

```
1 C:\Users\lucas\PycharmProjects\pythonProject2\venv\  
  Scripts\python.exe C:\Users\lucas\PycharmProjects\  
  pythonProject2\main.py  
2 2024-06-07 20:53:20.274110: I tensorflow/core/util/  
  port.cc:113] oneDNN custom operations are on. You may  
  see slightly different numerical results due to  
  floating-point round-off errors from different  
  computation orders. To turn them off, set the  
  environment variable `TF_ENABLE_ONEDNN_OPTS=0`.  
3 2024-06-07 20:53:21.338105: I tensorflow/core/util/  
  port.cc:113] oneDNN custom operations are on. You may  
  see slightly different numerical results due to  
  floating-point round-off errors from different  
  computation orders. To turn them off, set the  
  environment variable `TF_ENABLE_ONEDNN_OPTS=0`.  
4 Runtime Seed: 07062024_205323  
5 Total configs: 12  
6 Número de GPUs disponíveis: 0  
7 ======  
8 Config nº1  
9 [33, 7, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100, 12  
 , 0.001, 'MLP']  
10 C:\Users\lucas\PycharmProjects\pythonProject2\venv\  
  Lib\site-packages\keras\src\layers\core\dense.py:87:  
  UserWarning: Do not pass an `input_shape`/`input_dim`  
  ` argument to a layer. When using Sequential models,  
  prefer using an `Input(shape)` object as the first  
  layer in the model instead.  
11 super().__init__(activity_regularizer=  
  activity_regularizer, **kwargs)  
12 2024-06-07 20:53:23.357415: I tensorflow/core/  
  platform/cpu_feature_guard.cc:210] This TensorFlow  
  binary is optimized to use available CPU instructions  
  in performance-critical operations.  
13 To enable the following instructions: AVX2 FMA, in  
  other operations, rebuild TensorFlow with the  
  appropriate compiler flags.  
14 Model: "sequential"  
15 [REDACTED]
```

	Layer (type)	Param #	Output Shape
16			
17			
18	dense (Dense)	1,122	(None, 33)
19	)		
20	dense_1 (Dense)	2,176	(None, 64)
21	)		
22	dense_2 (Dense)	4,160	(None, 64)
23	)		
24	dropout (Dropout)	0	(None, 64)
25	)		
26	dense_3 (Dense)	65	(None, 1)
27	)		
28	Total params: 7,523 (29.39 KB)		
29	Trainable params: 7,523 (29.39 KB)		
30	Non-trainable params: 0 (0.00 B)		
31	Epoch 1/100		
32	267/267 ━━━━━━ 1s 848us/step - loss: 42 .2244		
33	Epoch 2/100		
34	267/267 ━━━━━━ 0s 809us/step - loss: 11 .3310		
35	Epoch 3/100		
36	267/267 ━━━━━━ 0s 818us/step - loss: 10 .9450		
37	Epoch 4/100		
38	267/267 ━━━━━━ 0s 847us/step - loss: 11 .5588		
39	Epoch 5/100		
40	267/267 ━━━━━━ 0s 806us/step - loss: 10		

```
40 .2989
41 Epoch 6/100
42 267/267 ━━━━━━━━ 0s 810us/step - loss: 10
    .1784
43 Epoch 7/100
44 267/267 ━━━━━━━━ 0s 817us/step - loss: 10
    .2758
45 Epoch 8/100
46 267/267 ━━━━━━━━ 0s 891us/step - loss: 10
    .6685
47 Epoch 9/100
48 267/267 ━━━━━━━━ 0s 805us/step - loss: 10
    .6853
49 Epoch 10/100
50 267/267 ━━━━━━━━ 0s 821us/step - loss: 9.
    6814
51 Epoch 11/100
52 267/267 ━━━━━━━━ 0s 821us/step - loss: 10
    .1892
53 Epoch 12/100
54 267/267 ━━━━━━━━ 0s 883us/step - loss: 9.
    7789
55 Epoch 13/100
56 267/267 ━━━━━━━━ 0s 816us/step - loss: 9.
