```
1  ssh://root@103.254.67.181:10006/usr/bin/python -u /home/sunfengzhen/pycharm/dadi_typhoon/run.py
2  Using TensorFlow backend.
3  ################work mode train ####################
4  train_size 176
5  txt_path dataset/Train/Track/Track.txt
6  type typhoon_seq <type 'numpy.ndarray'>
7  typhoon_seq.shape (176, 16, 5)
8  i_max_val 6.0
9  i_min_val 0.0
10 lat_max_val 485.0
11 lat_min_val 92.0
12 lon_max_val 1885.0
13 lon_min_val 1052.0
14 press_max_val 1010.0
15 press_min_val 888.0
16 wnd_max_val 72.0
17 wnd_min_val 10.0
18 trainX.shape: (166, 4, 5)
19 trainY.shape: (166, 4, 2)
20 validX.shape: (10, 4, 5)
21 validY.shape: (10, 4, 2)
22 trainX[0]
23  [[0.66666667 0.43256997 0.25330132 0.67213115 0.40322581]
24  [0.66666667 0.45547074 0.25090036 0.67213115 0.40322581]
25  [0.66666667 0.4783715  0.25570228 0.67213115 0.40322581]
26  [0.66666667 0.50636132 0.26170468 0.63114754 0.40322581]]
27 trainY[0]
28 : [[0.54707379 0.26890756]
29  [0.59287532 0.27130852]
30  [0.63867684 0.27130852]
31  [0.67938931 0.2785114 ]]
32 hello world
33 #############model build#############
34 _____
35 Layer (type)                 Output Shape              Param #
36 =================================================================
37 LSTM_layer01 (LSTM)          (None, 4, 64)             17920
38 _____
39 LSTM_layer02 (LSTM)          (None, 4, 64)             33024
40 _____
41 LSTM_layer03 (LSTM)          (None, 4, 2)              536
42 =================================================================
43 Total params: 51,480
44 Trainable params: 51,480
45 Non-trainable params: 0
46 _____
47 model.input= Tensor("LSTM_layer01_input:0", shape=(?, 4, 5), dtype=float32)
48 model.input.name= LSTM_layer01_input:0
49 model.input.shape= (?, 4, 5)
50 model.output= Tensor("LSTM_layer03/transpose_1:0", shape=(?, ?, 2), dtype=float32)
51 model.output.name= LSTM_layer03/transpose_1:0
52 model.output.shape= (?, ?, 2)
53 #############model train#############
54 model.metrics_names =  ['loss', 'mean_squared_error']
55 Train on 166 samples, validate on 10 samples
56 2019-10-15 02:59:55.542136: I tensorflow/core/platform/cpu_feature_guard.cc:141] Your CPU supports
   instructions that this TensorFlow binary was not compiled to use: AVX2 FMA
57 2019-10-15 02:59:55.817809: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1432] Found device 0 with
   properties:
58 name: GeForce GTX 1080 Ti major: 6 minor: 1 memoryClockRate(GHz): 1.582
59 pciBusID: 0000:02:00.0
```

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60  totalMemory: 10.92GiB freeMemory: 10.76GiB
61  2019-10-15 02:59:55.817877: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1511] Adding visible gpu
    devices: 0
62  2019-10-15 02:59:57.506401: I tensorflow/core/common_runtime/gpu/gpu_device.cc:982] Device interconnect
    StreamExecutor with strength 1 edge matrix:
63  2019-10-15 02:59:57.506484: I tensorflow/core/common_runtime/gpu/gpu_device.cc:988]        0
64  2019-10-15 02:59:57.506512: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1001] 0:    N
65  2019-10-15 02:59:57.506873: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1115] Created TensorFlow
    device (/job:localhost/replica:0/task:0/device:GPU:0 with 10409 MB memory) -> physical GPU (device: 0,
