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1 C:\Users\wangyisu\PycharmProjects\MolClassifier\venv\Scripts\python.  
  exe C:/Users/wangyisu/PycharmProjects/MolClassifier/MolClas/CNN.py  
2 Using TensorFlow backend.  
3 2020-03-04 21:10:49.125290: I tensorflow/core/platform/  
  cpu_feature_guard.cc:142] Your CPU supports instructions that this  
  TensorFlow binary was not compiled to use: AVX AVX2  
4 2020-03-04 21:10:49.127196: I tensorflow/stream_executor/platform/  
  default/dso_loader.cc:42] Successfully opened dynamic library nvcuda.  
  dll  
5 2020-03-04 21:10:49.149344: I tensorflow/core/common_runtime/gpu/  
  gpu_device.cc:1640] Found device 0 with properties:  
6 name: GeForce GTX 1660 SUPER major: 7 minor: 5 memoryClockRate(GHz): 1  
  .785  
7 pciBusID: 0000:01:00.0  
8 2020-03-04 21:10:49.149572: I tensorflow/stream_executor/platform/  
  default/dlopen_checker_stub.cc:25] GPU libraries are statically linked  
  , skip dlopen check.  
9 2020-03-04 21:10:49.150059: I tensorflow/core/common_runtime/gpu/  
  gpu_device.cc:1763] Adding visible gpu devices: 0  
10 2020-03-04 21:10:49.644553: I tensorflow/core/common_runtime/gpu/  
  gpu_device.cc:1181] Device interconnect StreamExecutor with strength 1  
  edge matrix:  
11 2020-03-04 21:10:49.644714: I tensorflow/core/common_runtime/gpu/  
  gpu_device.cc:1187]      0  
12 2020-03-04 21:10:49.644809: I tensorflow/core/common_runtime/gpu/  
  gpu_device.cc:1200] 0:   N  
13 2020-03-04 21:10:49.645493: I tensorflow/core/common_runtime/gpu/  
  gpu_device.cc:1326] Created TensorFlow device (/device:GPU:0 with 4640  
  MB memory) -> physical GPU (device: 0, name: GeForce GTX 1660 SUPER,  
  pci bus id: 0000:01:00.0, compute capability: 7.5)  
14 [name: "/device:CPU:0"  
15 device_type: "CPU"  
16 memory_limit: 268435456  
17 locality {  
18 }  
19 incarnation: 17857268075423555924  
20 , name: "/device:GPU:0"  
21 device_type: "GPU"  
22 memory_limit: 4866349465  
23 locality {
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24 bus_id: 1
25 links {
26 }
27 }
28 incarnation: 971452109225074051
29 physical_device_desc: "device: 0, name: GeForce GTX 1660 SUPER, pci
    bus id: 0000:01:00.0, compute capability: 7.5"
30 ]
31 [[0. 0. 0. ... 1. 0. 0.]
32 [0. 0. 0. ... 0. 0. 0.]
33 [0. 0. 0. ... 0. 0. 1.]
34 ...
35 [0. 0. 0. ... 0. 0. 1.]
36 [0. 0. 0. ... 1. 0. 0.]
37 [0. 0. 0. ... 1. 0. 0.]]
