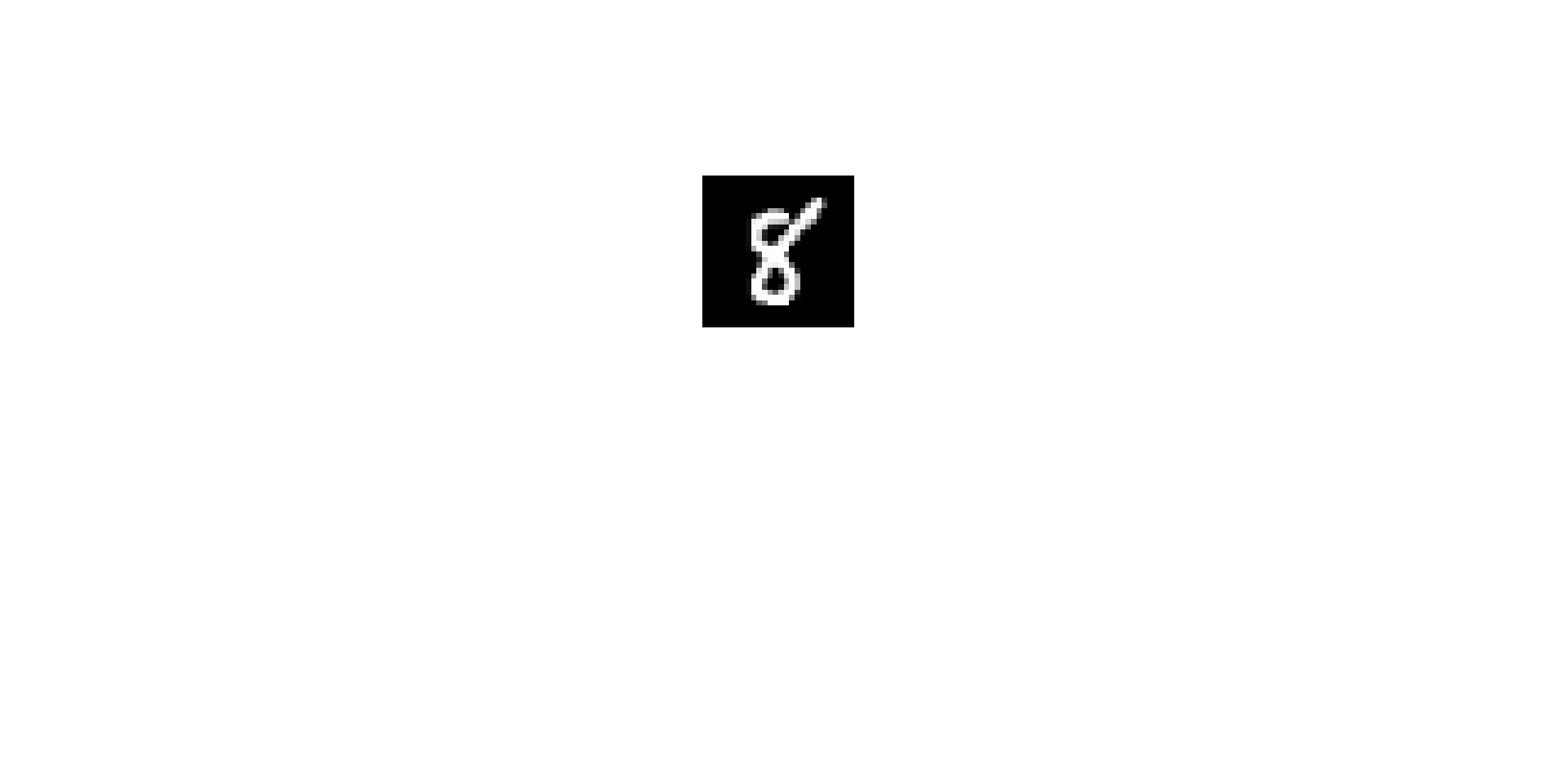
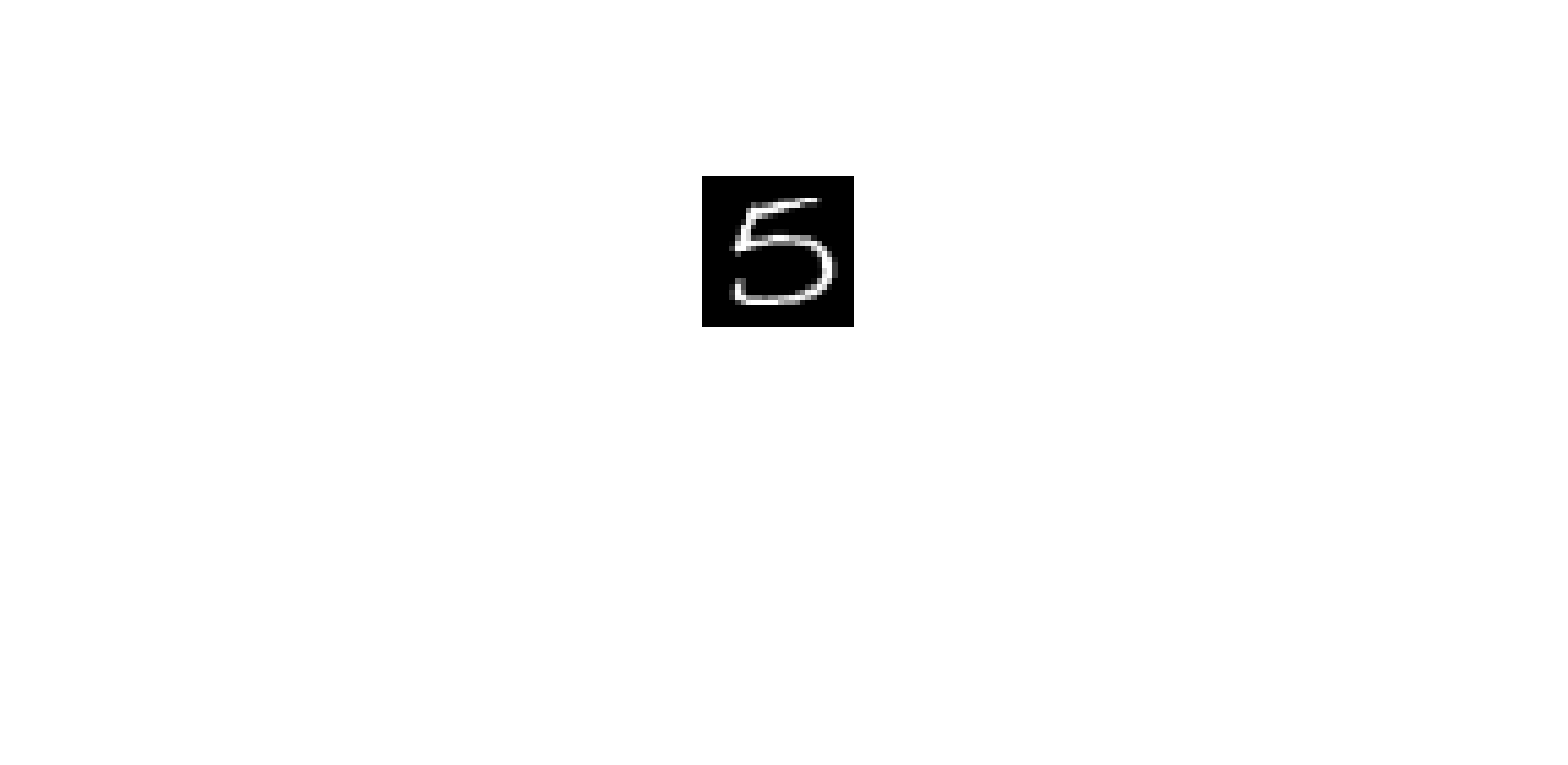
**Applying Group Learning to improve prediction performance of classifiers (e.g., SVM and CNN) trained using sparse data**