    8358
57 Epoch 14/100
58 267/267 ━━━━━━━━ 0s 808us/step - loss: 9.
    5902
59 Epoch 15/100
60 267/267 ━━━━━━━━ 0s 839us/step - loss: 10
    .1034
61 Epoch 16/100
62 267/267 ━━━━━━━━ 0s 824us/step - loss: 9.
    4158
63 Epoch 17/100
64 267/267 ━━━━━━━━ 0s 838us/step - loss: 9.
    3392
65 Epoch 18/100
66 267/267 ━━━━━━━━ 0s 820us/step - loss: 9.
    8600
67 Epoch 19/100
```

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68 267/267 ━━━━━━━━ 0s 893us/step - loss: 8  
    .9345  
69 Epoch 20/100  
70 267/267 ━━━━━━ 0s 824us/step - loss: 8  
    .9818  
71 Epoch 21/100  
72 267/267 ━━━━━━ 0s 820us/step - loss: 8  
    .8623  
73 Epoch 22/100  
74 267/267 ━━━━━━ 0s 809us/step - loss:  
    10.0751  
75 Epoch 23/100  
76 267/267 ━━━━━━ 0s 809us/step - loss: 9  
    .1437  
77 Epoch 24/100  
78 267/267 ━━━━━━ 0s 831us/step - loss: 8  
    .7693  
79 Epoch 25/100  
80 267/267 ━━━━━━ 0s 816us/step - loss: 8  
    .8494  
81 Epoch 26/100  
82 267/267 ━━━━━━ 0s 808us/step - loss: 9  
    .2006  
83 Epoch 27/100  
84 267/267 ━━━━━━ 0s 833us/step - loss: 9  
    .0742  
85 Epoch 28/100  
86 267/267 ━━━━━━ 0s 823us/step - loss: 9  
    .3915  
87 Epoch 29/100  
88 267/267 ━━━━━━ 0s 807us/step - loss: 9  
    .4279  
89 Epoch 30/100  
90 267/267 ━━━━━━ 0s 814us/step - loss: 9  
    .1465  
91 Epoch 31/100  
92 267/267 ━━━━━━ 0s 832us/step - loss: 9  
    .1947  
93 Epoch 32/100  
94 267/267 ━━━━━━ 0s 835us/step - loss: 9  
    .6595
```

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95 Epoch 33/100
96 267/267 ━━━━━━━━ 0s 823us/step - loss: 8
    .8495
97 Epoch 34/100
98 267/267 ━━━━━━━━ 0s 834us/step - loss: 8
    .6670
99 Epoch 35/100
100 267/267 ━━━━━━━━ 0s 803us/step - loss: 8
    .7948
101 Epoch 36/100
102 267/267 ━━━━━━━━ 0s 841us/step - loss: 8
    .7151
103 Epoch 37/100
104 267/267 ━━━━━━━━ 0s 904us/step - loss: 8
    .6199
105 Epoch 38/100
106 267/267 ━━━━━━━━ 0s 812us/step - loss: 9
    .3167
107 Epoch 39/100
108 267/267 ━━━━━━━━ 0s 813us/step - loss: 8
    .7839
109 Epoch 40/100
110 267/267 ━━━━━━━━ 0s 814us/step - loss: 8
    .6694
111 Epoch 41/100
112 267/267 ━━━━━━━━ 0s 814us/step - loss: 8
    .8227
113 Epoch 42/100
114 267/267 ━━━━━━━━ 0s 798us/step - loss: 8
    .3552
115 Epoch 43/100
116 267/267 ━━━━━━━━ 0s 809us/step - loss: 7
    .9710
117 Epoch 44/100
118 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    2555
119 Epoch 45/100
120 267/267 ━━━━━━━━ 0s 861us/step - loss: 8
    .4382
121 Epoch 46/100
122 267/267 ━━━━━━━━ 0s 798us/step - loss: 8
```

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122 .3097
123 Epoch 47/100
124 267/267 ━━━━━━━━ 0s 863us/step - loss: 8
    .2655
125 Epoch 48/100
126 267/267 ━━━━━━━━ 0s 812us/step - loss: 8