38 训练数据的维度 (600000, 2, 128)
39 输入信号的维度: [2, 128]
40 调制信号种类 ['8PSK', 'AM-DSB', 'BPSK', 'CPFSK', 'GFSK', 'PAM4', '
    QAM16', 'QAM64', 'QPSK', 'WBFM']
41 C:/Users/wangyisu/PycharmProjects/MolClassifier/MolClas/CNN.py:52:
    UserWarning: Update your `Conv2D` call to the Keras 2 API: `Conv2D(256
    , (1, 3), activation="relu", name="conv1", padding="valid",
    kernel_initializer="glorot_uniform")`
42 model.add(Convolution2D(256, 1, 3, border_mode='valid', activation="
    relu", name="conv1", init='glorot_uniform'))
43 C:/Users/wangyisu/PycharmProjects/MolClassifier/MolClas/CNN.py:55:
    UserWarning: Update your `Conv2D` call to the Keras 2 API: `Conv2D(80
    , (2, 3), activation="relu", name="conv2", padding="valid",
    kernel_initializer="glorot_uniform")`
44 model.add(Convolution2D(80, 2, 3, border_mode="valid", activation="
    relu", name="conv2", init='glorot_uniform'))
45 C:/Users/wangyisu/PycharmProjects/MolClassifier/MolClas/CNN.py:58:
    UserWarning: Update your `Dense` call to the Keras 2 API: `Dense(256,
    activation="relu", name="dense1", kernel_initializer="he_normal")`
46 model.add(Dense(256, activation='relu', init='he_normal', name="
    dense1"))
47 C:/Users/wangyisu/PycharmProjects/MolClassifier/MolClas/CNN.py:60:
    UserWarning: Update your `Dense` call to the Keras 2 API: `Dense(10,
    name="dense2", kernel_initializer="he_normal")`
48 model.add(Dense(len(classes), init='he_normal', name="dense2"))

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49 Model: "sequential_1"
50 _____
51 Layer (type)                Output Shape                Param #
52 =====
53 reshape_1 (Reshape)         (None, 2, 128, 1)          0
54 _____
55 zero_padding2d_1 (ZeroPaddin (None, 2, 132, 1)          0
56 _____
57 conv1 (Conv2D)              (None, 2, 130, 256)        1024
58 _____
59 dropout_1 (Dropout)         (None, 2, 130, 256)        0
60 _____
61 zero_padding2d_2 (ZeroPaddin (None, 2, 134, 256)        0
62 _____
63 conv2 (Conv2D)              (None, 1, 132, 80)         122960
64 _____
65 dropout_2 (Dropout)         (None, 1, 132, 80)         0
66 _____
67 flatten_1 (Flatten)         (None, 10560)              0
68 _____
69 dense1 (Dense)              (None, 256)                2703616
70 _____
71 dropout_3 (Dropout)         (None, 256)                0
72 _____
73 dense2 (Dense)              (None, 10)                 2570
74 _____
75 activation_1 (Activation)    (None, 10)                 0
76 _____
77 reshape_2 (Reshape)         (None, 10)                 0
78 =====
79 Total params: 2,830,170
80 Trainable params: 2,830,170
81 Non-trainable params: 0
82 _____
83 C:/Users/wangyisu/PycharmProjects/MolClassifier/MolClas/CNN.py:83:
  UserWarning: The `nb_epoch` argument in `fit` has been renamed `epochs`
    .
84 K.callbacks.EarlyStopping(monitor='val_loss', patience=5, verbose=0
  , mode='auto')
85 WARNING:tensorflow:From C:\Users\wangyisu\AppData\Local\Continuum\

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85 anaconda3\lib\site-packages\tensorflow\python\ops\math_grad.py:1250:
    add_dispatch_support.<locals>.wrapper (from tensorflow.python.ops.
    array_ops) is deprecated and will be removed in a future version.
86 Instructions for updating:
87 Use tf.where in 2.0, which has the same broadcast rule as np.where
88 2020-03-04 21:11:22.485023: I tensorflow/core/common_runtime/gpu/
    gpu_device.cc:1640] Found device 0 with properties:
89 name: GeForce GTX 1660 SUPER major: 7 minor: 5 memoryClockRate(GHz):
    1.785
90 pciBusID: 0000:01:00.0
91 2020-03-04 21:11:22.485247: I tensorflow/stream_executor/platform/
    default/dlopen_checker_stub.cc:25] GPU libraries are statically
    linked, skip dlopen check.
