

```
1 C:\ProgramData\Anaconda3\envs\MLenv\python.exe "C:\Users\aberrf\Documents\GitHub\CS-534\Final Project\
  EMNIST_train.py"
```

```
2
3 Loading Datasets....
```

```
4 Total No of Images in EMNIST-Letters dataset: 145600
```

```
5 No of images in Training dataset: 124800
```

```
6 No of images in Testing dataset: 20800
```

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7
```

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8
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```
9 Neural Network Structure:
```

```
10 EMNIST_Net(
```

```
11   (conv1): Sequential(
```

```
12     (0): Conv2d(1, 64, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
```

```
13     (1): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
```

```
14     (2): ReLU(inplace=True)
```

```
15   )
```

```
16   (conv2): Sequential(
```

```
17     (0): Conv2d(64, 128, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
```

```
18     (1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
```

```
19     (2): ReLU(inplace=True)
```

```
20   )
```

```
21   (conv3): Sequential(
```

```
22     (0): Conv2d(128, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
```

```
23     (1): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
```

```
24     (2): ReLU(inplace=True)
```

```
25     (3): MaxPool2d(kernel_size=2, stride=2, padding=0, dilation=1, ceil_mode=False)
```

```
26   )
```

```
27   (classifier): Sequential(
```

```
28     (0): MaxPool2d(kernel_size=7, stride=7, padding=0, dilation=1, ceil_mode=False)
```

```
29     (1): Flatten(start_dim=1, end_dim=-1)
```

```
30     (2): Dropout(p=0.2, inplace=False)
```

```
31     (3): Linear(in_features=1024, out_features=27, bias=True)
```

```
32   )
```

```
33 )
```

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34
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File - EMNIST_train