* **Handwritten digit images**
* **Binary classification 1 (positive vs. negative samples):**

Positive samples (digit 8)



Negative samples (digit 5)



* **Experimental setting:**

Training data: 10 (5 per class)

Validation data (for SVM): 10 (5 per class)

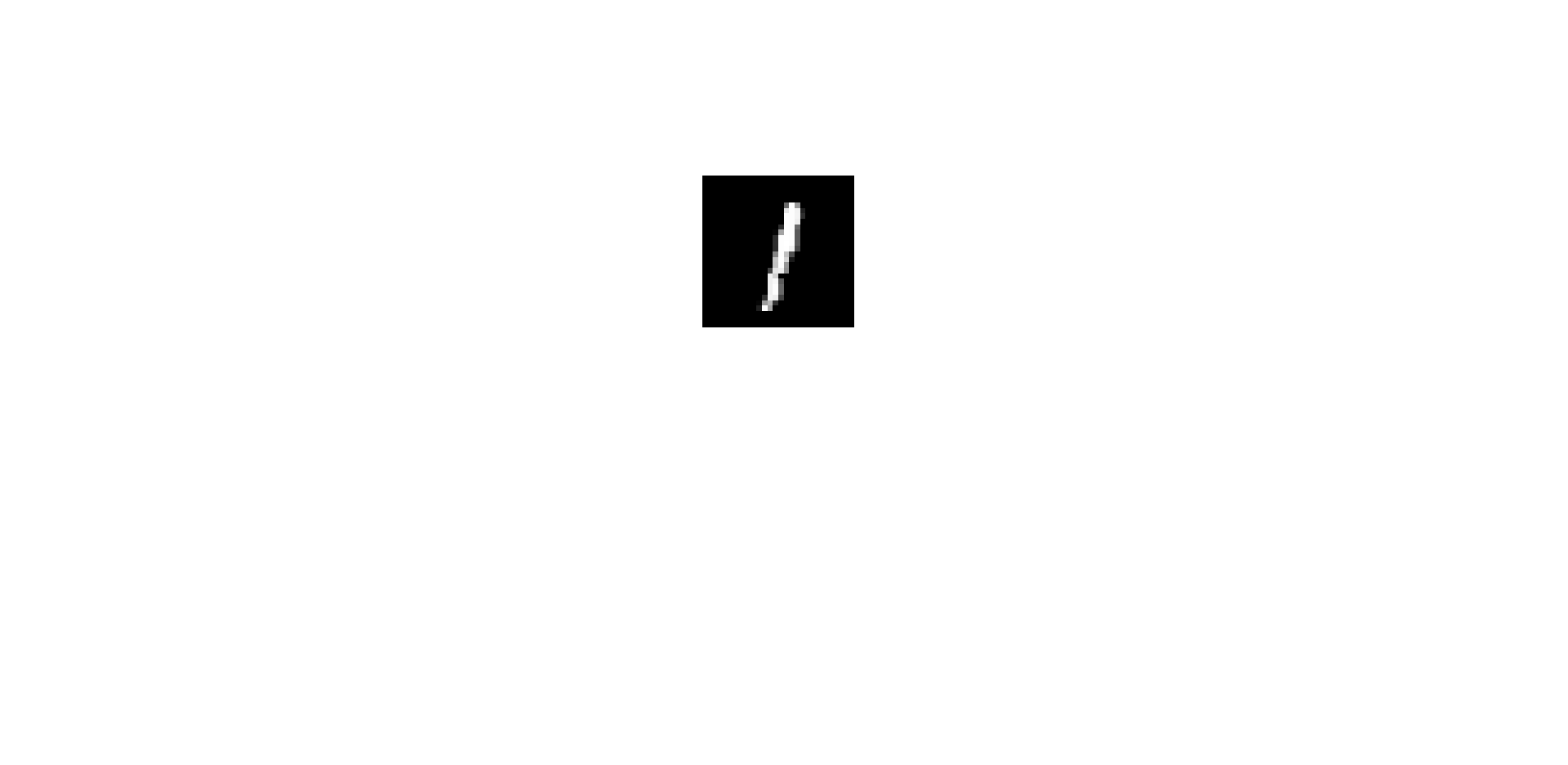
Test data: 1000 (500 per class)

