the features to the training data and classify by a majority vote of its neighbors. The image is assigned to the class most common among its  $k$  nearest neighbors.

### Scale invariant moments



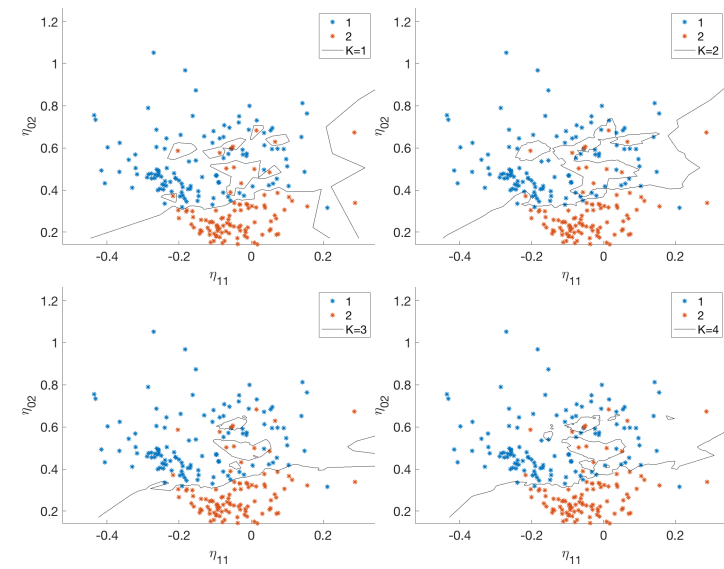
## KNN results



Title page

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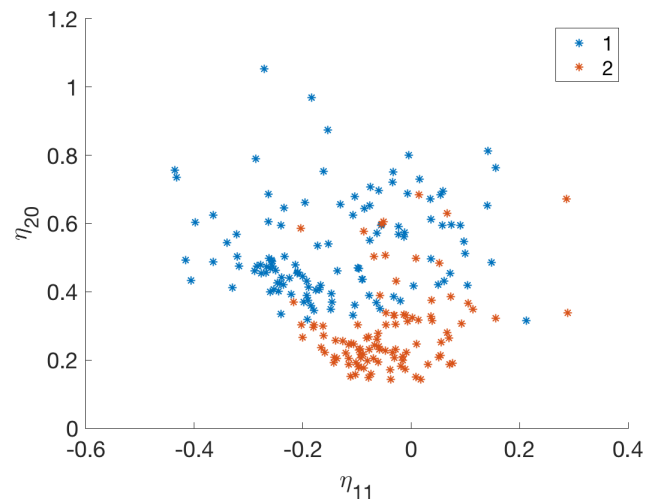
## KNN results



Title page

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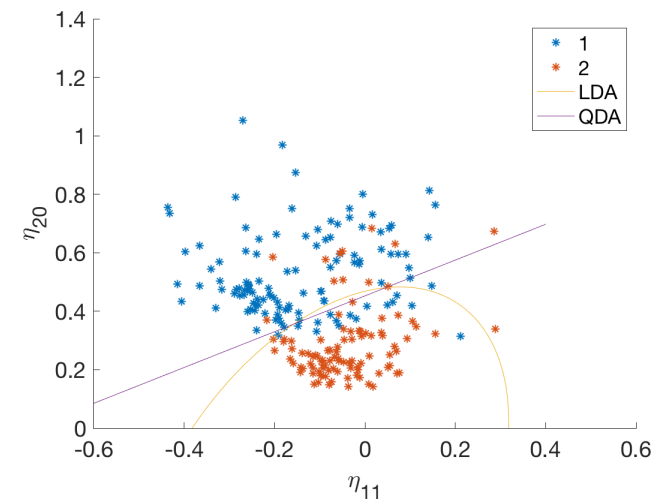
## Scale invariant moments



Title page

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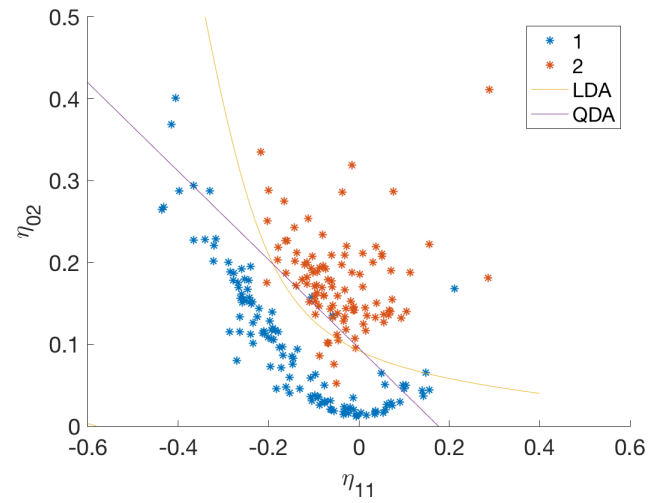
## LDA and QDA



