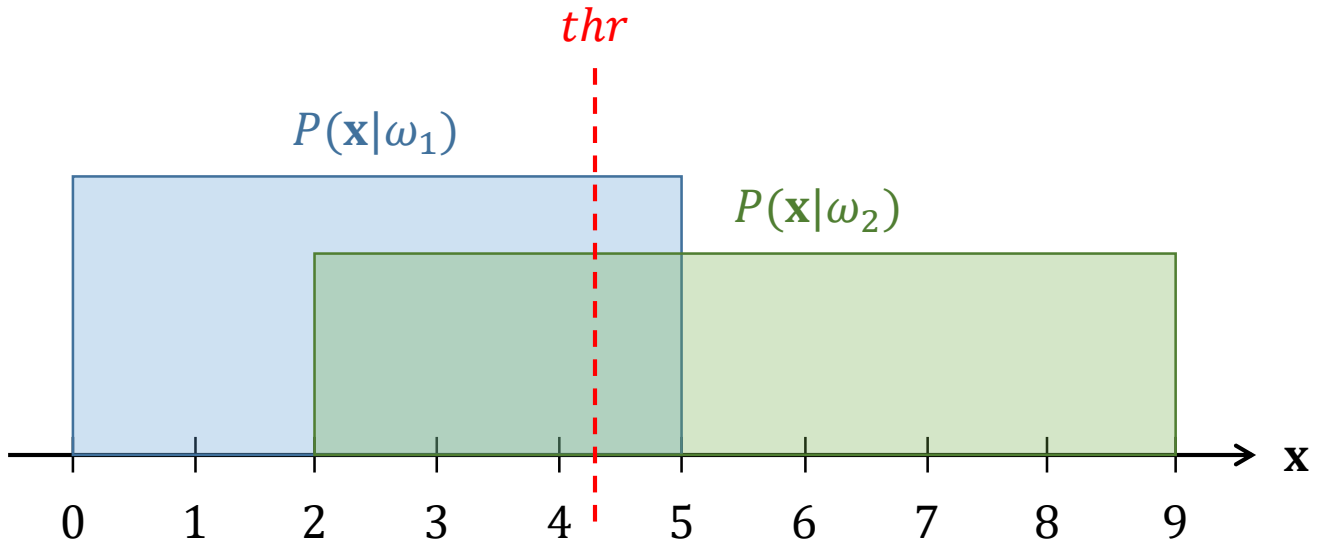
Homework #1

Deep Learning for Computer Vision

NTU, Spring 2019

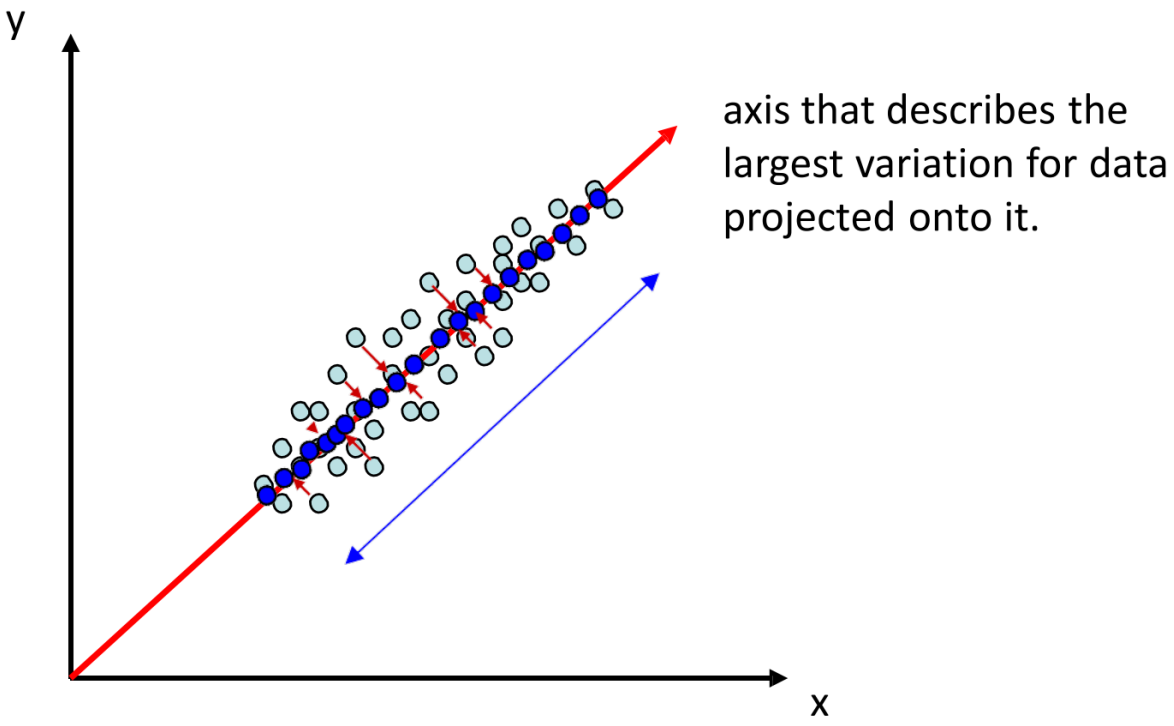
108/3/6

Problem 1: Bayes Decision Rule



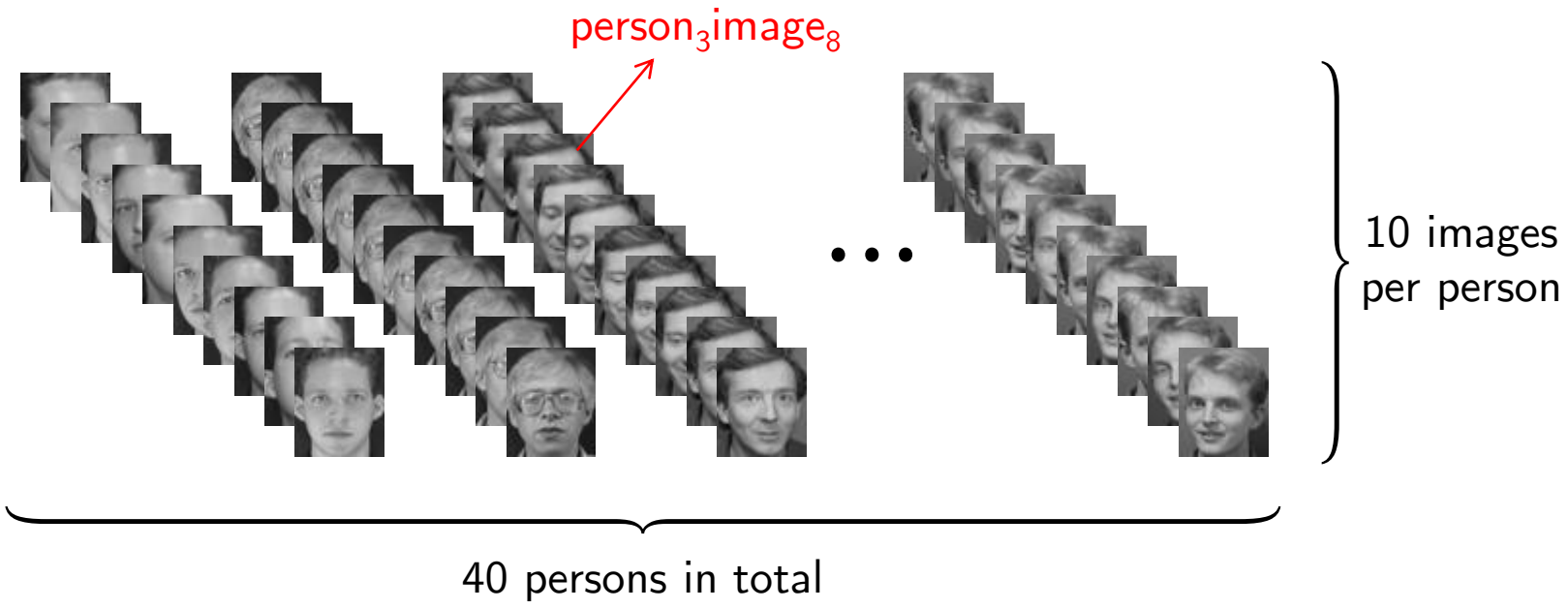