    .5394
127 Epoch 49/100
128 267/267 ━━━━━━━━ 0s 842us/step - loss: 7
    .4930
129 Epoch 50/100
130 267/267 ━━━━━━━━ 0s 842us/step - loss: 8
    .3607
131 Epoch 51/100
132 267/267 ━━━━━━━━ 0s 819us/step - loss: 8
    .5383
133 Epoch 52/100
134 267/267 ━━━━━━━━ 0s 831us/step - loss: 7
    .4371
135 Epoch 53/100
136 267/267 ━━━━━━━━ 0s 861us/step - loss: 7
    .6617
137 Epoch 54/100
138 267/267 ━━━━━━━━ 0s 804us/step - loss: 8
    .8212
139 Epoch 55/100
140 267/267 ━━━━━━━━ 0s 806us/step - loss: 8
    .1455
141 Epoch 56/100
142 267/267 ━━━━━━━━ 0s 816us/step - loss: 7
    .9032
143 Epoch 57/100
144 267/267 ━━━━━━━━ 0s 834us/step - loss: 8
    .0140
145 Epoch 58/100
146 267/267 ━━━━━━━━ 0s 813us/step - loss: 7
    .9761
147 Epoch 59/100
148 267/267 ━━━━━━━━ 0s 840us/step - loss: 7
    .6094
149 Epoch 60/100
```

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150 267/267 ━━━━━━━━ 0s 833us/step - loss: 8  
    .0495  
151 Epoch 61/100  
152 267/267 ━━━━━━ 0s 855us/step - loss: 7  
    .5356  
153 Epoch 62/100  
154 267/267 ━━━━━━ 0s 827us/step - loss: 7  
    .9131  
155 Epoch 63/100  
156 267/267 ━━━━━━ 0s 810us/step - loss: 7  
    .7234  
157 Epoch 64/100  
158 267/267 ━━━━━━ 0s 828us/step - loss: 7  
    .5701  
159 Epoch 65/100  
160 267/267 ━━━━━━ 0s 899us/step - loss: 7  
    .4749  
161 Epoch 66/100  
162 267/267 ━━━━━━ 0s 804us/step - loss: 7  
    .8238  
163 Epoch 67/100  
164 267/267 ━━━━━━ 0s 803us/step - loss: 7  
    .7912  
165 Epoch 68/100  
166 267/267 ━━━━━━ 0s 866us/step - loss: 8  
    .0651  
167 Epoch 69/100  
168 267/267 ━━━━━━ 0s 856us/step - loss: 7  
    .5081  
169 Epoch 70/100  
170 267/267 ━━━━━━ 0s 831us/step - loss: 8  
    .3294  
171 Epoch 71/100  
172 267/267 ━━━━━━ 0s 807us/step - loss: 7  
    .0106  
173 Epoch 72/100  
174 267/267 ━━━━━━ 0s 824us/step - loss: 7  
    .2979  
175 Epoch 73/100  
176 267/267 ━━━━━━ 0s 822us/step - loss: 7  
    .3744
```

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177 Epoch 74/100
178 267/267 ━━━━━━━━ 0s 839us/step - loss: 7
    .5630
179 Epoch 75/100
180 267/267 ━━━━━━━━ 0s 806us/step - loss: 7
    .4649
181 Epoch 76/100
182 267/267 ━━━━━━━━ 0s 837us/step - loss: 7
    .1811
183 Epoch 77/100
184 267/267 ━━━━━━━━ 0s 849us/step - loss: 7
    .4156
185 Epoch 78/100
186 267/267 ━━━━━━━━ 0s 819us/step - loss: 6
    .9992
187 Epoch 79/100
188 267/267 ━━━━━━━━ 0s 819us/step - loss: 6
    .8268
189 Epoch 80/100
190 267/267 ━━━━━━━━ 0s 832us/step - loss: 6
    .4515
191 Epoch 81/100
192 267/267 ━━━━━━━━ 0s 814us/step - loss: 7
    .1046
193 Epoch 82/100
194 267/267 ━━━━━━━━ 0s 851us/step - loss: 6
    .9715
195 Epoch 83/100
196 267/267 ━━━━━━━━ 0s 814us/step - loss: 7
    .0909
197 Epoch 84/100