92 2020-03-04 21:11:22.485738: I tensorflow/core/common_runtime/gpu/
    gpu_device.cc:1763] Adding visible gpu devices: 0
93 2020-03-04 21:11:22.485896: I tensorflow/core/common_runtime/gpu/
    gpu_device.cc:1181] Device interconnect StreamExecutor with strength
    1 edge matrix:
94 2020-03-04 21:11:22.486053: I tensorflow/core/common_runtime/gpu/
    gpu_device.cc:1187]      0
95 2020-03-04 21:11:22.486150: I tensorflow/core/common_runtime/gpu/
    gpu_device.cc:1200] 0:   N
96 2020-03-04 21:11:22.486618: I tensorflow/core/common_runtime/gpu/
    gpu_device.cc:1326] Created TensorFlow device (/job:localhost/replica
    :0/task:0/device:GPU:0 with 4640 MB memory) -> physical GPU (device:
    0, name: GeForce GTX 1660 SUPER, pci bus id: 0000:01:00.0, compute
    capability: 7.5)
97 Train on 600000 samples, validate on 600000 samples
98 Epoch 1/100
99 WARNING:tensorflow:From C:\Users\wangyisu\AppData\Local\Continuum\
    anaconda3\lib\site-packages\keras\backend\tensorflow_backend.py:422:
    The name tf.global_variables is deprecated. Please use tf.compat.v1.
    global_variables instead.
100
101 2020-03-04 21:11:25.479305: W tensorflow/core/common_runtime/
    bfc_allocator.cc:237] Allocator (GPU_0_bfc) ran out of memory trying
    to allocate 2.87GiB with freed_by_count=0. The caller indicates that
    this is not a failure, but may mean that there could be performance
    gains if more memory were available.
102 2020-03-04 21:11:25.479635: W tensorflow/core/common_runtime/
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102 bfc_allocator.cc:237] Allocator (GPU_0_bfc) ran out of memory trying
    to allocate 2.87GiB with freed_by_count=0. The caller indicates that
    this is not a failure, but may mean that there could be performance
    gains if more memory were available.
103 - 76s - loss: 1.8336 - val_loss: 1.4803
104 Epoch 2/100
105 - 71s - loss: 1.4138 - val_loss: 1.2244
106 Epoch 3/100
107 - 71s - loss: 1.3194 - val_loss: 1.2023
108 Epoch 4/100
109 - 72s - loss: 1.2909 - val_loss: 1.1863
110 Epoch 5/100
111 - 71s - loss: 1.2756 - val_loss: 1.1772
112 Epoch 6/100
113 - 70s - loss: 1.2625 - val_loss: 1.1875
114 Epoch 7/100
115 - 71s - loss: 1.2545 - val_loss: 1.1923
116 Epoch 8/100
117 - 71s - loss: 1.2472 - val_loss: 1.1506
118 Epoch 9/100
119 - 70s - loss: 1.2368 - val_loss: 1.1455
120 Epoch 10/100
121 - 71s - loss: 1.2326 - val_loss: 1.1719
122 Epoch 11/100
123 - 71s - loss: 1.2283 - val_loss: 1.1454
124 Epoch 12/100
125 - 71s - loss: 1.2215 - val_loss: 1.1393
126 Epoch 13/100
127 - 70s - loss: 1.2168 - val_loss: 1.1385
128 Epoch 14/100
129 - 71s - loss: 1.2126 - val_loss: 1.1400
130 Epoch 15/100
131 - 71s - loss: 1.2055 - val_loss: 1.1276
132 Epoch 16/100
133 - 71s - loss: 1.1994 - val_loss: 1.1150
134 Epoch 17/100
135 - 73s - loss: 1.1927 - val_loss: 1.1161
136 Epoch 18/100
