COMP0078 Assignment 2

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Dec 14, 2022

1 PART I

1.1 Kernel Perceptron

1.1.1 Experimental Results

1. Basic Results:

	Train	Test
degree=1.0e+00	10.46%±1.28%	11.84%±1.72%
degree=2.0e+00	3.07%±0.94%	6.02%±1.15%
degree=3.0e+00	1.41%±0.40%	4.41%±0.55%
degree=4.0e+00	0.73%±0.15%	3.80%±0.37%
degree=5.0e+00	0.46%±0.13%	3.45%±0.44%
degree=6.0e+00	0.34%±0.08%	3.37%±0.48%
degree=7.0e+00	0.27%±0.10%	3.37%±0.33%

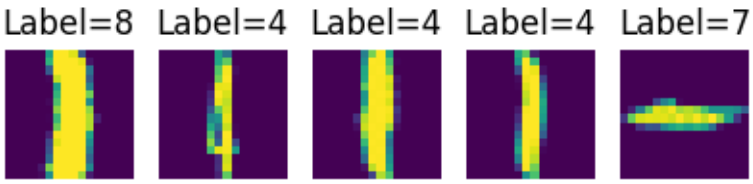
2. Cross Validation Results:

	Test Error Rate
Mean Optimal degree=6.0e+00±8.9e-01	3.38%±0.53%

3. Confusion Matrix:

	0	1	2	3	4	5	6	
0	0.0%±0.0%	0.11%±0.0%	0.11%±0.0%	0.18%±0.0%	0.08%±0.0%	0.23%±0.0%	0.22%±0.0%	0.
1	0.0%±0.0%	0.0%±0.0%	0.06%±0.0%	0.04%±0.0%	0.19%±0.0%	0.0%±0.0%	0.08%±0.0%	0.1
2	0.43%±0.0%	0.37%±0.0%	0.0%±0.0%	0.68%±1.0%	0.57%±1.0%	0.13%±0.0%	0.16%±0.0%	0.8
3	0.35%±1.0%	0.34%±0.0%	0.69%±1.0%	0.0%±0.0%	0.06%±0.0%	1.8%±1.0%	0.1%±0.0%	0.4
4	0.12%±0.0%	1.34%±1.0%	1.1%±1.0%	0.26%±0.0%	0.0%±0.0%	0.36%±0.0%	0.6%±0.0%	0.3
5	0.75%±1.0%	0.07%±0.0%	0.35%±0.0%	1.12%±1.0%	0.17%±0.0%	0.0%±0.0%	0.65%±1.0%	0.
6	0.85%±1.0%	0.81%±1.0%	0.11%±0.0%	0.0%±0.0%	0.38%±0.0%	0.39%±1.0%	0.0%±0.0%	0.
7	0.1%±0.0%	0.39%±1.0%	0.51%±1.0%	0.0%±0.0%	0.62%±1.0%	0.15%±0.0%	0.0%±0.0%	0.
8	0.9%±1.0%	0.69%±1.0%	0.66%±1.0%	0.96%±1.0%	0.46%±1.0%	1.41%±1.0%	0.31%±1.0%	0.5
9	0.21%±0.0%	0.21%±0.0%	0.19%±0.0%	0.16%±0.0%	1.43%±1.0%	0.33%±0.0%	0.1%±0.0%	1.2

4. Hardest to predict images:



5. Basic Results:

	Train	Test
sigma=2.0e-03	7.35%±1.93%	9.12%±1.86%
sigma=6.0e-03	1.92%±0.68%	4.78%±0.98%
sigma=1.0e-02	0.73%±0.29%	3.65%±0.51%
sigma=1.4e-02	0.31%±0.10%	3.07%±0.27%
sigma=1.8e-02	0.22%±0.06%	2.83%±0.39%
sigma=2.2e-02	0.16%±0.07%	2.91%±0.30%
sigma=2.6e-02	0.17%±0.05%	3.04%±0.37%

Cross Validation Results:

	Test Error Rate
Mean Optimal sigma=2.0e-02±3.2e-03	3.05%±0.33%

1.1.2 Discussions

Choice of Parameters that weren't cross validated
Generalisation to k-classifiers
Kernel Comparison
Kernel Perceptron Implementation

2 PART II

2.1 Semi-supervised Leanrning via Laplacian Interpolation

Experimental report for the laplacian interpolation approach:

		# of known labels (per class)				
		1	2	4	8	16
accuracy	50	0.82±0.1449	0.86±0.1112	0.93±0.0544	0.95±0.0109	0.95±0.0202
	100	0.84±0.2055	0.94±0.0135	0.93±0.0417	0.95±0.0197	0.95±0.0175
	200	0.82±0.1564	0.97±0.0325	0.97±0.0278	0.97±0.0156	0.98±0.0082
	400	0.89±0.1835	0.98±0.0051	0.98±0.0065	0.99±0.0043	0.99±0.0047

And for the laplacian kernel method:

		# of known labels (per class)				
		1	2	4	8	16
accuracy	50	0.93±0.0815	0.94±0.031	0.95±0.0152	0.95±0.0196	0.96±0.0183
	100	0.89±0.1864	0.93±0.0287	0.94±0.0207	0.93±0.0141	0.97±0.0172
	200	0.98±0.0088	0.98±0.0075	0.98±0.0085	0.98±0.0104	0.98±0.0074
	400	0.95±0.1516	0.99±0.0047	0.98±0.0054	0.98±0.0069	0.99±0.0046

3 PART III

3.1 Questions

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