198 267/267 ━━━━━━━━ 0s 858us/step - loss: 6
    .6760
199 Epoch 85/100
200 267/267 ━━━━━━━━ 0s 837us/step - loss: 6
    .3712
201 Epoch 86/100
202 267/267 ━━━━━━━━ 0s 833us/step - loss: 6
    .6753
203 Epoch 87/100
204 267/267 ━━━━━━━━ 0s 815us/step - loss: 6
```

```

204 .7726
205 Epoch 88/100
206 267/267 ━━━━━━━━ 0s 819us/step - loss: 6
    .6295
207 Epoch 89/100
208 267/267 ━━━━━━━━ 0s 815us/step - loss: 7
    .1451
209 24/24 ━━━━━━ 0s 2ms/step
210 Score (MSE): 1.048601464439174
211 Score (RMSE): 1.0240124337327032
212 Time (seconds): 24.343535
213 =====
=====
214 Config n°2
215 [33, 7, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100,
   12, 0.001, 'LSTM']
216 C:\Users\lucas\PycharmProjects\pythonProject2\venv\
   Lib\site-packages\keras\src\layers\core\dense.py:87
   : UserWarning: Do not pass an `input_shape`/`input_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.
217     super().__init__(activity_regularizer=
   activity_regularizer, **kwargs)
218 Model: "sequential_1"
219
220 | Layer (type) | Param # | Output Shape |
221 |             |          |              |
222 | dense_4 (Dense) | 66 | (None, 33, 33)
223 |             |          |              |
224 | lstm (LSTM) | 25,088 | (None, 33, 64)
225 |             |          |              |
226 | lstm_1 (LSTM) | 33,024 | (None, 64)

```

```
227
228 dropout_1 (Dropout)          | (None, 64
229 )
230 dense_5 (Dense)            | (None, 1
231
232 Total params: 58,243 (227.51 KB)
233 Trainable params: 58,243 (227.51 KB)
234 Non-trainable params: 0 (0.00 B)
235 Epoch 1/100
236 267/267 ━━━━━━━━ 6s 13ms/step - loss:
   250.2489
237 Epoch 2/100
238 267/267 ━━━━━━━━ 3s 12ms/step - loss: 37
   .2319
239 Epoch 3/100
240 267/267 ━━━━━━━━ 3s 13ms/step - loss: 24
   .3697
241 Epoch 4/100
242 267/267 ━━━━━━━━ 3s 12ms/step - loss: 9.
   7334
243 Epoch 5/100
244 267/267 ━━━━━━━━ 3s 12ms/step - loss: 7.
   1328
245 Epoch 6/100
246 267/267 ━━━━━━━━ 3s 13ms/step - loss: 6.
   2763
247 Epoch 7/100
248 267/267 ━━━━━━━━ 4s 15ms/step - loss: 6.
   1646
249 Epoch 8/100
250 267/267 ━━━━━━━━ 4s 15ms/step - loss: 5.
   1196
251 Epoch 9/100
252 267/267 ━━━━━━━━ 4s 15ms/step - loss: 4.
   5755
253 Epoch 10/100
```

```
254 267/267 ━━━━━━━━ 4s 16ms/step - loss: 5.  
    7338  
255 Epoch 11/100  
256 267/267 ━━━━━━━━ 4s 16ms/step - loss: 4.  
    5451  
257 Epoch 12/100  
258 267/267 ━━━━━━━━ 4s 17ms/step - loss: 4.  
    3466  
259 Epoch 13/100  
260 267/267 ━━━━━━━━ 4s 17ms/step - loss: 4.  
    3467  
261 Epoch 14/100  
262 267/267 ━━━━━━━━ 4s 16ms/step - loss: 4.  
    6513  
263 Epoch 15/100  
264 267/267 ━━━━━━━━ 4s 15ms/step - loss: 4.  
    1647  
265 Epoch 16/100  
266 267/267 ━━━━━━━━ 4s 16ms/step - loss: 4.  