137 - 73s - loss: 1.1860 - val_loss: 1.1113
138 Epoch 19/100
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139 - 72s - loss: 1.1802 - val_loss: 1.0973
140 Epoch 20/100
141 - 71s - loss: 1.1781 - val_loss: 1.1168
142 Epoch 21/100
143 - 71s - loss: 1.1734 - val_loss: 1.0951
144 Epoch 22/100
145 - 71s - loss: 1.1705 - val_loss: 1.0917
146 Epoch 23/100
147 - 71s - loss: 1.1686 - val_loss: 1.0878
148 Epoch 24/100
149 - 71s - loss: 1.1661 - val_loss: 1.0866
150 Epoch 25/100
151 - 71s - loss: 1.1630 - val_loss: 1.0860
152 Epoch 26/100
153 - 71s - loss: 1.1601 - val_loss: 1.0826
154 Epoch 27/100
155 - 70s - loss: 1.1588 - val_loss: 1.0839
156 Epoch 28/100
157 - 71s - loss: 1.1556 - val_loss: 1.0857
158 Epoch 29/100
159 - 70s - loss: 1.1540 - val_loss: 1.0833
160 Epoch 30/100
161 - 70s - loss: 1.1523 - val_loss: 1.1037
162 Epoch 31/100
163 - 71s - loss: 1.1523 - val_loss: 1.0803
164 Epoch 32/100
165 - 71s - loss: 1.1490 - val_loss: 1.0811
166 Epoch 33/100
167 - 70s - loss: 1.1480 - val_loss: 1.0839
168 Epoch 34/100
169 - 70s - loss: 1.1469 - val_loss: 1.0854
170 Epoch 35/100
171 - 70s - loss: 1.1429 - val_loss: 1.0792
172 Epoch 36/100
173 - 70s - loss: 1.1420 - val_loss: 1.0791
174 Epoch 37/100
175 - 71s - loss: 1.1410 - val_loss: 1.0852
176 Epoch 38/100
177 - 71s - loss: 1.1402 - val_loss: 1.0784
178 Epoch 39/100
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179 - 71s - loss: 1.1381 - val_loss: 1.0780
180 Epoch 40/100
181 - 70s - loss: 1.1376 - val_loss: 1.0776
182 Epoch 41/100
183 - 71s - loss: 1.1345 - val_loss: 1.0793
184 Epoch 42/100
185 - 71s - loss: 1.1348 - val_loss: 1.0871
186 Epoch 43/100
187 - 71s - loss: 1.1333 - val_loss: 1.0796
188 Epoch 44/100
189 - 70s - loss: 1.1325 - val_loss: 1.0763
190 Epoch 45/100
191 - 71s - loss: 1.1316 - val_loss: 1.0796
192 Epoch 46/100
193 - 70s - loss: 1.1303 - val_loss: 1.0780
194 Epoch 47/100
195 - 70s - loss: 1.1286 - val_loss: 1.0953
196 Epoch 48/100
197 - 70s - loss: 1.1281 - val_loss: 1.0695
198 Epoch 49/100
199 - 70s - loss: 1.1253 - val_loss: 1.0706
200 Epoch 50/100
201 - 70s - loss: 1.1240 - val_loss: 1.0731
202 Epoch 51/100
203 - 70s - loss: 1.1210 - val_loss: 1.0643
204 Epoch 52/100
205 - 70s - loss: 1.1194 - val_loss: 1.0740
206 Epoch 53/100
207 - 70s - loss: 1.1162 - val_loss: 1.0658
208 Epoch 54/100
209 - 70s - loss: 1.1153 - val_loss: 1.0632
210 Epoch 55/100
211 - 70s - loss: 1.1147 - val_loss: 1.0646
212 Epoch 56/100
213 - 70s - loss: 1.1144 - val_loss: 1.0576
214 Epoch 57/100
215 - 70s - loss: 1.1110 - val_loss: 1.0617
216 Epoch 58/100
217 - 70s - loss: 1.1106 - val_loss: 1.0651
218 Epoch 59/100
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219 - 70s - loss: 1.1093 - val_loss: 1.0614
220 Epoch 60/100
221 - 70s - loss: 1.1086 - val_loss: 1.0652
222 Epoch 61/100
223 - 70s - loss: 1.1074 - val_loss: 1.0568