* **Results:**

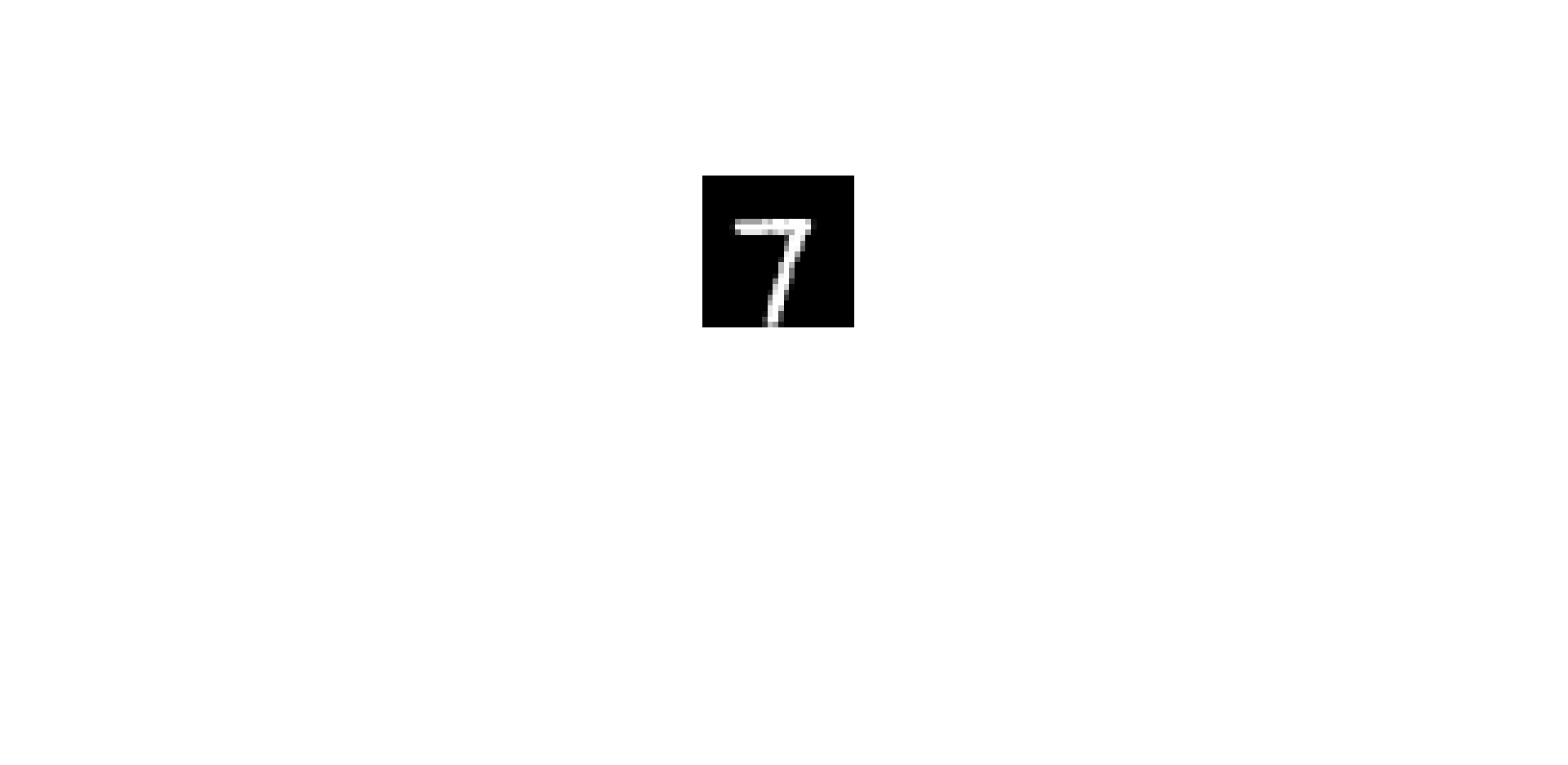
SVM vs. SVM+GL

* **Binary classification 2 (positive vs. negative samples):**

Positive samples (digit 1)



Negative samples (digit 7)



* **Experimental setting:**

Training data: 10 (5 per class)

Validation data (for SVM): 10 (5 per class)