Problem 2: Principle Component Analysis

- Perform PCA as taught in the lectures



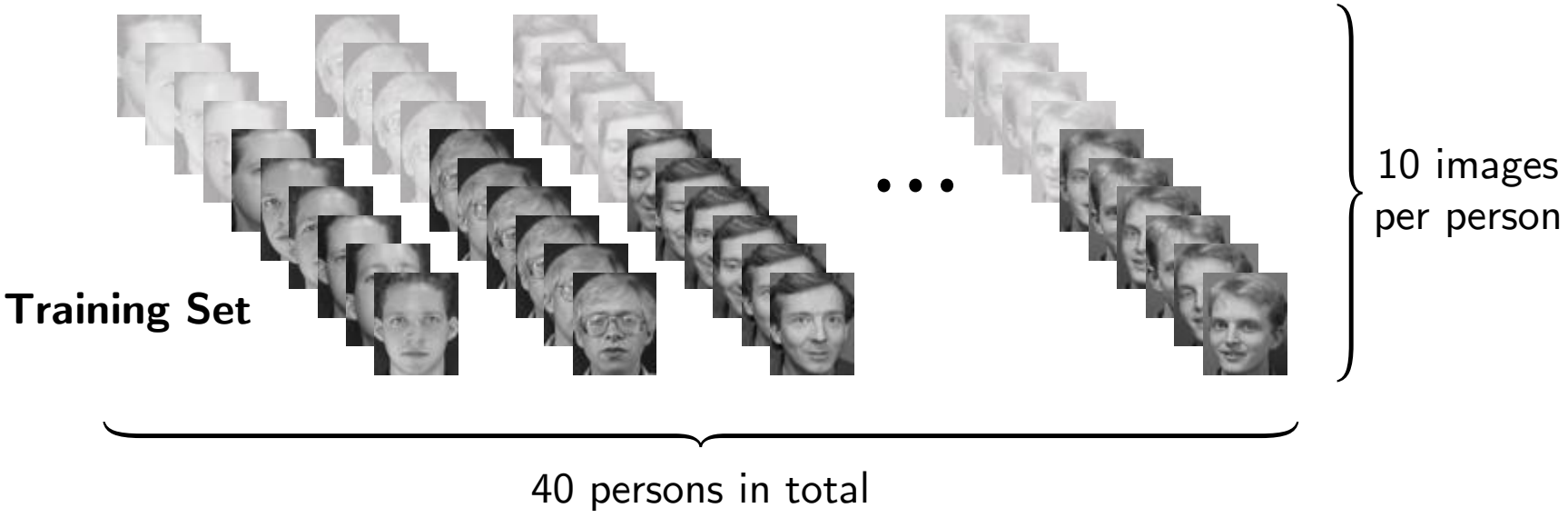
Problem 2: Principle Component Analysis

- Perform PCA as taught in the lectures
- Dataset



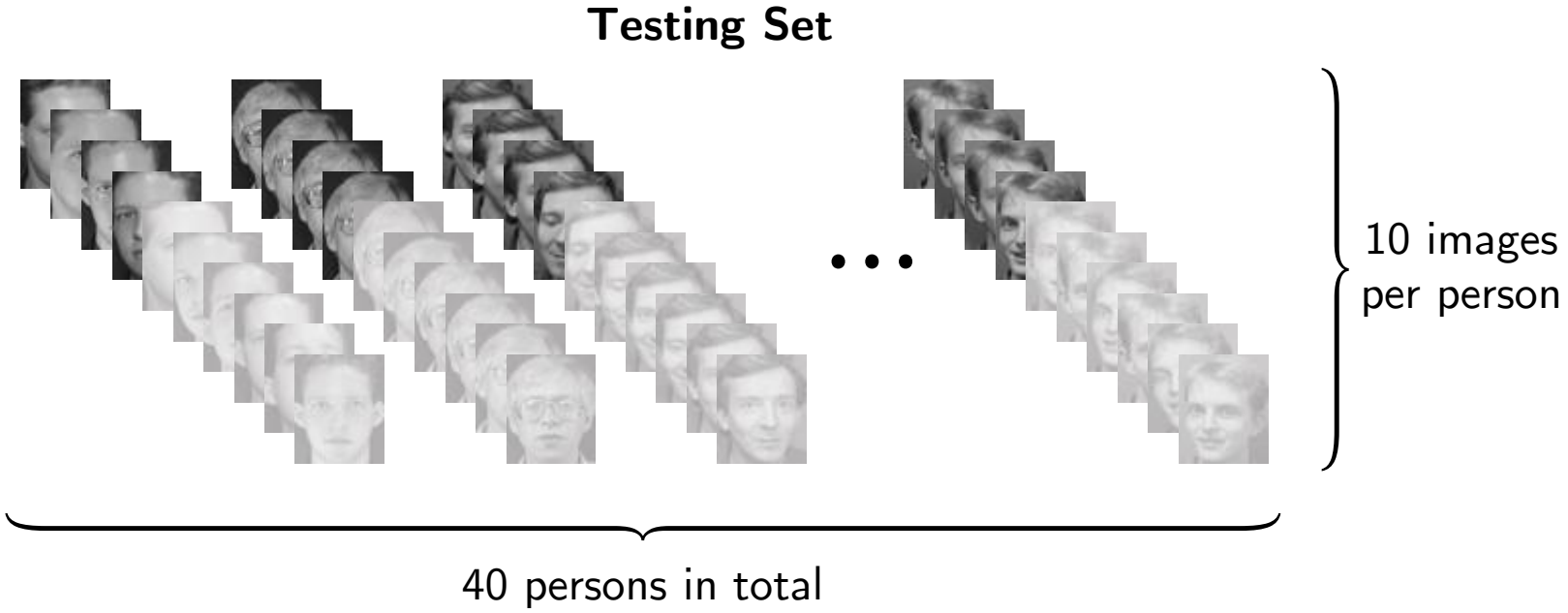
