Letter Recognition — Test

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Final test

Three “candidates” were produced by AdaBoost.M2 with 16-70-50-26 neural nets on the first 12000 train samples, and were “validated” on the rest 3997 samples.

They used different training algorithms for individual neural nets. Due to different learning speeds and time, parameters used were different:

<table>
<thead>
<tr>
<th>method</th>
<th>epoch</th>
<th># nets</th>
<th>time (h)</th>
<th>$\nu$ (%)</th>
<th>$\pi_t$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG</td>
<td>1000</td>
<td>100</td>
<td>66.5</td>
<td>2.752</td>
<td>2.348</td>
</tr>
<tr>
<td>CG</td>
<td>600</td>
<td>80</td>
<td>113</td>
<td>2.777</td>
<td>2.298</td>
</tr>
<tr>
<td>MM</td>
<td>1000</td>
<td>100</td>
<td>n/a</td>
<td>3.252</td>
<td>2.873</td>
</tr>
</tbody>
</table>

The one with the best “validation error” (using SG) was selected. I showed the 95% confidence interval (in the last presentation) is $[2.24\%, 3.26\%]$.

However, from the test results, we will see:

- the one with the best test error is CG, (note that $\pi_t$ is also an estimate of $\pi$. It is not $\pi$.)
- the “worst one” (MM) has the best generalization.

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Curious about the generalization of individual nets?
I was also curious. Below I plotted the errors of individual nets on the validation / test sets.
AdaBoost.M2 with CG

final validation error: 2.7771%, test error: 2.2983%

# of aggregated hypotheses
classification error (%)

validation err
test error

2.22
AdaBoost.M2 with MM

It seems that this has the best generalization...

final validation error: 3.2524%, test error: 2.8728%