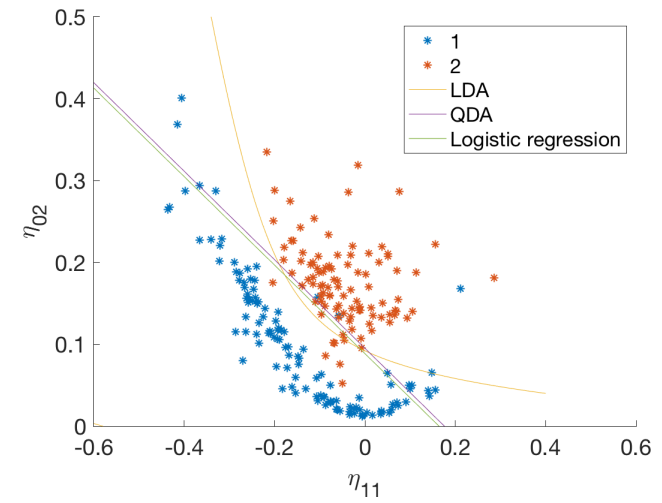
Title page

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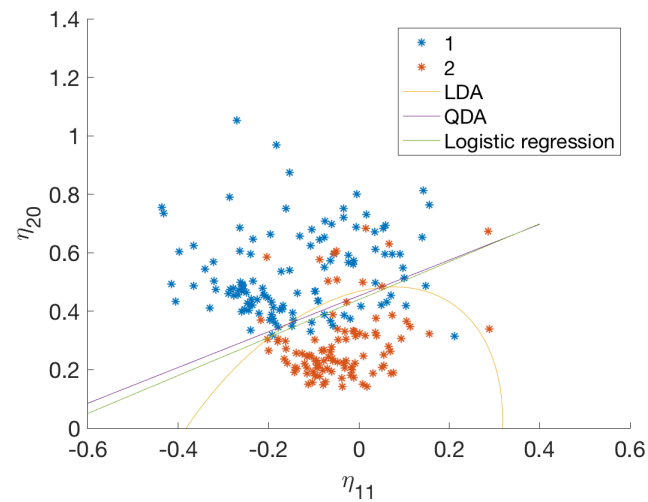
## LDA and QDA



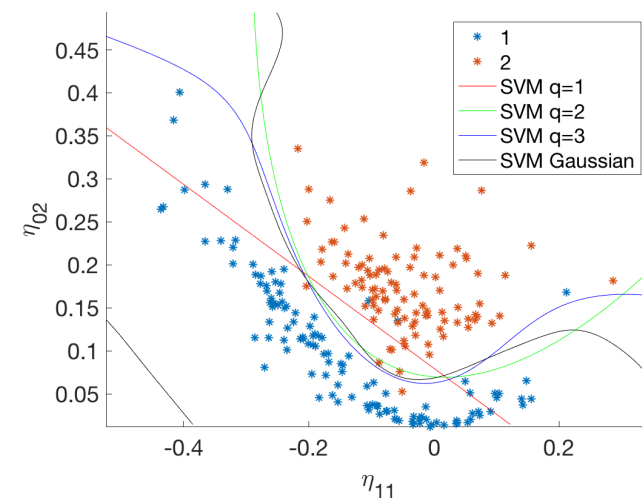
## Comparison



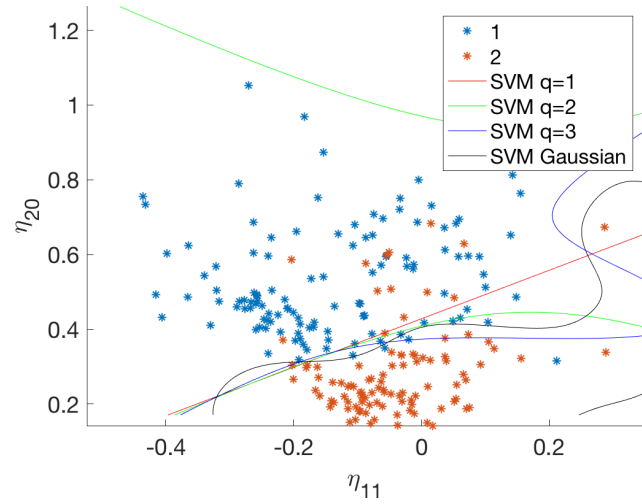
## Comparison



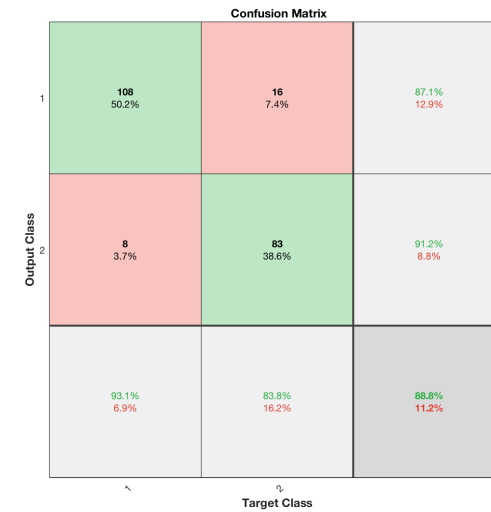
## SVM results



SVM results



Confusion matrix for 5-fold crossvalidation



Confusion matrix for the SVM with Gaussian kernel