    name: GeForce GTX 1080 Ti, pci bus id: 0000:02:00.0, compute capability: 6.1)
66  Epoch 1/1000
67   - 4s - loss: 0.1185 - mean_squared_error: 0.1185 - val_loss: 0.0977 - val_mean_squared_error: 0.0977
68  epoch_end_callback epoch 0 lr 0.001
69  Epoch 2/1000
70   - 1s - loss: 0.0653 - mean_squared_error: 0.0653 - val_loss: 0.0781 - val_mean_squared_error: 0.0781
71  epoch_end_callback epoch 1 lr 0.001
72  Epoch 3/1000
73   - 1s - loss: 0.0547 - mean_squared_error: 0.0547 - val_loss: 0.0633 - val_mean_squared_error: 0.0633
74  epoch_end_callback epoch 2 lr 0.001
75  Epoch 4/1000
76   - 1s - loss: 0.0457 - mean_squared_error: 0.0457 - val_loss: 0.0523 - val_mean_squared_error: 0.0523
77  epoch_end_callback epoch 3 lr 0.001
78  Epoch 5/1000
79   - 1s - loss: 0.0378 - mean_squared_error: 0.0378 - val_loss: 0.0436 - val_mean_squared_error: 0.0436
80  epoch_end_callback epoch 4 lr 0.001
81  Epoch 6/1000
82   - 1s - loss: 0.0335 - mean_squared_error: 0.0335 - val_loss: 0.0367 - val_mean_squared_error: 0.0367
83  epoch_end_callback epoch 5 lr 0.001
84  Epoch 7/1000
85   - 1s - loss: 0.0272 - mean_squared_error: 0.0272 - val_loss: 0.0290 - val_mean_squared_error: 0.0290
86  epoch_end_callback epoch 6 lr 0.001
87  Epoch 8/1000
88   - 1s - loss: 0.0257 - mean_squared_error: 0.0257 - val_loss: 0.0269 - val_mean_squared_error: 0.0269
89  epoch_end_callback epoch 7 lr 0.001
90  Epoch 9/1000
91   - 1s - loss: 0.0213 - mean_squared_error: 0.0213 - val_loss: 0.0210 - val_mean_squared_error: 0.0210
92  epoch_end_callback epoch 8 lr 0.001
93  Epoch 10/1000
94   - 1s - loss: 0.0196 - mean_squared_error: 0.0196 - val_loss: 0.0192 - val_mean_squared_error: 0.0192
95
96  Epoch 00010: saving model to model/model_best.h5
97  epoch_end_callback epoch 9 lr 0.001
98  Epoch 11/1000
99   - 1s - loss: 0.0177 - mean_squared_error: 0.0177 - val_loss: 0.0177 - val_mean_squared_error: 0.0177
100 epoch_end_callback epoch 10 lr 0.001
101 Epoch 12/1000
102  - 1s - loss: 0.0159 - mean_squared_error: 0.0159 - val_loss: 0.0158 - val_mean_squared_error: 0.0158
103 epoch_end_callback epoch 11 lr 0.001
104 Epoch 13/1000
105  - 1s - loss: 0.0153 - mean_squared_error: 0.0153 - val_loss: 0.0165 - val_mean_squared_error: 0.0165
106 epoch_end_callback epoch 12 lr 0.001
107 Epoch 14/1000
108  - 1s - loss: 0.0139 - mean_squared_error: 0.0139 - val_loss: 0.0140 - val_mean_squared_error: 0.0140
109 epoch_end_callback epoch 13 lr 0.001
110 Epoch 15/1000
111  - 1s - loss: 0.0132 - mean_squared_error: 0.0132 - val_loss: 0.0129 - val_mean_squared_error: 0.0129
112 epoch_end_callback epoch 14 lr 0.001
113 Epoch 16/1000
114  - 1s - loss: 0.0132 - mean_squared_error: 0.0132 - val_loss: 0.0120 - val_mean_squared_error: 0.0120
115 epoch_end_callback epoch 15 lr 0.001
116 Epoch 17/1000
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117   - 1s - loss: 0.0124 - mean_squared_error: 0.0124 - val_loss: 0.0118 - val_mean_squared_error: 0.0118
118  epoch_end_callback epoch 16 lr 0.001
119  Epoch 18/1000
120   - 1s - loss: 0.0114 - mean_squared_error: 0.0114 - val_loss: 0.0112 - val_mean_squared_error: 0.0112
121  epoch_end_callback epoch 17 lr 0.001
122  Epoch 19/1000
123   - 1s - loss: 0.0120 - mean_squared_error: 0.0120 - val_loss: 0.0110 - val_mean_squared_error: 0.0110