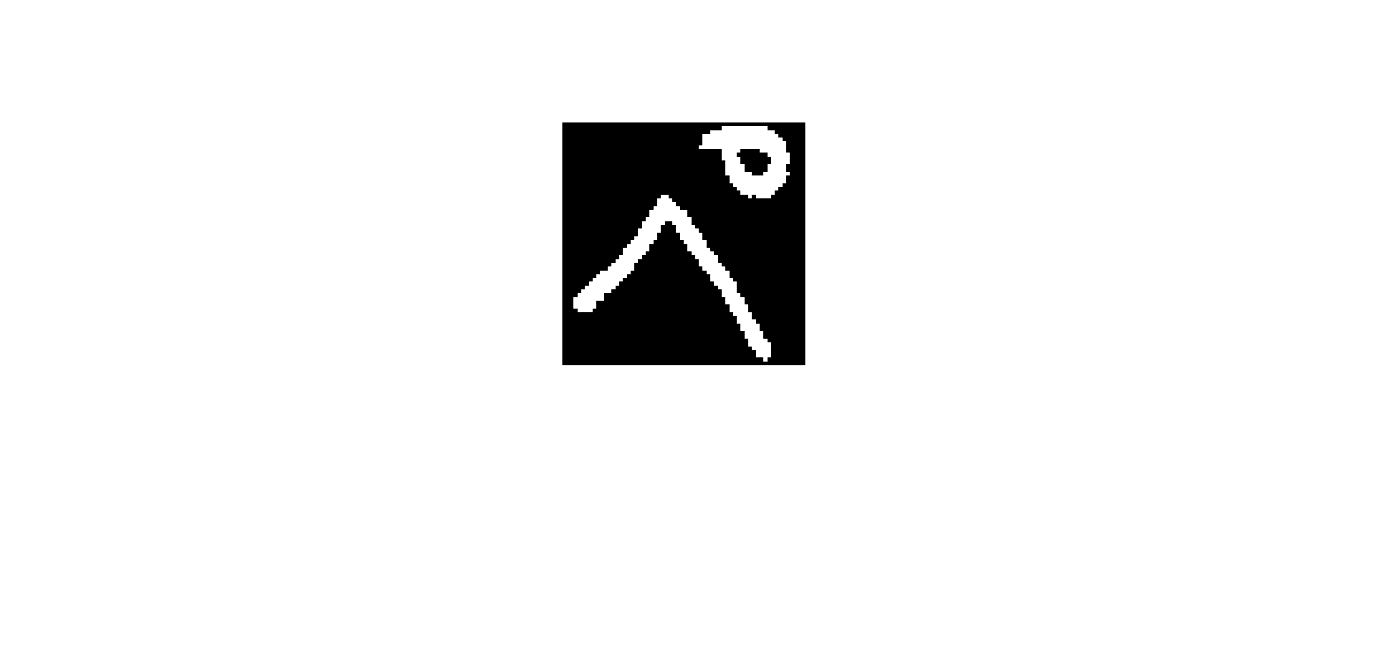
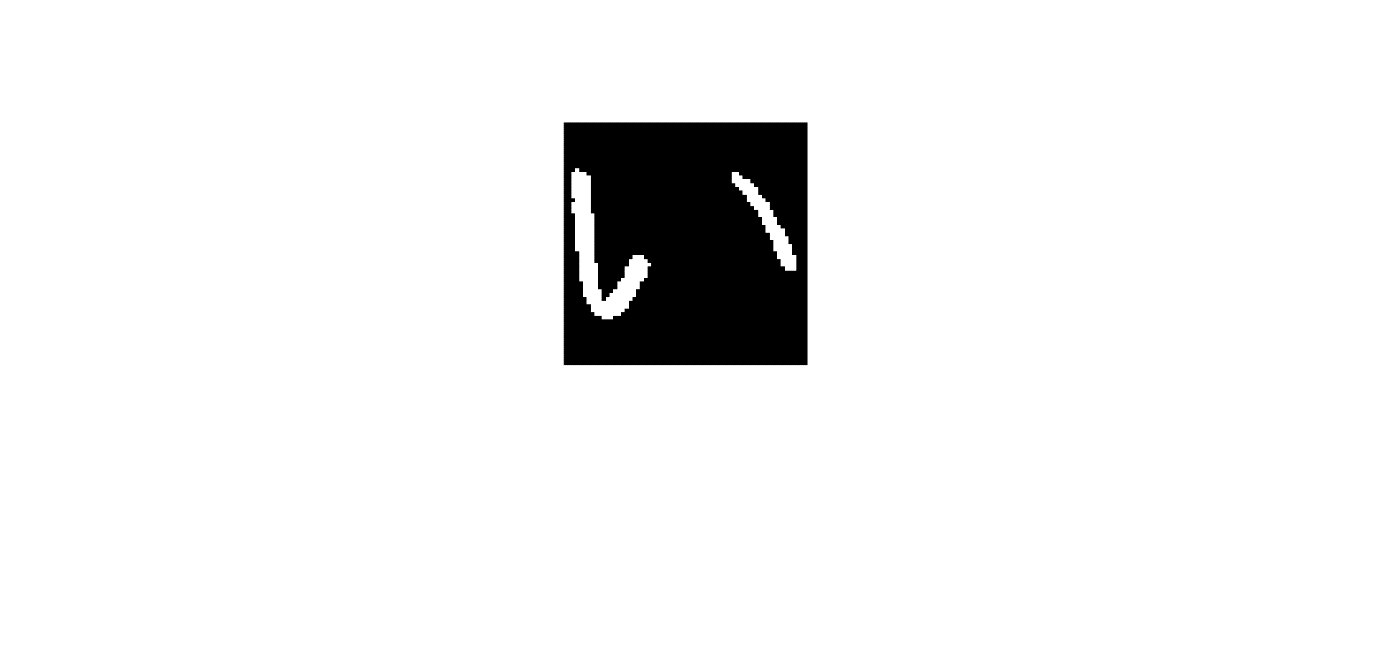
Test data: 1000 (500 per class)