Problem 2: Principle Component Analysis

- Perform PCA as taught in the lectures
- Dataset



Problem 2: Principle Component Analysis

- Perform PCA as taught in the lectures
- Dataset

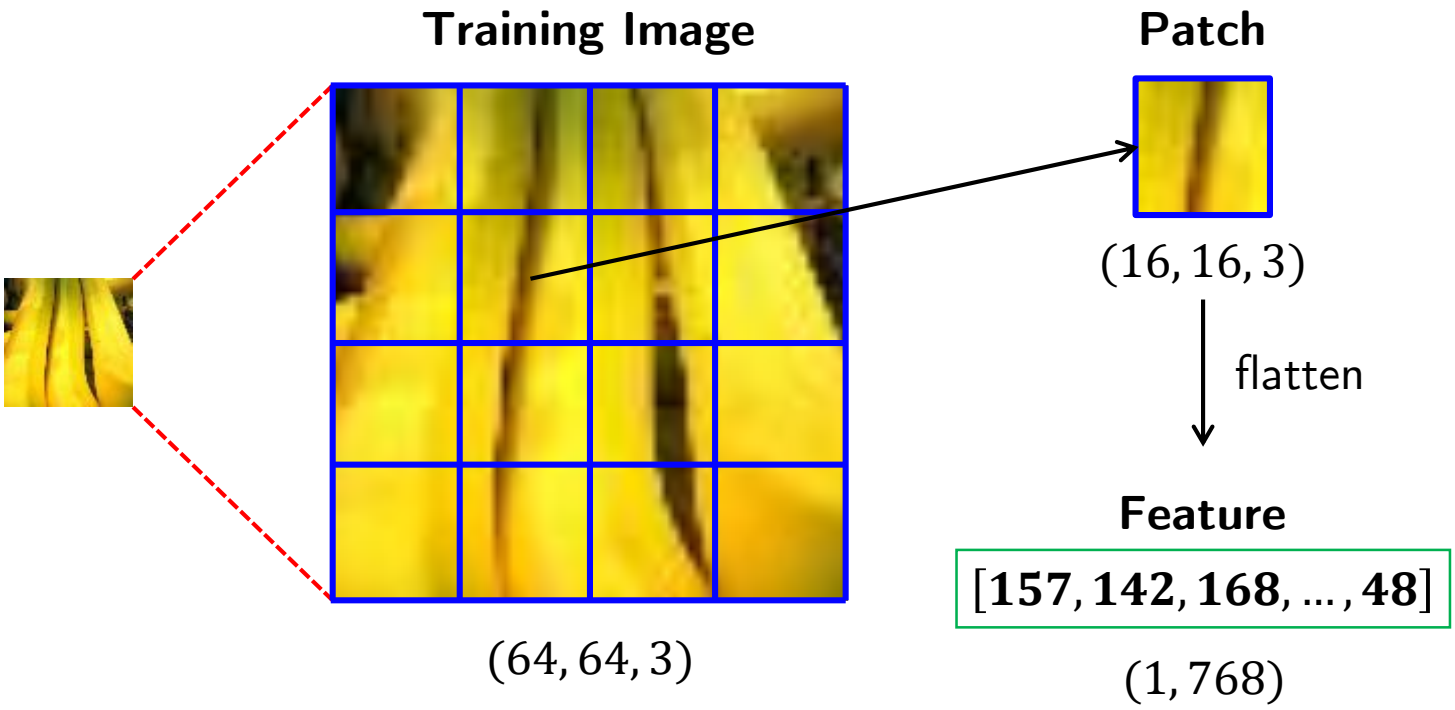


Problem 2: Principle Component Analysis

- Plot the mean face and eigenfaces
- Project face images onto the eigenspace
- Plot the reconstructed image
- Compute mean squared error
- Apply k-nearest neighbors for classification