124  epoch_end_callback epoch 18 lr 0.001
125  Epoch 20/1000
126   - 1s - loss: 0.0111 - mean_squared_error: 0.0111 - val_loss: 0.0099 - val_mean_squared_error: 0.0099
127
128  Epoch 00020: saving model to model/model_best.h5
129  epoch_end_callback epoch 19 lr 0.001
130  Epoch 21/1000
131   - 1s - loss: 0.0115 - mean_squared_error: 0.0115 - val_loss: 0.0095 - val_mean_squared_error: 0.0095
132  epoch_end_callback epoch 20 lr 0.001
133  Epoch 22/1000
134   - 1s - loss: 0.0102 - mean_squared_error: 0.0102 - val_loss: 0.0091 - val_mean_squared_error: 0.0091
135  epoch_end_callback epoch 21 lr 0.001
136  Epoch 23/1000
137   - 1s - loss: 0.0099 - mean_squared_error: 0.0099 - val_loss: 0.0081 - val_mean_squared_error: 0.0081
138  epoch_end_callback epoch 22 lr 0.001
139  Epoch 24/1000
140   - 1s - loss: 0.0101 - mean_squared_error: 0.0101 - val_loss: 0.0086 - val_mean_squared_error: 0.0086
141  epoch_end_callback epoch 23 lr 0.001
142  Epoch 25/1000
143   - 1s - loss: 0.0092 - mean_squared_error: 0.0092 - val_loss: 0.0080 - val_mean_squared_error: 0.0080
144  epoch_end_callback epoch 24 lr 0.001
145  Epoch 26/1000
146   - 1s - loss: 0.0095 - mean_squared_error: 0.0095 - val_loss: 0.0070 - val_mean_squared_error: 0.0070
147  epoch_end_callback epoch 25 lr 0.001
148  Epoch 27/1000
149   - 1s - loss: 0.0091 - mean_squared_error: 0.0091 - val_loss: 0.0072 - val_mean_squared_error: 0.0072
150  epoch_end_callback epoch 26 lr 0.001
151  Epoch 28/1000
152   - 1s - loss: 0.0086 - mean_squared_error: 0.0086 - val_loss: 0.0066 - val_mean_squared_error: 0.0066
153  epoch_end_callback epoch 27 lr 0.001
154  Epoch 29/1000
155   - 1s - loss: 0.0088 - mean_squared_error: 0.0088 - val_loss: 0.0072 - val_mean_squared_error: 0.0072
156  epoch_end_callback epoch 28 lr 0.001
157  Epoch 30/1000
158   - 1s - loss: 0.0084 - mean_squared_error: 0.0084 - val_loss: 0.0062 - val_mean_squared_error: 0.0062
159
160  Epoch 00030: saving model to model/model_best.h5
161  epoch_end_callback epoch 29 lr 0.001
162  Epoch 31/1000
163   - 1s - loss: 0.0084 - mean_squared_error: 0.0084 - val_loss: 0.0060 - val_mean_squared_error: 0.0060
164  epoch_end_callback epoch 30 lr 0.001
165  Epoch 32/1000
166   - 1s - loss: 0.0075 - mean_squared_error: 0.0075 - val_loss: 0.0065 - val_mean_squared_error: 0.0065
167  epoch_end_callback epoch 31 lr 0.001
168  Epoch 33/1000
169   - 1s - loss: 0.0082 - mean_squared_error: 0.0082 - val_loss: 0.0054 - val_mean_squared_error: 0.0054
170  epoch_end_callback epoch 32 lr 0.001
171  Epoch 34/1000
172   - 1s - loss: 0.0077 - mean_squared_error: 0.0077 - val_loss: 0.0048 - val_mean_squared_error: 0.0048
173  epoch_end_callback epoch 33 lr 0.001
174  Epoch 35/1000
175   - 1s - loss: 0.0074 - mean_squared_error: 0.0074 - val_loss: 0.0051 - val_mean_squared_error: 0.0051
176  epoch_end_callback epoch 34 lr 0.001
177  Epoch 36/1000
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178   - 1s - loss: 0.0074 - mean_squared_error: 0.0074 - val_loss: 0.0048 - val_mean_squared_error: 0.0048
179  epoch_end_callback epoch 35 lr 0.001
180  Epoch 37/1000
181   - 1s - loss: 0.0070 - mean_squared_error: 0.0070 - val_loss: 0.0051 - val_mean_squared_error: 0.0051
182  epoch_end_callback epoch 36 lr 0.001
183  Epoch 38/1000