* **Results:**

SVM vs. SVM+GL

* **Handwritten CN/JP character images**

Positive samples (Japanese characters randomly chosen from ETL dataset)

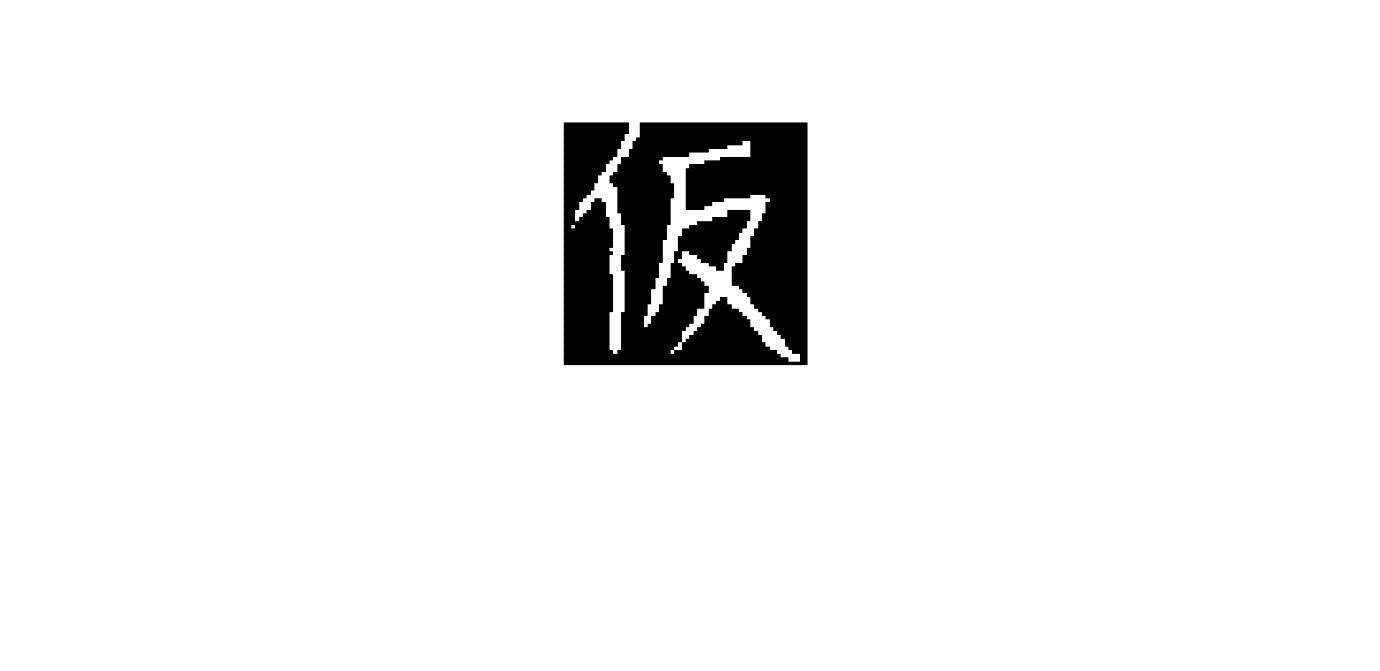
  一張含有 文字 的圖片

自動產生的描述 一張含有 文字 的圖片

自動產生的描述

Negative samples (Chinese characters randomly chosen from ETL dataset)

一張含有 文字 的圖片

自動產生的描述一張含有 文字 的圖片

自動產生的描述

* **Experimental setting:**

Training data: 10 (5 per class)

Validation data (for SVM): 10 (5 per class)

Test data: 1000 (500 per class)

* **Results:**

SVM vs. SVM+GL

* **Handwritten Digit Matrix**
* **Binary classification (positive vs. negative samples):**

Positive samples (8 ‘digit 2’, 8 ‘digit 3’, 8 ‘digit 4’, 4 ‘digit 1’, 4 ‘digit 7’)

**一張含有 箭 的圖片

自動產生的描述**

Negative samples (8 ‘digit 2’, 8 ‘digit 3’, 8 ‘digit 4’, 8 ‘digit 1’)