    2970  
267 Epoch 17/100  
268 267/267 ━━━━━━━━ 4s 15ms/step - loss: 4.  
    1204  
269 Epoch 18/100  
270 267/267 ━━━━━━━━ 4s 15ms/step - loss: 4.  
    3245  
271 Epoch 19/100  
272 267/267 ━━━━━━━━ 4s 15ms/step - loss: 4.  
    1003  
273 Epoch 20/100  
274 267/267 ━━━━━━━━ 4s 14ms/step - loss: 3.  
    9184  
275 Epoch 21/100  
276 267/267 ━━━━━━━━ 4s 14ms/step - loss: 3.  
    6927  
277 Epoch 22/100  
278 267/267 ━━━━━━━━ 4s 14ms/step - loss: 4.  
    1327  
279 Epoch 23/100  
280 267/267 ━━━━━━━━ 4s 15ms/step - loss: 4.  
    2880
```

```
281 Epoch 24/100
282 267/267 ━━━━━━━━ 4s 14ms/step - loss: 3.
    9254
283 Epoch 25/100
284 267/267 ━━━━━━━━ 4s 14ms/step - loss: 3.
    8522
285 Epoch 26/100
286 267/267 ━━━━━━━━ 4s 14ms/step - loss: 3.
    6067
287 Epoch 27/100
288 267/267 ━━━━━━━━ 4s 15ms/step - loss: 3.
    8563
289 Epoch 28/100
290 267/267 ━━━━━━━━ 4s 15ms/step - loss: 4.
    2675
291 Epoch 29/100
292 267/267 ━━━━━━━━ 4s 15ms/step - loss: 3.
    8052
293 Epoch 30/100
294 267/267 ━━━━━━━━ 4s 16ms/step - loss: 3.
    6228
295 Epoch 31/100
296 267/267 ━━━━━━━━ 4s 16ms/step - loss: 4.
    1392
297 Epoch 32/100
298 267/267 ━━━━━━━━ 4s 16ms/step - loss: 3.
    6418
299 Epoch 33/100
300 267/267 ━━━━━━━━ 4s 15ms/step - loss: 3.
    8353
301 Epoch 34/100
302 267/267 ━━━━━━━━ 4s 15ms/step - loss: 3.
    9495
303 Epoch 35/100
304 267/267 ━━━━━━━━ 4s 15ms/step - loss: 3.
    7528
305 Epoch 36/100
306 267/267 ━━━━━━━━ 4s 14ms/step - loss: 3.
    8066
307 Epoch 37/100
308 267/267 ━━━━━━━━ 4s 16ms/step - loss: 3.
```

```
308 9586
309 Epoch 38/100
310 267/267 ━━━━━━━━━━ 4s 15ms/step - loss: 3.
      5943
311 Epoch 39/100
312 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 3.
      6113
313 Epoch 40/100
314 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 3.
      8314
315 Epoch 41/100
316 267/267 ━━━━━━━━━━ 5s 17ms/step - loss: 3.
      5103
317 Epoch 42/100
318 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 3.
      8510
319 Epoch 43/100
320 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 4.
      2934
321 Epoch 44/100
322 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 4.
      0057
323 Epoch 45/100
324 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 3.
      6596
325 Epoch 46/100
326 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 3.
      7148
327 Epoch 47/100
328 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 3.
      6167
329 Epoch 48/100
330 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 3.
      5803
331 Epoch 49/100
332 267/267 ━━━━━━━━━━ 4s 15ms/step - loss: 3.
      8531
333 Epoch 50/100
334 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 3.
      5305
335 Epoch 51/100
```

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336 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 3.
       6778
337 Epoch 52/100
338 267/267 ━━━━━━━━━━ 4s 17ms/step - loss: 3.
       6876
339 Epoch 53/100
340 267/267 ━━━━━━━━━━ 4s 16ms/step - loss: 3.
       6942
341 Epoch 54/100
342 267/267 ━━━━━━━━━━ 5s 17ms/step - loss: 3.
       7290
343 Epoch 55/100
344 267/267 ━━━━━━━━━━ 5s 17ms/step - loss: 3.