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35
36 Training Parameters:
37 Epoch Count: 25,    Batch Size: 200
38 Learning Rate: 5e-05,    Weight Decay: 0.0001
39
40 Training Epoch...
41 100%|██████████| 624/624 [00:49<00:00, 12.60it/s]
42
43 Testing Model...
44 100%|██████████| 104/104 [00:05<00:00, 20.11it/s]
45 Epoch: 1,    Val-Loss: 0.7365,    Val-Accuracy: 77.60000000000001%,    Train-Accuracy: 77.0%
46
47 Training Epoch...
48 100%|██████████| 624/624 [00:46<00:00, 13.44it/s]
49
50 Testing Model...
51 100%|██████████| 104/104 [00:05<00:00, 20.67it/s]
52 Epoch: 2,    Val-Loss: 0.5257,    Val-Accuracy: 83.5%,    Train-Accuracy: 84.0%
53
54 Training Epoch...
55 100%|██████████| 624/624 [00:46<00:00, 13.53it/s]
56
57 Testing Model...
58 100%|██████████| 104/104 [00:05<00:00, 20.67it/s]
59 Epoch: 3,    Val-Loss: 0.434,    Val-Accuracy: 86.2%,    Train-Accuracy: 86.5%
60
61 Training Epoch...
62 100%|██████████| 624/624 [00:46<00:00, 13.55it/s]
63
64 Testing Model...
65 100%|██████████| 104/104 [00:05<00:00, 20.68it/s]
66 Epoch: 4,    Val-Loss: 0.386,    Val-Accuracy: 87.4%,    Train-Accuracy: 83.5%
67
68 Training Epoch...
69 100%|██████████| 624/624 [00:46<00:00, 13.47it/s]
```

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70
71 Testing Model...
72 100%|██████████| 104/104 [00:05<00:00, 20.37it/s]
73 Epoch: 5, Val-Loss: 0.3614, Val-Accuracy: 88.4%, Train-Accuracy: 91.5%
74
75 Training Epoch...
76 100%|██████████| 624/624 [00:46<00:00, 13.44it/s]
77
78 Testing Model...
79 100%|██████████| 104/104 [00:05<00:00, 20.79it/s]
80 Epoch: 6, Val-Loss: 0.3421, Val-Accuracy: 89.3%, Train-Accuracy: 91.5%
81
82 Training Epoch...
83 100%|██████████| 624/624 [00:46<00:00, 13.36it/s]
84
85 Testing Model...
86 100%|██████████| 104/104 [00:05<00:00, 20.36it/s]
87 Epoch: 7, Val-Loss: 0.3149, Val-Accuracy: 90.100000000000001%, Train-Accuracy: 92.5%
88
89 Training Epoch...
90 100%|██████████| 624/624 [00:46<00:00, 13.56it/s]
91
92 Testing Model...
93 100%|██████████| 104/104 [00:05<00:00, 20.25it/s]
94 Epoch: 8, Val-Loss: 0.309, Val-Accuracy: 89.9%, Train-Accuracy: 92.0%
95
96 Training Epoch...
97 100%|██████████| 624/624 [00:46<00:00, 13.46it/s]
98
99 Testing Model...
100 100%|██████████| 104/104 [00:05<00:00, 20.49it/s]
101 Epoch: 9, Val-Loss: 0.3, Val-Accuracy: 90.2%, Train-Accuracy: 92.0%
102
103 Training Epoch...
104 100%|██████████| 624/624 [00:46<00:00, 13.44it/s]
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File - EMNIST_train

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105
106 Testing Model...
107 100%|██████████| 104/104 [00:05<00:00, 20.52it/s]
108 Epoch: 10, Val-Loss: 0.2894, Val-Accuracy: 90.5%, Train-Accuracy: 91.0%
109
110 Training Epoch...
111 100%|██████████| 624/624 [00:46<00:00, 13.45it/s]
112
113 Testing Model...
114 100%|██████████| 104/104 [00:05<00:00, 20.24it/s]
115 Epoch: 11, Val-Loss: 0.2726, Val-Accuracy: 91.10000000000001%, Train-Accuracy: 91.5%
116
117 Training Epoch...
118 100%|██████████| 624/624 [00:46<00:00, 13.50it/s]
119
120 Testing Model...
121 100%|██████████| 104/104 [00:05<00:00, 20.55it/s]
122 Epoch: 12, Val-Loss: 0.277, Val-Accuracy: 91.0%, Train-Accuracy: 89.0%
123
124 Training Epoch...
125 100%|██████████| 624/624 [00:46<00:00, 13.52it/s]
126
127 Testing Model...
128 100%|██████████| 104/104 [00:05<00:00, 20.04it/s]
129 Epoch: 13, Val-Loss: 0.2646, Val-Accuracy: 91.5%, Train-Accuracy: 93.5%
130
131 Training Epoch...
132 100%|██████████| 624/624 [00:46<00:00, 13.46it/s]
133
134 Testing Model...
135 100%|██████████| 104/104 [00:05<00:00, 20.64it/s]
136 Epoch: 14, Val-Loss: 0.2617, Val-Accuracy: 91.5%, Train-Accuracy: 93.5%
137
138 Training Epoch...
139 100%|██████████| 624/624 [00:46<00:00, 13.47it/s]
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File - EMNIST_train

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140
141 Testing Model...
142 100%|██████████| 104/104 [00:05<00:00, 20.32it/s]
143 Epoch: 15, Val-Loss: 0.2562, Val-Accuracy: 91.5%, Train-Accuracy: 94.5%
144
145 Training Epoch...
146 100%|██████████| 624/624 [00:46<00:00, 13.46it/s]
147
148 Testing Model...
149 100%|██████████| 104/104 [00:05<00:00, 20.53it/s]
150 Epoch: 16, Val-Loss: 0.2569, Val-Accuracy: 91.7%, Train-Accuracy: 91.5%
151
152 Training Epoch...
153 100%|██████████| 624/624 [00:46<00:00, 13.47it/s]
154
155 Testing Model...
156 100%|██████████| 104/104 [00:05<00:00, 19.95it/s]
157 Epoch: 17, Val-Loss: 0.2467, Val-Accuracy: 92.100000000000001%, Train-Accuracy: 90.0%
158
159 Training Epoch...
160 100%|██████████| 624/624 [00:46<00:00, 13.49it/s]
161
162 Testing Model...
163 100%|██████████| 104/104 [00:05<00:00, 20.45it/s]
164 Epoch: 18, Val-Loss: 0.2494, Val-Accuracy: 92.2%, Train-Accuracy: 92.0%
165
166 Training Epoch...
167 100%|██████████| 624/624 [00:46<00:00, 13.44it/s]
168
169 Testing Model...
170 100%|██████████| 104/104 [00:05<00:00, 20.71it/s]
171 Epoch: 19, Val-Loss: 0.2447, Val-Accuracy: 92.0%, Train-Accuracy: 92.5%
172
173 Training Epoch...
174 100%|██████████| 624/624 [00:46<00:00, 13.54it/s]
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File - EMNIST_train

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175
176 Testing Model...
177 100%|██████████| 104/104 [00:05<00:00, 20.60it/s]
178 Epoch: 20, Val-Loss: 0.2467, Val-Accuracy: 91.9%, Train-Accuracy: 92.5%
179
180 Training Epoch...
181 100%|██████████| 624/624 [00:46<00:00, 13.35it/s]
182
183 Testing Model...
184 100%|██████████| 104/104 [00:05<00:00, 20.21it/s]
185 Epoch: 21, Val-Loss: 0.2429, Val-Accuracy: 92.30000000000001%, Train-Accuracy: 90.5%
186
187 Training Epoch...
188 100%|██████████| 624/624 [00:46<00:00, 13.54it/s]
189
190 Testing Model...
191 100%|██████████| 104/104 [00:05<00:00, 19.97it/s]
192 Epoch: 22, Val-Loss: 0.2336, Val-Accuracy: 92.5%, Train-Accuracy: 95.0%
193
194 Training Epoch...
195 100%|██████████| 624/624 [00:46<00:00, 13.48it/s]
196
197 Testing Model...
198 100%|██████████| 104/104 [00:05<00:00, 20.64it/s]
199 Epoch: 23, Val-Loss: 0.2437, Val-Accuracy: 92.2%, Train-Accuracy: 94.5%
200
201 Training Epoch...
202 100%|██████████| 624/624 [00:46<00:00, 13.41it/s]
203
204 Testing Model...
205 100%|██████████| 104/104 [00:05<00:00, 20.56it/s]
206 Epoch: 24, Val-Loss: 0.2345, Val-Accuracy: 92.5%, Train-Accuracy: 92.0%
207
208 Training Epoch...
209 100%|██████████| 624/624 [00:46<00:00, 13.33it/s]
```

File - EMNIST_train

210

211 Testing Model...

212 100%|██████████| 104/104 [00:05<00:00, 20.25it/s]

213 Epoch: 25, Val-Loss: 0.2356, Val-Accuracy: 92.30000000000001%, Train-Accuracy: 92.5%

214

215

216 Process finished with exit code 0

217