184   - 1s - loss: 0.0074 - mean_squared_error: 0.0074 - val_loss: 0.0054 - val_mean_squared_error: 0.0054
185  epoch_end_callback epoch 37 lr 0.001
186  Epoch 39/1000
187   - 1s - loss: 0.0068 - mean_squared_error: 0.0068 - val_loss: 0.0058 - val_mean_squared_error: 0.0058
188  epoch_end_callback epoch 38 lr 0.001
189  Epoch 40/1000
190   - 1s - loss: 0.0070 - mean_squared_error: 0.0070 - val_loss: 0.0042 - val_mean_squared_error: 0.0042
191
192  Epoch 00040: saving model to model/model_best.h5
193  epoch_end_callback epoch 39 lr 0.001
194  Epoch 41/1000
195   - 1s - loss: 0.0070 - mean_squared_error: 0.0070 - val_loss: 0.0042 - val_mean_squared_error: 0.0042
196  epoch_end_callback epoch 40 lr 0.001
197  Epoch 42/1000
198   - 1s - loss: 0.0069 - mean_squared_error: 0.0069 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
199  epoch_end_callback epoch 41 lr 0.001
200  Epoch 43/1000
201   - 1s - loss: 0.0066 - mean_squared_error: 0.0066 - val_loss: 0.0041 - val_mean_squared_error: 0.0041
202  epoch_end_callback epoch 42 lr 0.001
203  Epoch 44/1000
204   - 1s - loss: 0.0068 - mean_squared_error: 0.0068 - val_loss: 0.0042 - val_mean_squared_error: 0.0042
205  epoch_end_callback epoch 43 lr 0.001
206  Epoch 45/1000
207   - 1s - loss: 0.0067 - mean_squared_error: 0.0067 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
208  epoch_end_callback epoch 44 lr 0.001
209  Epoch 46/1000
210   - 1s - loss: 0.0060 - mean_squared_error: 0.0060 - val_loss: 0.0043 - val_mean_squared_error: 0.0043
211  epoch_end_callback epoch 45 lr 0.001
212  Epoch 47/1000
213   - 1s - loss: 0.0068 - mean_squared_error: 0.0068 - val_loss: 0.0047 - val_mean_squared_error: 0.0047
214  epoch_end_callback epoch 46 lr 0.001
215  Epoch 48/1000
216   - 1s - loss: 0.0060 - mean_squared_error: 0.0060 - val_loss: 0.0043 - val_mean_squared_error: 0.0043
217  epoch_end_callback epoch 47 lr 0.001
218  Epoch 49/1000
219   - 1s - loss: 0.0057 - mean_squared_error: 0.0057 - val_loss: 0.0039 - val_mean_squared_error: 0.0039
220  epoch_end_callback epoch 48 lr 0.001
221  Epoch 50/1000
222   - 1s - loss: 0.0054 - mean_squared_error: 0.0054 - val_loss: 0.0048 - val_mean_squared_error: 0.0048
223
224  Epoch 00050: saving model to model/model_best.h5
225  epoch_end_callback epoch 49 lr 0.001
226  Epoch 51/1000
227   - 1s - loss: 0.0063 - mean_squared_error: 0.0063 - val_loss: 0.0048 - val_mean_squared_error: 0.0048
228  epoch_end_callback epoch 50 lr 0.001
229  Epoch 52/1000
230   - 1s - loss: 0.0068 - mean_squared_error: 0.0068 - val_loss: 0.0040 - val_mean_squared_error: 0.0040
231  epoch_end_callback epoch 51 lr 0.001
232  Epoch 53/1000
233   - 1s - loss: 0.0058 - mean_squared_error: 0.0058 - val_loss: 0.0040 - val_mean_squared_error: 0.0040
234  epoch_end_callback epoch 52 lr 0.001
235  Epoch 54/1000
236   - 1s - loss: 0.0059 - mean_squared_error: 0.0059 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
237  epoch_end_callback epoch 53 lr 0.001
238  Epoch 55/1000
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239    - 1s - loss: 0.0054 - mean_squared_error: 0.0054 - val_loss: 0.0036 - val_mean_squared_error: 0.0036
240   epoch_end_callback epoch 54 lr 0.001
241   Epoch 56/1000
242    - 1s - loss: 0.0059 - mean_squared_error: 0.0059 - val_loss: 0.0043 - val_mean_squared_error: 0.0043