       5005
345 Score (MSE): 1.3520792852354024
346 Score (RMSE): 1.1627894414877538
347 Time (seconds): 269.153842
348 =====
349 Config n°3
350 [33, 7, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100,
   12, 0.001, 'BiLSTM']
351 C:\Users\lucas\PycharmProjects\pythonProject2\venv\
   Lib\site-packages\keras\src\layers\core\dense.py:87
   : UserWarning: Do not pass an `input_shape`/
   `input_dim` argument to a layer. When using
   Sequential models, prefer using an `Input(shape)`
   object as the first layer in the model instead.
352     super().__init__(activity_regularizer=
   activity_regularizer, **kwargs)
353 Model: "sequential_2"
354
355 | Layer (type)           | Param # | Output Shape |
356 |-----|-----|-----|
357 | dense_6 (Dense)        | 66      | (None, 33, 33)
358 |-----|-----|-----|

```

359	bidirectional (Bidirectional)	(None, 33, 128)
)	50,176	
360		
361	bidirectional_1 (Bidirectional)	(None, 128)
)	98,816	
362		
363	dropout_2 (Dropout)	(None, 128)
)	0	
364		
365	dense_7 (Dense)	(None, 1)
)	129	
366		
367	Total params: 149,187 (582.76 KB)	
368	Trainable params: 149,187 (582.76 KB)	
369	Non-trainable params: 0 (0.00 B)	
370	Epoch 1/100	
371	267/267 ━━━━━━━━ 11s 21ms/step - loss: 175.5337	
372	Epoch 2/100	
373	267/267 ━━━━━━ 6s 22ms/step - loss: 19.7912	
374	Epoch 3/100	
375	267/267 ━━━━━━ 6s 23ms/step - loss: 5.6958	
376	Epoch 4/100	
377	267/267 ━━━━━━ 6s 24ms/step - loss: 4.7930	
378	Epoch 5/100	
379	267/267 ━━━━━━ 7s 27ms/step - loss: 3.8922	
380	Epoch 6/100	
381	267/267 ━━━━━━ 7s 27ms/step - loss: 3.7223	
382	Epoch 7/100	
383	267/267 ━━━━━━ 7s 25ms/step - loss: 3.5854	
384	Epoch 8/100	

```
385 267/267 ━━━━━━━━ 6s 24ms/step - loss: 3.  
      5346  
386 Epoch 9/100  
387 267/267 ━━━━━━━━ 6s 24ms/step - loss: 3.  
      5611  
388 Epoch 10/100  
389 267/267 ━━━━━━━━ 6s 22ms/step - loss: 3.  
      0969  
390 Epoch 11/100  
391 267/267 ━━━━━━━━ 6s 21ms/step - loss: 3.  
      1386  
392 Epoch 12/100  
393 267/267 ━━━━━━━━ 6s 22ms/step - loss: 3.  
      1019  
394 Epoch 13/100  
395 267/267 ━━━━━━━━ 6s 23ms/step - loss: 3.  
      1308  
396 Epoch 14/100  
397 267/267 ━━━━━━━━ 6s 23ms/step - loss: 2.  
      9319  
398 Epoch 15/100  
399 267/267 ━━━━━━━━ 7s 25ms/step - loss: 3.  
      0313  
400 Epoch 16/100  
401 267/267 ━━━━━━━━ 7s 26ms/step - loss: 3.  
      0463  
402 Epoch 17/100  
403 267/267 ━━━━━━━━ 7s 25ms/step - loss: 2.  
      9188  
404 Epoch 18/100  
405 267/267 ━━━━━━━━ 7s 25ms/step - loss: 3.  
      2321  
406 Epoch 19/100  
407 267/267 ━━━━━━━━ 6s 24ms/step - loss: 2.  
      7626  
408 Epoch 20/100  
409 267/267 ━━━━━━━━ 7s 25ms/step - loss: 3.  
      0829  
410 Epoch 21/100  
411 267/267 ━━━━━━━━ 6s 22ms/step - loss: 3.  
      0519
```

```
412 Epoch 22/100
413 267/267 ━━━━━━━━ 6s 22ms/step - loss: 2.