224 Epoch 62/100
225 - 70s - loss: 1.1058 - val_loss: 1.0575
226 Epoch 63/100
227 - 70s - loss: 1.1056 - val_loss: 1.0729
228 Epoch 64/100
229 - 70s - loss: 1.1036 - val_loss: 1.0532
230 Epoch 65/100
231 - 70s - loss: 1.1042 - val_loss: 1.0532
232 Epoch 66/100
233 - 70s - loss: 1.1014 - val_loss: 1.0566
234 Epoch 67/100
235 - 70s - loss: 1.1004 - val_loss: 1.0593
236 Epoch 68/100
237 - 70s - loss: 1.0987 - val_loss: 1.0519
238 Epoch 69/100
239 - 70s - loss: 1.0971 - val_loss: 1.0473
240 Epoch 70/100
241 - 70s - loss: 1.0962 - val_loss: 1.0434
242 Epoch 71/100
243 - 70s - loss: 1.0944 - val_loss: 1.0404
244 Epoch 72/100
245 - 71s - loss: 1.0944 - val_loss: 1.0448
246 Epoch 73/100
247 - 70s - loss: 1.0937 - val_loss: 1.0411
248 Epoch 74/100
249 - 71s - loss: 1.0914 - val_loss: 1.0444
250 Epoch 75/100
251 - 71s - loss: 1.0907 - val_loss: 1.0466
252 Epoch 76/100
253 - 71s - loss: 1.0910 - val_loss: 1.0472
254 Overall Accuracy: 0.10206399038140405
255 Overall Accuracy: 0.10714285714285714
256 Overall Accuracy: 0.11380677841836905
257 Overall Accuracy: 0.12142115661520946
258 Overall Accuracy: 0.15199252386356052
```



```
259 Overall Accuracy: 0.2517405643092708
260 Overall Accuracy: 0.41575681146915344
261 Overall Accuracy: 0.535558005144136
262 Overall Accuracy: 0.6257746385020324
263 Overall Accuracy: 0.7109071419000402
264 Overall Accuracy: 0.7854433141974687
265 Overall Accuracy: 0.8092876165113182
266 Overall Accuracy: 0.8127764291177546
267 Overall Accuracy: 0.8192212096106049
268 Overall Accuracy: 0.8210907159690642
269 Overall Accuracy: 0.820917858330562
270 Overall Accuracy: 0.8216829771653019
271 Overall Accuracy: 0.8194062033504728
272 Overall Accuracy: 0.8186276145044534
273 Overall Accuracy: 0.8182578164186591
274 {-20: 0.10206399038140405, -18: 0.10714285714285714, -16: 0.
    11380677841836905, -14: 0.12142115661520946, -12: 0.15199252386356052
    , -10: 0.2517405643092708, -8: 0.41575681146915344, -6: 0.
    535558005144136, -4: 0.6257746385020324, -2: 0.7109071419000402, 0: 0
    .7854433141974687, 2: 0.8092876165113182, 4: 0.8127764291177546, 6: 0
    .8192212096106049, 8: 0.8210907159690642, 10: 0.820917858330562, 12:
    0.8216829771653019, 14: 0.8194062033504728, 16: 0.8186276145044534,
    18: 0.8182578164186591}
275 {-20: 0.10206399038140405, -18: 0.10714285714285714, -16: 0.
    11380677841836905, -14: 0.12142115661520946, -12: 0.15199252386356052
    , -10: 0.2517405643092708, -8: 0.41575681146915344, -6: 0.
    535558005144136, -4: 0.6257746385020324, -2: 0.7109071419000402, 0: 0
    .7854433141974687, 2: 0.8092876165113182, 4: 0.8127764291177546, 6: 0
    .8192212096106049, 8: 0.8210907159690642, 10: 0.820917858330562, 12:
    0.8216829771653019, 14: 0.8194062033504728, 16: 0.8186276145044534,
    18: 0.8182578164186591}
276
277 Process finished with exit code 0
278
```