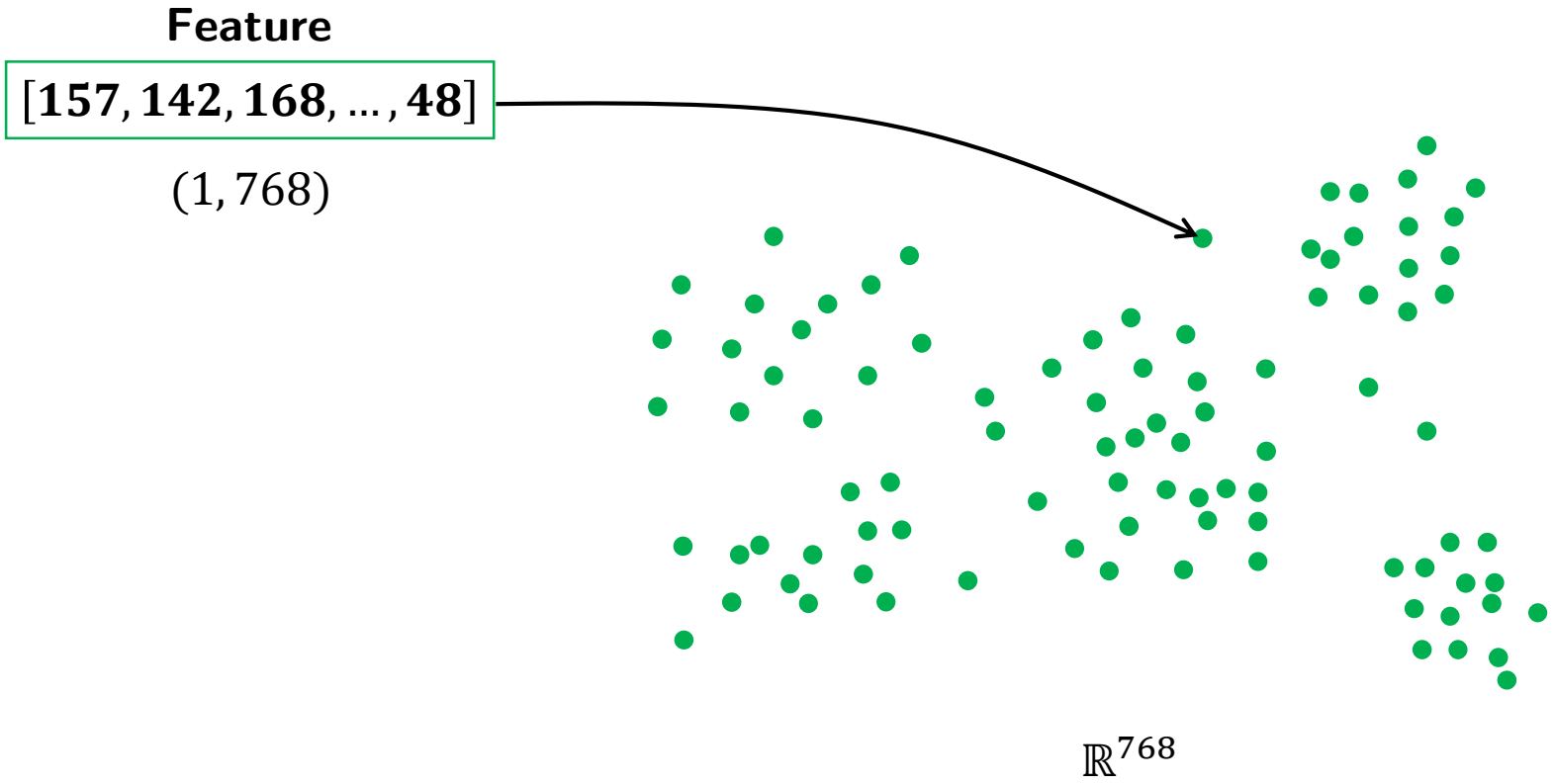
Problem 3: Visual Bag-of-Words

- Extract 16 patches from each image and use them as features



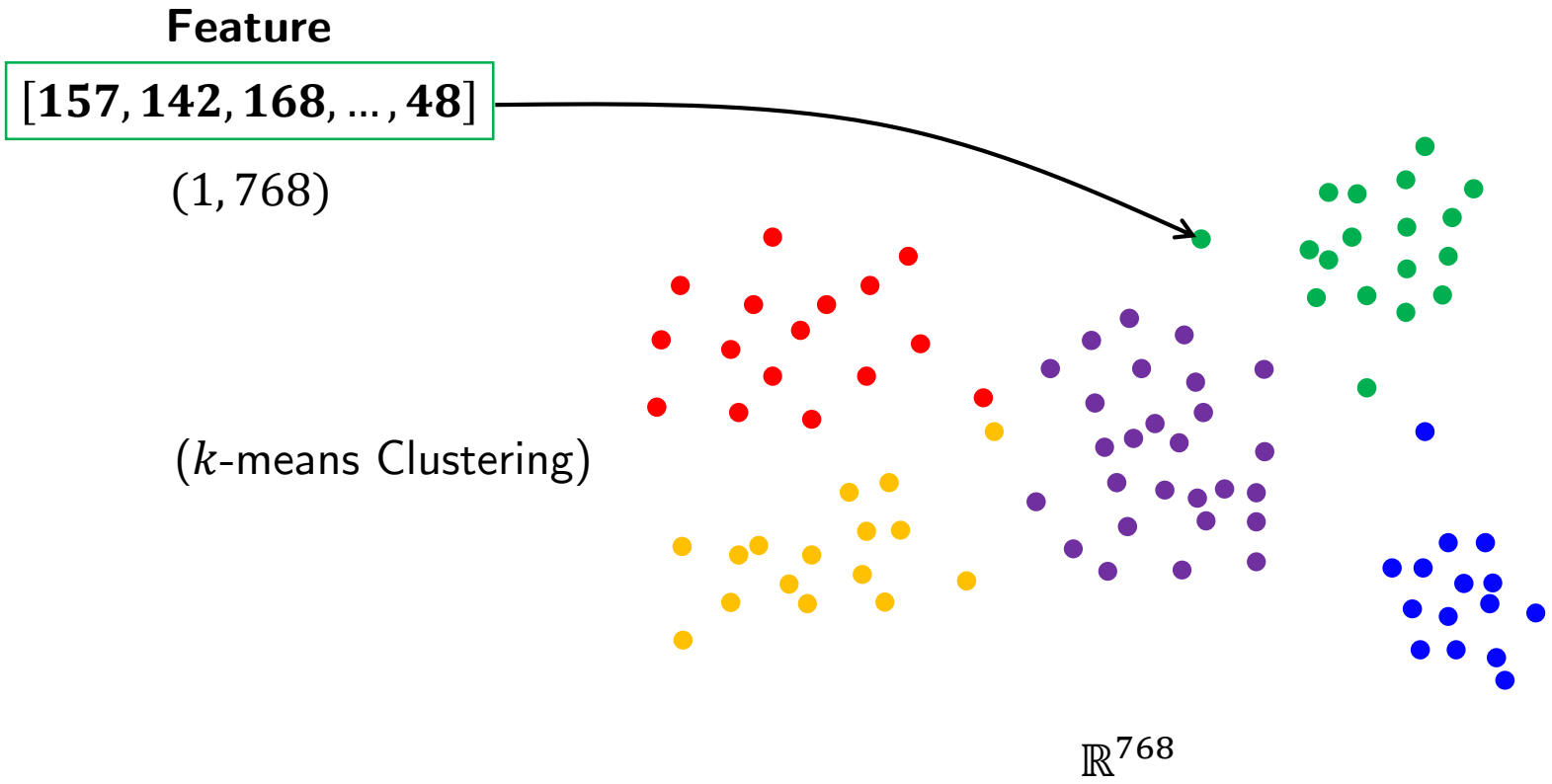
Problem 3: Visual Bag-of-Words

- **Training**: 1500 images; **Testing**: 500 images



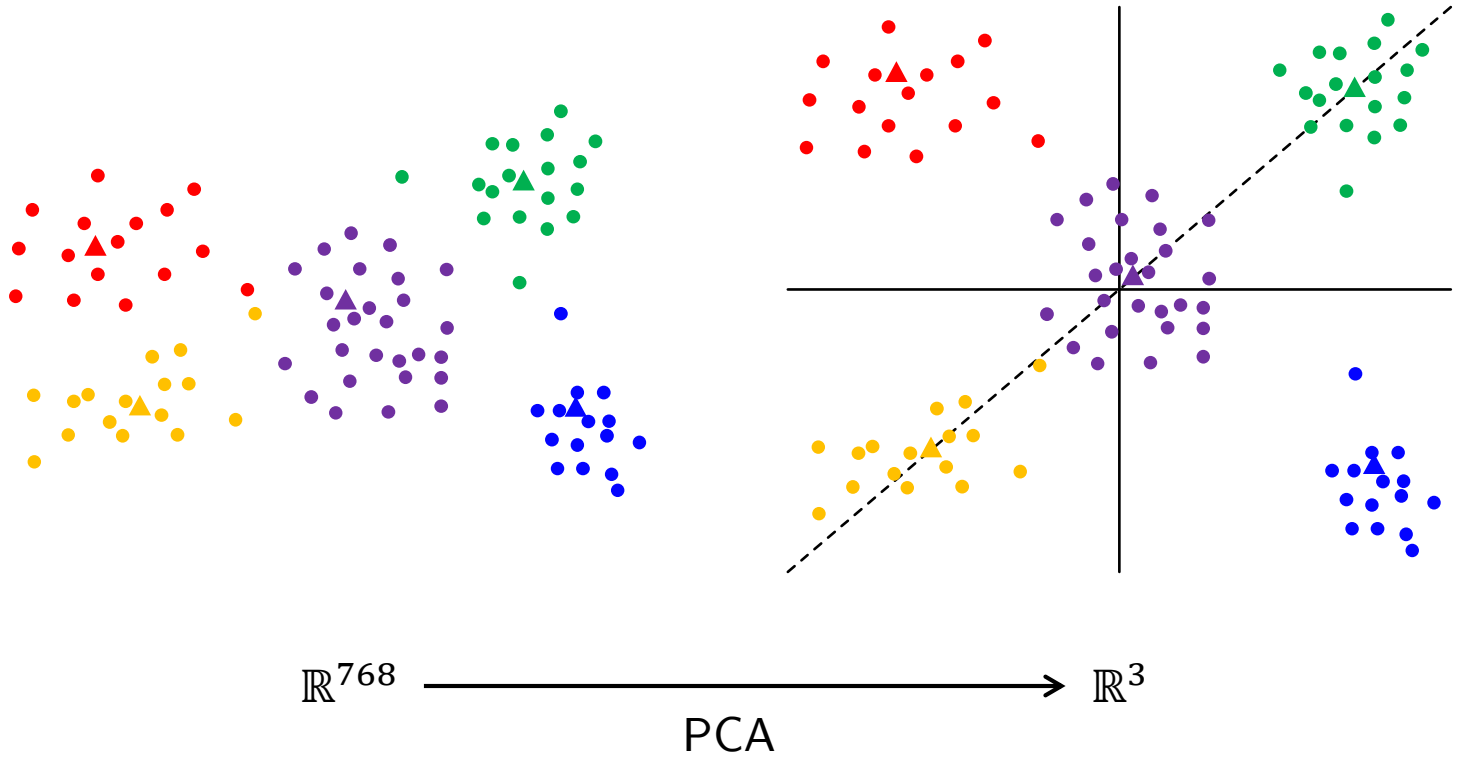