    6613
414 Epoch 23/100
415 267/267 ━━━━━━━━ 6s 23ms/step - loss: 2.
    7734
416 Epoch 24/100
417 267/267 ━━━━━━━━ 7s 25ms/step - loss: 2.
    5585
418 Epoch 25/100
419 267/267 ━━━━━━━━ 7s 26ms/step - loss: 2.
    8934
420 Epoch 26/100
421 267/267 ━━━━━━━━ 7s 26ms/step - loss: 2.
    8686
422 Epoch 27/100
423 267/267 ━━━━━━━━ 7s 25ms/step - loss: 2.
    7531
424 Epoch 28/100
425 267/267 ━━━━━━━━ 7s 25ms/step - loss: 2.
    6808
426 Epoch 29/100
427 267/267 ━━━━━━━━ 6s 24ms/step - loss: 2.
    8098
428 Epoch 30/100
429 267/267 ━━━━━━━━ 6s 23ms/step - loss: 2.
    7775
430 Epoch 31/100
431 267/267 ━━━━━━━━ 6s 23ms/step - loss: 2.
    6990
432 Epoch 32/100
433 267/267 ━━━━━━━━ 6s 24ms/step - loss: 2.
    8272
434 Epoch 33/100
435 267/267 ━━━━━━━━ 7s 25ms/step - loss: 2.
    8671
436 Epoch 34/100
437 267/267 ━━━━━━━━ 7s 26ms/step - loss: 2.
    6852
438 Epoch 35/100
439 267/267 ━━━━━━━━ 7s 26ms/step - loss: 2.
```

```
439 7596
440 Epoch 36/100
441 267/267 ━━━━━━━━━━ 6s 24ms/step - loss: 2.
6969
442 Epoch 37/100
443 267/267 ━━━━━━━━━━ 6s 23ms/step - loss: 2.
5755
444 Epoch 38/100
445 267/267 ━━━━━━━━━━ 6s 22ms/step - loss: 2.
8767
446 Score (MSE): 1.0364449224271013
447 Score (RMSE): 1.0180593904223374
448 Time (seconds): 293.312113
449 =====
=====
450 Config n°4
451 [33, 21, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100,
12, 0.001, 'MLP']
452 C:\Users\lucas\PycharmProjects\pythonProject2\venv\
Lib\site-packages\keras\src\layers\core\dense.py:87
: UserWarning: Do not pass an `input_shape`/`input_dim` argument to a layer. When using
Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.
453     super().__init__(activity_regularizer=
activity_regularizer, **kwargs)
454 Model: "sequential_3"
455
456 | Layer (type)           | Param # | Output Shape
457 |
458 | dense_8 (Dense)        | 1,122   | (None, 33)
459 |
460 | dense_9 (Dense)        | 2,176   | (None, 64)
461 |
```

462	dense_10 (Dense)		(None, 64)
)		4,160	
463			
464	dropout_3 (Dropout)		(None, 64)
)		0	
465			
466	dense_11 (Dense)		(None, 1)
)		65	
467			
468	Total params:	7,523	(29.39 KB)
469	Trainable params:	7,523	(29.39 KB)
470	Non-trainable params:	0	(0.00 B)
471	Epoch 1/100		
472	267/267	1s 956us/step	- loss: 46.2882
473	Epoch 2/100		
474	267/267	0s 977us/step	- loss: 15.5061
475	Epoch 3/100		
476	267/267	0s 981us/step	- loss: 12.8957
477	Epoch 4/100		
478	267/267	0s 1ms/step	- loss: 13.4897
479	Epoch 5/100		
480	267/267	0s 989us/step	- loss: 12.5735
481	Epoch 6/100		
482	267/267	0s 950us/step	- loss: 12.2186
483	Epoch 7/100		
484	267/267	0s 956us/step	- loss: 12.5976
485	Epoch 8/100		
486	267/267	0s 996us/step	- loss: 12.4474
487	Epoch 9/100		
488	267/267	0s 969us/step	- loss:

```
488 11.8223
489 Epoch 10/100
490 267/267 ━━━━━━━━ 0s 970us/step - loss:
12.0491
491 Epoch 11/100
492 267/267 ━━━━━━━━ 0s 978us/step - loss:
11.3560
493 Epoch 12/100
494 267/267 ━━━━━━━━ 0s 934us/step - loss:
11.3092
495 Epoch 13/100
496 267/267 ━━━━━━━━ 0s 933us/step - loss:
12.7598
497 Epoch 14/100
498 267/267 ━━━━━━━━ 0s 940us/step - loss:
10.9363
499 Epoch 15/100
500 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10.