**一張含有 箭 的圖片

自動產生的描述**

* **Experimental setting:**

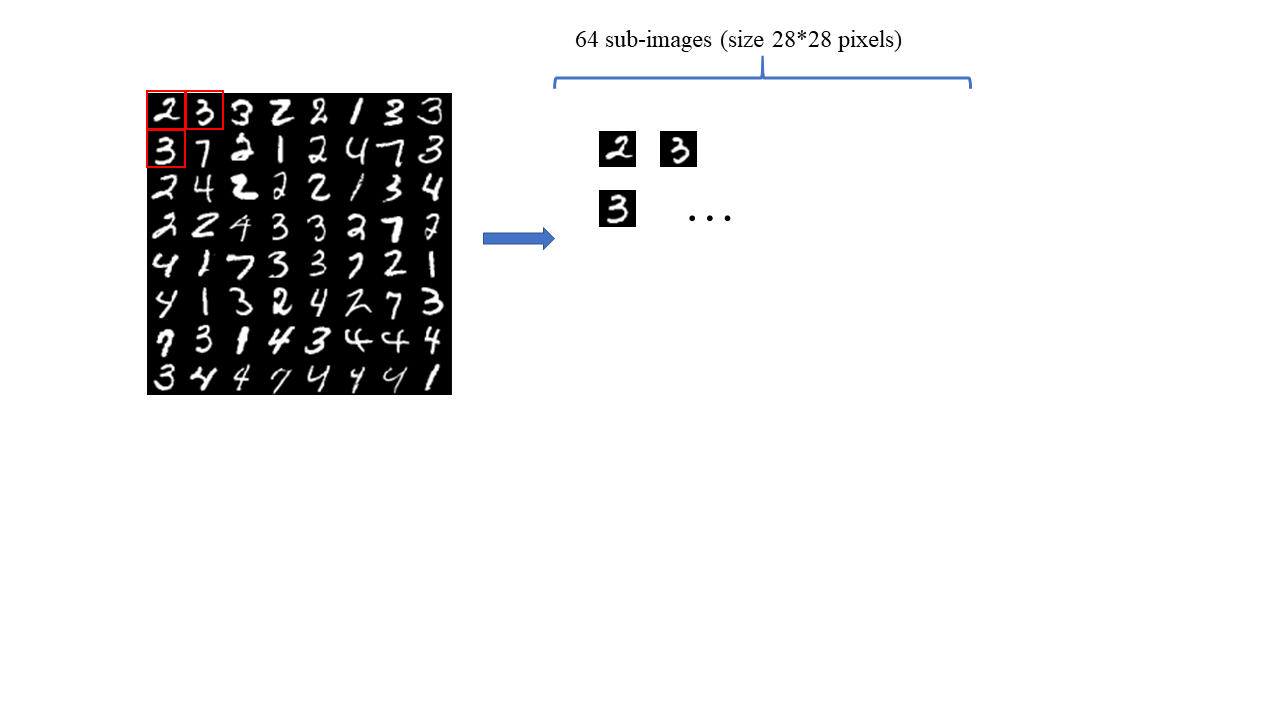
Classifiers: linear SVM, CNN

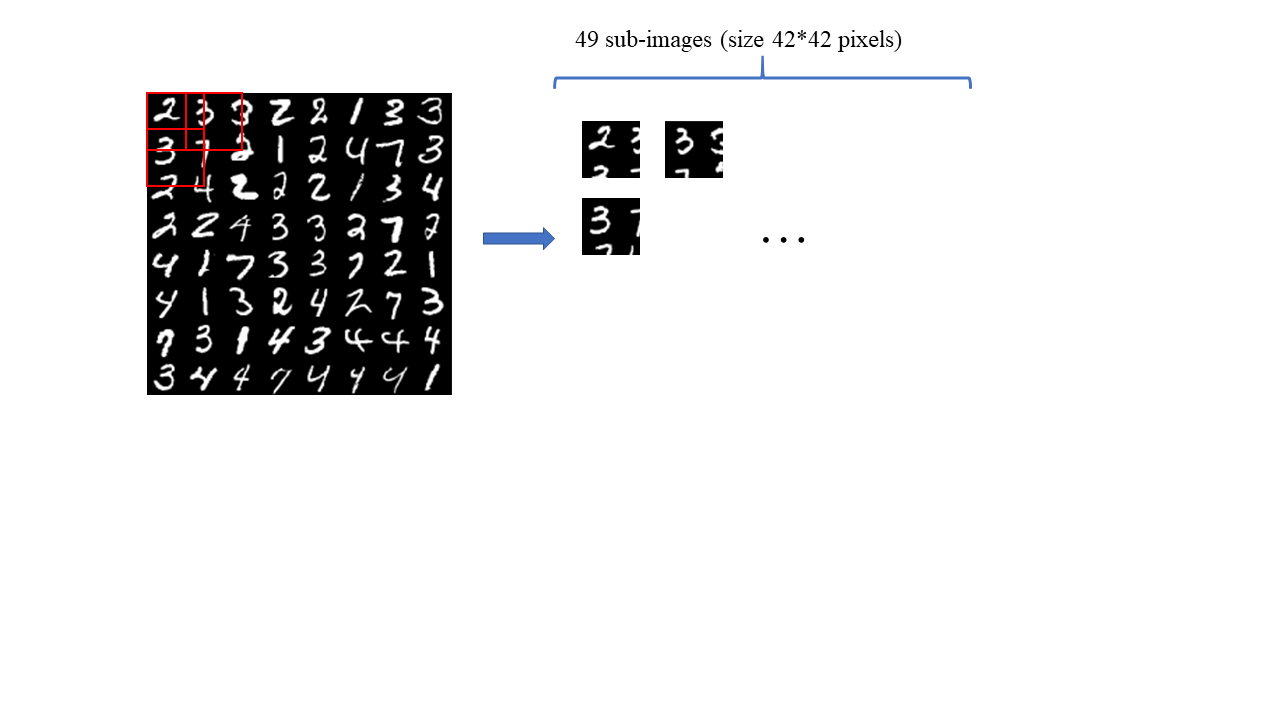
Training data: 20 (10 per class)