243   epoch_end_callback epoch 55 lr 0.001
244   Epoch 57/1000
245    - 1s - loss: 0.0058 - mean_squared_error: 0.0058 - val_loss: 0.0036 - val_mean_squared_error: 0.0036
246   epoch_end_callback epoch 56 lr 0.001
247   Epoch 58/1000
248    - 1s - loss: 0.0054 - mean_squared_error: 0.0054 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
249   epoch_end_callback epoch 57 lr 0.001
250   Epoch 59/1000
251    - 1s - loss: 0.0056 - mean_squared_error: 0.0056 - val_loss: 0.0046 - val_mean_squared_error: 0.0046
252   epoch_end_callback epoch 58 lr 0.001
253   Epoch 60/1000
254    - 1s - loss: 0.0054 - mean_squared_error: 0.0054 - val_loss: 0.0043 - val_mean_squared_error: 0.0043
255
256   Epoch 00060: saving model to model/model_best.h5
257   epoch_end_callback epoch 59 lr 0.001
258   Epoch 61/1000
259    - 1s - loss: 0.0057 - mean_squared_error: 0.0057 - val_loss: 0.0039 - val_mean_squared_error: 0.0039
260   epoch_end_callback epoch 60 lr 0.001
261   Epoch 62/1000
262    - 1s - loss: 0.0052 - mean_squared_error: 0.0052 - val_loss: 0.0038 - val_mean_squared_error: 0.0038
263   epoch_end_callback epoch 61 lr 0.001
264   Epoch 63/1000
265    - 1s - loss: 0.0053 - mean_squared_error: 0.0053 - val_loss: 0.0036 - val_mean_squared_error: 0.0036
266   epoch_end_callback epoch 62 lr 0.001
267   Epoch 64/1000
268    - 1s - loss: 0.0058 - mean_squared_error: 0.0058 - val_loss: 0.0035 - val_mean_squared_error: 0.0035
269   epoch_end_callback epoch 63 lr 0.001
270   Epoch 65/1000
271    - 1s - loss: 0.0050 - mean_squared_error: 0.0050 - val_loss: 0.0035 - val_mean_squared_error: 0.0035
272   epoch_end_callback epoch 64 lr 0.001
273   Epoch 66/1000
274    - 1s - loss: 0.0052 - mean_squared_error: 0.0052 - val_loss: 0.0040 - val_mean_squared_error: 0.0040
275   epoch_end_callback epoch 65 lr 0.001
276   Epoch 67/1000
277    - 1s - loss: 0.0054 - mean_squared_error: 0.0054 - val_loss: 0.0040 - val_mean_squared_error: 0.0040
278   epoch_end_callback epoch 66 lr 0.001
279   Epoch 68/1000
280    - 1s - loss: 0.0051 - mean_squared_error: 0.0051 - val_loss: 0.0037 - val_mean_squared_error: 0.0037
281   epoch_end_callback epoch 67 lr 0.001
282   Epoch 69/1000
283    - 1s - loss: 0.0052 - mean_squared_error: 0.0052 - val_loss: 0.0036 - val_mean_squared_error: 0.0036
284   epoch_end_callback epoch 68 lr 0.001
285   Epoch 70/1000
286    - 1s - loss: 0.0053 - mean_squared_error: 0.0053 - val_loss: 0.0038 - val_mean_squared_error: 0.0038
287
288   Epoch 00070: saving model to model/model_best.h5
289   epoch_end_callback epoch 69 lr 0.001
290   Epoch 71/1000
291    - 1s - loss: 0.0055 - mean_squared_error: 0.0055 - val_loss: 0.0037 - val_mean_squared_error: 0.0037
292   epoch_end_callback epoch 70 lr 0.001
293   Epoch 72/1000
294    - 1s - loss: 0.0052 - mean_squared_error: 0.0052 - val_loss: 0.0037 - val_mean_squared_error: 0.0037
295   epoch_end_callback epoch 71 lr 0.001
296   Epoch 73/1000
297    - 1s - loss: 0.0052 - mean_squared_error: 0.0052 - val_loss: 0.0041 - val_mean_squared_error: 0.0041
298   epoch_end_callback epoch 72 lr 0.001
299   Epoch 74/1000
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300    - 1s - loss: 0.0047 - mean_squared_error: 0.0047 - val_loss: 0.0037 - val_mean_squared_error: 0.0037