Problem 3: Visual Bag-of-Words

- **Training**: 1500 images; **Testing**: 500 images



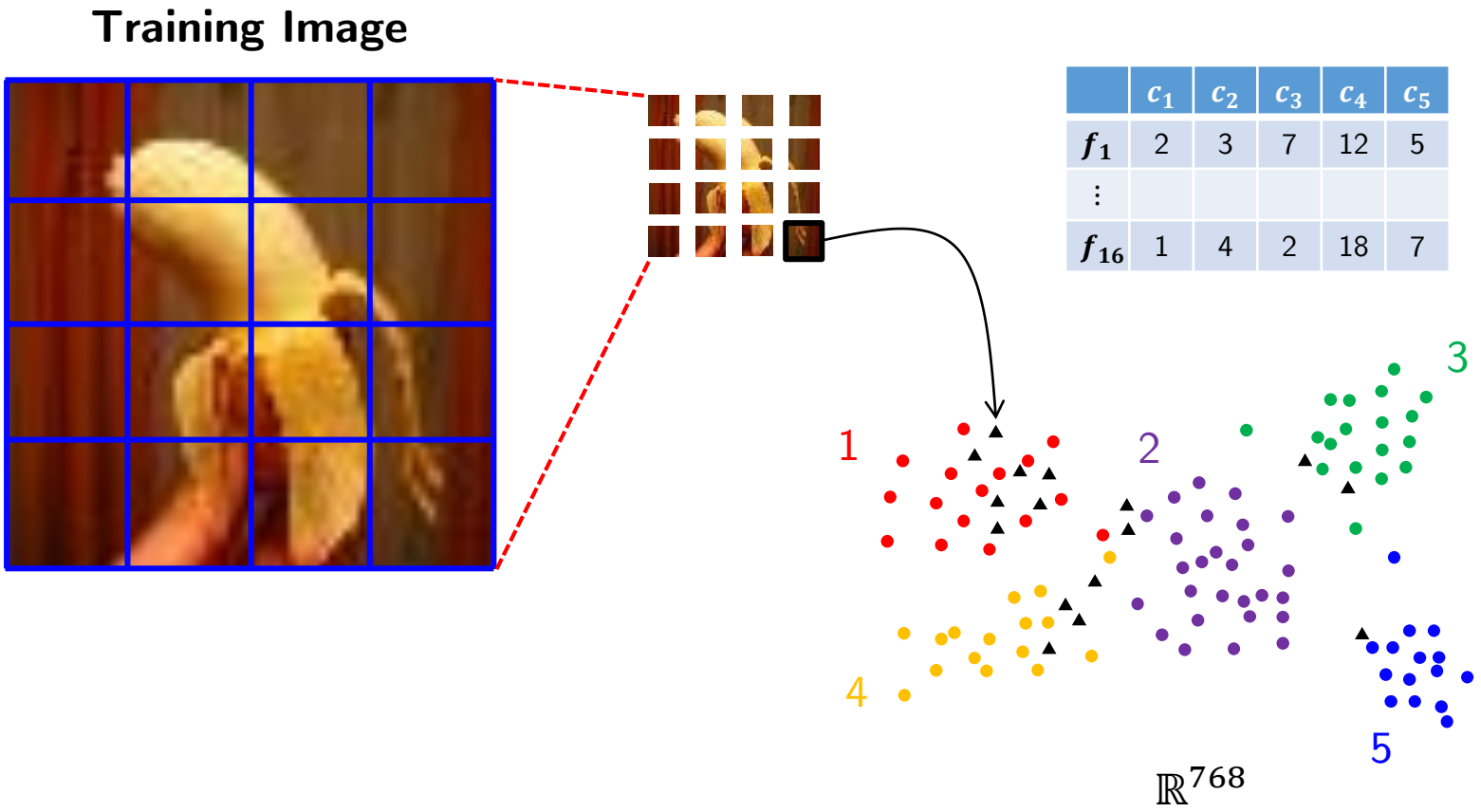
Problem 3: Visual Bag-of-Words

- Perform PCA, then plot in $\mathbb{R}^3$ space
- Use scatter plots



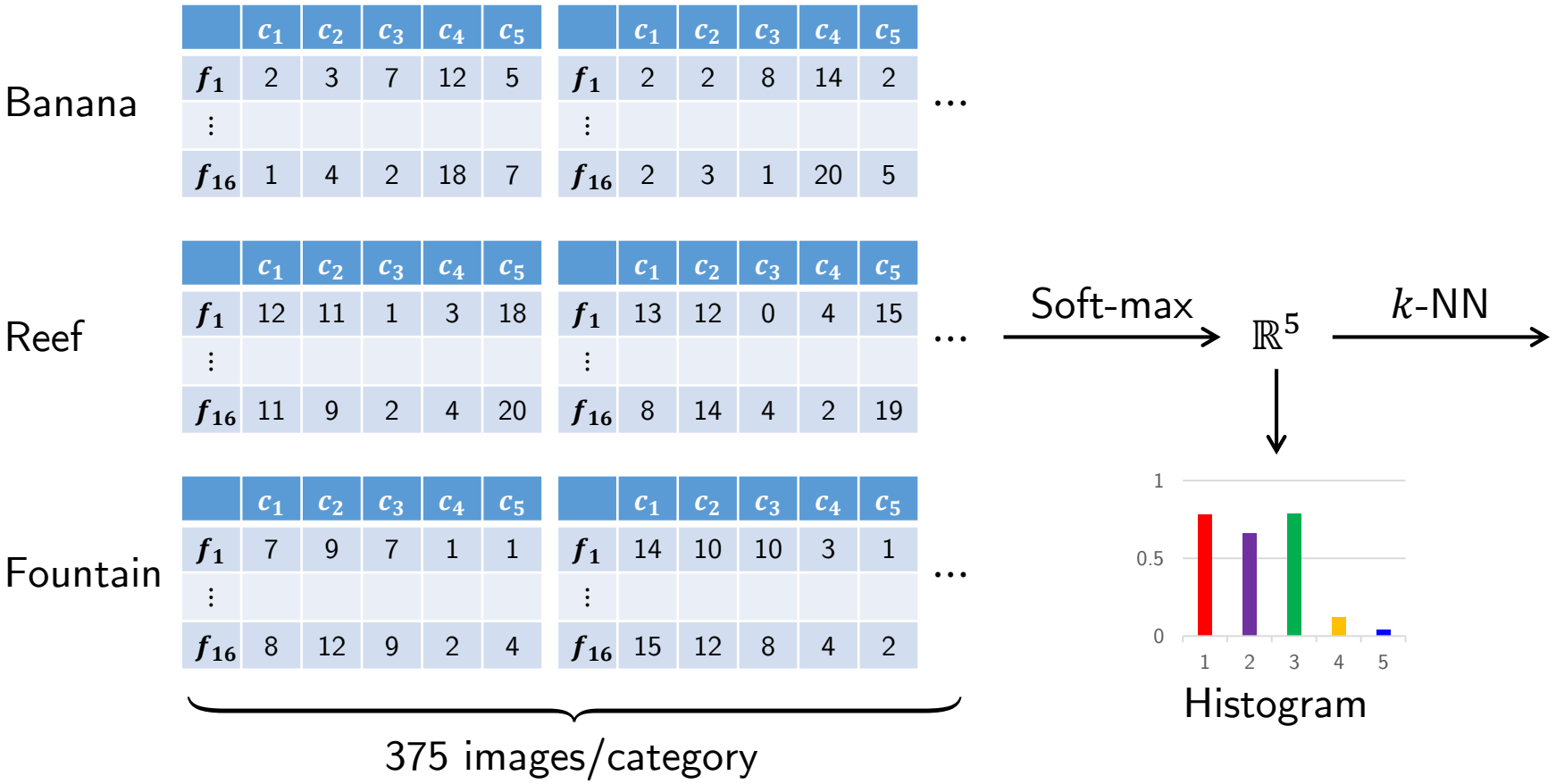
Problem 3: Visual Bag-of-Words

- **Training**: 1500 images; **Testing**: 500 images



Problem 3: Visual Bag-of-Words

- **Training**: 1500 images; **Testing**: 500 images



Problem 4: Image Filtering

- Implement a simple 2D Gaussian filter
- Apply edge detection using derivatives of pixel values
- Plot the detected vertical and horizontal edges
- Plot the gradient magnitude image

Remarks

- You are allowed to use **any** programming language you desire, including all related packages/functions.
- In your report, provide detailed explanations or discussions about your answer.
- If unsure about your answer, write down how you obtained it as detailed as possible.