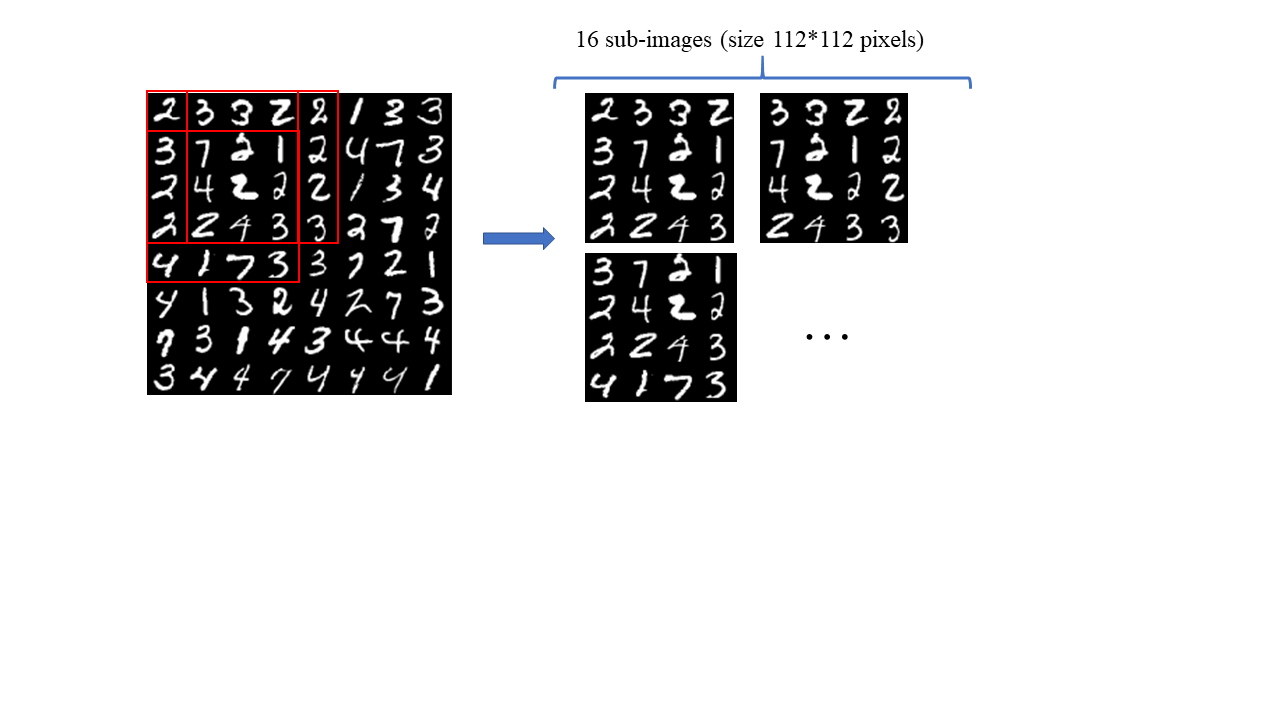
Validation data (for SVM): 20 (10 per class)

Test data: 200 (100 per class)

* **Partition data for Group Learning (with different window sizes):**







* **Results:**

1. SVM vs. SVM+GL
2. CNN vs. CNN+GL