301
302   Epoch 00074: ReduceLROnPlateau reducing learning rate to 0.00010000000475.
303   epoch_end_callback epoch 73 lr 0.001
304   Epoch 75/1000
305    - 1s - loss: 0.0046 - mean_squared_error: 0.0046 - val_loss: 0.0041 - val_mean_squared_error: 0.0041
306   epoch_end_callback epoch 74 lr 0.000100000005
307   Epoch 76/1000
308    - 1s - loss: 0.0042 - mean_squared_error: 0.0042 - val_loss: 0.0043 - val_mean_squared_error: 0.0043
309   epoch_end_callback epoch 75 lr 0.000100000005
310   Epoch 77/1000
311    - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0046 - val_mean_squared_error: 0.0046
312   epoch_end_callback epoch 76 lr 0.000100000005
313   Epoch 78/1000
314    - 1s - loss: 0.0047 - mean_squared_error: 0.0047 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
315   epoch_end_callback epoch 77 lr 0.000100000005
316   Epoch 79/1000
317    - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
318   epoch_end_callback epoch 78 lr 0.000100000005
319   Epoch 80/1000
320    - 1s - loss: 0.0047 - mean_squared_error: 0.0047 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
321
322   Epoch 00080: saving model to model/model_best.h5
323   epoch_end_callback epoch 79 lr 0.000100000005
324   Epoch 81/1000
325    - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
326   epoch_end_callback epoch 80 lr 0.000100000005
327   Epoch 82/1000
328    - 1s - loss: 0.0047 - mean_squared_error: 0.0047 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
329   epoch_end_callback epoch 81 lr 0.000100000005
330   Epoch 83/1000
331    - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0042 - val_mean_squared_error: 0.0042
332   epoch_end_callback epoch 82 lr 0.000100000005
333   Epoch 84/1000
334    - 1s - loss: 0.0049 - mean_squared_error: 0.0049 - val_loss: 0.0042 - val_mean_squared_error: 0.0042
335
336   Epoch 00084: ReduceLROnPlateau reducing learning rate to 1.0000000475e-05.
337   epoch_end_callback epoch 83 lr 0.000100000005
338   Epoch 85/1000
339    - 1s - loss: 0.0046 - mean_squared_error: 0.0046 - val_loss: 0.0043 - val_mean_squared_error: 0.0043
340   epoch_end_callback epoch 84 lr 1.0000001e-05
341   Epoch 86/1000
342    - 1s - loss: 0.0038 - mean_squared_error: 0.0038 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
343   epoch_end_callback epoch 85 lr 1.0000001e-05
344   Epoch 87/1000
345    - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
346   epoch_end_callback epoch 86 lr 1.0000001e-05
347   Epoch 88/1000
348    - 1s - loss: 0.0048 - mean_squared_error: 0.0048 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
349   epoch_end_callback epoch 87 lr 1.0000001e-05
350   Epoch 89/1000
351    - 1s - loss: 0.0041 - mean_squared_error: 0.0041 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
352   epoch_end_callback epoch 88 lr 1.0000001e-05
353   Epoch 90/1000
354    - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
355
356   Epoch 00090: saving model to model/model_best.h5
357   epoch_end_callback epoch 89 lr 1.0000001e-05
358   Epoch 91/1000
359    - 1s - loss: 0.0048 - mean_squared_error: 0.0048 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
360   epoch_end_callback epoch 90 lr 1.0000001e-05
```

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361  Epoch 92/1000
362   - 1s - loss: 0.0041 - mean_squared_error: 0.0041 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
363  epoch_end_callback epoch 91 lr 1.0000001e-05
364  Epoch 93/1000
365   - 1s - loss: 0.0047 - mean_squared_error: 0.0047 - val_loss: 0.0044 - val_mean_squared_error: 0.0044
366  epoch_end_callback epoch 92 lr 1.0000001e-05
367  Epoch 94/1000
368   - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
369
370  Epoch 00094: ReduceLROnPlateau reducing learning rate to 1.00000006569e-06.
371  epoch_end_callback epoch 93 lr 1.0000001e-05
372  Epoch 95/1000
373   - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
374  epoch_end_callback epoch 94 lr 1.0000001e-06
375  Epoch 96/1000
376   - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
377  epoch_end_callback epoch 95 lr 1.0000001e-06
378  Epoch 97/1000
379   - 1s - loss: 0.0052 - mean_squared_error: 0.0052 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
380  epoch_end_callback epoch 96 lr 1.0000001e-06
381  Epoch 98/1000
382   - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
383  epoch_end_callback epoch 97 lr 1.0000001e-06
384  Epoch 99/1000
385   - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
386  epoch_end_callback epoch 98 lr 1.0000001e-06
387  Epoch 100/1000
388   - 1s - loss: 0.0046 - mean_squared_error: 0.0046 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
389
390  Epoch 00100: saving model to model/model_best.h5
391  epoch_end_callback epoch 99 lr 1.0000001e-06
392  Epoch 101/1000
393   - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
394  epoch_end_callback epoch 100 lr 1.0000001e-06
395  Epoch 102/1000
396   - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
397  epoch_end_callback epoch 101 lr 1.0000001e-06
398  Epoch 103/1000
399   - 1s - loss: 0.0048 - mean_squared_error: 0.0048 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
