

# Single character OCR using Support Vector Machine

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## Abstract

This paper describes optical character recognition for bitmap characters using Support Vector Machine with RBF kernel, including parameter search and bitmap normalization. Error rate with k-fold cross validation (k=20, n=42152) was 11%.

KEYWORDS: SVM, Support Vector Machine, RBF, OCR, Character Recognition

## 1 Dataset description

Training dataset:

- n=42152
- 16 x 8 black and white bitmaps
- Lowercase characters, n=26 (a-z)

Testing dataset:

- n=10000
- Same format

## 2 Character preprocessing

- Minimize noise by moving characters to bottom left corner. 0.5% improvement

## 3 What is SVM?

- <http://www.csie.ntu.edu.tw/~cjlin/papers/guide/guide.pdf>
- [http://www.ivanciuc.org/Files/Reprint/Ivanciuc\\_SVM\\_CCR\\_2007\\_23\\_291.pdf](http://www.ivanciuc.org/Files/Reprint/Ivanciuc_SVM_CCR_2007_23_291.pdf)
- RBF kernel

## 4 RBF kernel parameter search

$\gamma$  and  $C$

- Initial search space  $2^{**}x$  for  $x$  in range(-15, 15)
- Select best area for next round
- Validate by taking final arguments and calculating error rates for +- few percent for both variables.

## 5 Results and performance

- k-fold cross validation:  $k=20$ , error rate 11%
- k-fold cross validation:  $k=5$ , error rate 11.5%
- One iteration with training set  $n=40000$  and validation set  $n=2152$  about 17 min with 2.1GHz Xeon (single thread)
- about 300MB of memory for training set  $n=42152$
- Predicting one character: about 2 milliseconds

## 6 Quick comparison to other algorithms

- kNN (+PCA/LDA)
- ...?

[1]

## References

- [1] D. Albanese, R. Visintainer, S. Merler, S. Riccadonna, G. Jurman, and C. Furlanello. mlpy: Machine learning python, 2012.