400  epoch_end_callback epoch 102 lr 1.0000001e-06
401  Epoch 104/1000
402   - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
403
404  Epoch 00104: ReduceLROnPlateau reducing learning rate to 1e-06.
405  epoch_end_callback epoch 103 lr 1.0000001e-06
406  Epoch 105/1000
407   - 1s - loss: 0.0048 - mean_squared_error: 0.0048 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
408  epoch_end_callback epoch 104 lr 1e-06
409  Epoch 106/1000
410   - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
411  epoch_end_callback epoch 105 lr 1e-06
412  Epoch 107/1000
413   - 1s - loss: 0.0042 - mean_squared_error: 0.0042 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
414  epoch_end_callback epoch 106 lr 1e-06
415  Epoch 108/1000
416   - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
417  epoch_end_callback epoch 107 lr 1e-06
418  Epoch 109/1000
419   - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
420  epoch_end_callback epoch 108 lr 1e-06
421  Epoch 110/1000
```

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422      - 1s - loss: 0.0041 - mean_squared_error: 0.0041 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
423
424     Epoch 00110: saving model to model/model_best.h5
425     epoch_end_callback epoch 109 lr 1e-06
426     Epoch 111/1000
427      - 1s - loss: 0.0041 - mean_squared_error: 0.0041 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
428     epoch_end_callback epoch 110 lr 1e-06
429     Epoch 112/1000
430      - 1s - loss: 0.0042 - mean_squared_error: 0.0042 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
431     epoch_end_callback epoch 111 lr 1e-06
432     Epoch 113/1000
433      - 1s - loss: 0.0046 - mean_squared_error: 0.0046 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
434     epoch_end_callback epoch 112 lr 1e-06
435     Epoch 114/1000
436      - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
437     epoch_end_callback epoch 113 lr 1e-06
438     Epoch 115/1000
439      - 1s - loss: 0.0046 - mean_squared_error: 0.0046 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
440     epoch_end_callback epoch 114 lr 1e-06
441     Epoch 116/1000
442      - 1s - loss: 0.0041 - mean_squared_error: 0.0041 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
443     epoch_end_callback epoch 115 lr 1e-06
444     Epoch 117/1000
445      - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
446     epoch_end_callback epoch 116 lr 1e-06
447     Epoch 118/1000
448      - 1s - loss: 0.0047 - mean_squared_error: 0.0047 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
449     epoch_end_callback epoch 117 lr 1e-06
450     Epoch 119/1000
451      - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
452     epoch_end_callback epoch 118 lr 1e-06
453     Epoch 120/1000
454      - 1s - loss: 0.0041 - mean_squared_error: 0.0041 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
455
456     Epoch 00120: saving model to model/model_best.h5
457     epoch_end_callback epoch 119 lr 1e-06
458     Epoch 121/1000
459      - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
460     epoch_end_callback epoch 120 lr 1e-06
461     Epoch 122/1000
462      - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
463     epoch_end_callback epoch 121 lr 1e-06
464     Epoch 123/1000
465      - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
466     epoch_end_callback epoch 122 lr 1e-06
467     Epoch 124/1000
468      - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
469     epoch_end_callback epoch 123 lr 1e-06
470     Epoch 125/1000
471      - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
472     epoch_end_callback epoch 124 lr 1e-06
473     Epoch 126/1000
474      - 1s - loss: 0.0046 - mean_squared_error: 0.0046 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
475     epoch_end_callback epoch 125 lr 1e-06
476     Epoch 127/1000
477      - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
478     epoch_end_callback epoch 126 lr 1e-06
479     Epoch 128/1000
480      - 1s - loss: 0.0048 - mean_squared_error: 0.0048 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
481     epoch_end_callback epoch 127 lr 1e-06
482     Epoch 129/1000
```

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483     - 1s - loss: 0.0041 - mean_squared_error: 0.0041 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
484    epoch_end_callback epoch 128 lr 1e-06
485    Epoch 130/1000
486     - 1s - loss: 0.0041 - mean_squared_error: 0.0041 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
487
488    Epoch 00130: saving model to model/model_best.h5
489    epoch_end_callback epoch 129 lr 1e-06
490    Epoch 131/1000
491     - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
492    epoch_end_callback epoch 130 lr 1e-06
493    Epoch 132/1000
494     - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
495    epoch_end_callback epoch 131 lr 1e-06
496    Epoch 133/1000
497     - 1s - loss: 0.0042 - mean_squared_error: 0.0042 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
498    epoch_end_callback epoch 132 lr 1e-06
499    Epoch 134/1000
500     - 1s - loss: 0.0042 - mean_squared_error: 0.0042 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
501    epoch_end_callback epoch 133 lr 1e-06
502    Epoch 135/1000
503     - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
504    epoch_end_callback epoch 134 lr 1e-06
505    Epoch 136/1000
506     - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
507    epoch_end_callback epoch 135 lr 1e-06
508    Epoch 137/1000
509     - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
510    epoch_end_callback epoch 136 lr 1e-06
511    Epoch 138/1000
512     - 1s - loss: 0.0046 - mean_squared_error: 0.0046 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
513    epoch_end_callback epoch 137 lr 1e-06
514    Epoch 139/1000
515     - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
516    epoch_end_callback epoch 138 lr 1e-06
517    Epoch 140/1000
518     - 1s - loss: 0.0047 - mean_squared_error: 0.0047 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
519
520    Epoch 00140: saving model to model/model_best.h5
521    epoch_end_callback epoch 139 lr 1e-06
522    Epoch 141/1000
523     - 1s - loss: 0.0048 - mean_squared_error: 0.0048 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
524    epoch_end_callback epoch 140 lr 1e-06
525    Epoch 142/1000
526     - 1s - loss: 0.0050 - mean_squared_error: 0.0050 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
527    epoch_end_callback epoch 141 lr 1e-06
528    Epoch 143/1000
529     - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
530    epoch_end_callback epoch 142 lr 1e-06
531    Epoch 144/1000
532     - 1s - loss: 0.0046 - mean_squared_error: 0.0046 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
533    epoch_end_callback epoch 143 lr 1e-06
534    Epoch 145/1000
535     - 1s - loss: 0.0042 - mean_squared_error: 0.0042 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
536    epoch_end_callback epoch 144 lr 1e-06
537    Epoch 146/1000
538     - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
539    epoch_end_callback epoch 145 lr 1e-06
540    Epoch 147/1000
541     - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
542    epoch_end_callback epoch 146 lr 1e-06
543    Epoch 148/1000
```

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544    - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
545  epoch_end_callback epoch 147 lr 1e-06
546  Epoch 149/1000
547    - 1s - loss: 0.0041 - mean_squared_error: 0.0041 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
548  epoch_end_callback epoch 148 lr 1e-06
549  Epoch 150/1000
550    - 1s - loss: 0.0041 - mean_squared_error: 0.0041 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
551
552  Epoch 00150: saving model to model/model_best.h5
553  epoch_end_callback epoch 149 lr 1e-06
554  Epoch 151/1000
555    - 1s - loss: 0.0043 - mean_squared_error: 0.0043 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
556  epoch_end_callback epoch 150 lr 1e-06
557  Epoch 152/1000
558    - 1s - loss: 0.0047 - mean_squared_error: 0.0047 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
559  epoch_end_callback epoch 151 lr 1e-06
560  Epoch 153/1000
561    - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
562  epoch_end_callback epoch 152 lr 1e-06
563  Epoch 154/1000
564    - 1s - loss: 0.0047 - mean_squared_error: 0.0047 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
565  epoch_end_callback epoch 153 lr 1e-06
566  Epoch 155/1000
567    - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
568  epoch_end_callback epoch 154 lr 1e-06
569  Epoch 156/1000
570    - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
571  epoch_end_callback epoch 155 lr 1e-06
572  Epoch 157/1000
573    - 1s - loss: 0.0042 - mean_squared_error: 0.0042 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
574  epoch_end_callback epoch 156 lr 1e-06
575  Epoch 158/1000
576    - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
577  epoch_end_callback epoch 157 lr 1e-06
578  Epoch 159/1000
579    - 1s - loss: 0.0045 - mean_squared_error: 0.0045 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
580  epoch_end_callback epoch 158 lr 1e-06
581  Epoch 160/1000
582    - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
583
584  Epoch 00160: saving model to model/model_best.h5
585  epoch_end_callback epoch 159 lr 1e-06
586  Epoch 161/1000
587    - 1s - loss: 0.0046 - mean_squared_error: 0.0046 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
588  epoch_end_callback epoch 160 lr 1e-06
589  Epoch 162/1000
590    - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
591  epoch_end_callback epoch 161 lr 1e-06
592  Epoch 163/1000
593    - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
594  epoch_end_callback epoch 162 lr 1e-06
595  Epoch 164/1000
596    - 1s - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0045 - val_mean_squared_error: 0.0045
597  epoch_end_callback epoch 163 lr 1e-06
598  Epoch 00164: early stopping
599  ##############show result##############
600  history.png has been saved!
601  #############model evaluate#############
602  load the trained model
603  results test_loss: 0.004486754536628723
604  results test_mean_squared_error: 0.004486754536628723
```

605
606 `Process finished with exit code 0`
607