9677
501 Epoch 16/100
502 267/267 ━━━━━━━━ 0s 985us/step - loss:
12.6030
503 Epoch 17/100
504 267/267 ━━━━━━━━ 0s 928us/step - loss:
10.9364
505 Epoch 18/100
506 267/267 ━━━━━━━━ 0s 933us/step - loss:
11.2426
507 Epoch 19/100
508 267/267 ━━━━━━━━ 0s 924us/step - loss:
11.0285
509 Epoch 20/100
510 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10.
9933
511 Epoch 21/100
512 267/267 ━━━━━━━━ 0s 963us/step - loss:
10.0716
513 Epoch 22/100
514 267/267 ━━━━━━━━ 0s 985us/step - loss:
10.9929
515 Epoch 23/100
```

```
516 267/267 ━━━━━━━━ 0s 990us/step - loss:  
10.7958  
517 Epoch 24/100  
518 267/267 ━━━━━━ 0s 934us/step - loss:  
11.0515  
519 Epoch 25/100  
520 267/267 ━━━━━━ 0s 976us/step - loss:  
10.1230  
521 Epoch 26/100  
522 267/267 ━━━━━━ 0s 1ms/step - loss: 10.  
6039  
523 Epoch 27/100  
524 267/267 ━━━━━━ 0s 1ms/step - loss: 10.  
8957  
525 Epoch 28/100  
526 267/267 ━━━━━━ 0s 1ms/step - loss: 9.  
4852  
527 Epoch 29/100  
528 267/267 ━━━━━━ 0s 1ms/step - loss: 10.  
3086  
529 Epoch 30/100  
530 267/267 ━━━━━━ 0s 997us/step - loss:  
11.6580  
531 Epoch 31/100  
532 267/267 ━━━━━━ 0s 990us/step - loss:  
10.2214  
533 Epoch 32/100  
534 267/267 ━━━━━━ 0s 953us/step - loss: 9  
.7110  
535 Epoch 33/100  
536 267/267 ━━━━━━ 0s 1ms/step - loss: 9.  
8429  
537 Epoch 34/100  
538 267/267 ━━━━━━ 0s 929us/step - loss:  
10.0033  
539 Epoch 35/100  
540 267/267 ━━━━━━ 0s 1ms/step - loss: 10.  
3595  
541 Epoch 36/100  
542 267/267 ━━━━━━ 0s 980us/step - loss: 9  
.8197
```

```
543 Epoch 37/100
544 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
      2027
545 Epoch 38/100
546 267/267 ━━━━━━━━ 0s 974us/step - loss: 9
      .3464
547 Epoch 39/100
548 267/267 ━━━━━━━━ 0s 976us/step - loss: 9
      .3941
549 Epoch 40/100
550 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
      2552
551 Epoch 41/100
552 267/267 ━━━━━━━━ 0s 966us/step - loss: 9
      .4792
553 Epoch 42/100
554 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
      7269
555 Epoch 43/100
556 267/267 ━━━━━━━━ 0s 985us/step - loss: 9
      .3141
557 Epoch 44/100
558 267/267 ━━━━━━━━ 0s 997us/step - loss: 9
      .1413
559 Epoch 45/100
560 267/267 ━━━━━━━━ 0s 975us/step - loss:
      10.2941
561 Epoch 46/100
562 267/267 ━━━━━━━━ 0s 973us/step - loss: 9
      .4114
563 Epoch 47/100
564 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
      5958
565 24/24 ━━━━━━━━ 0s 2ms/step
566 Score (MSE): 3.2732230480721607
567 Score (RMSE): 1.8092050873442074
568 Time (seconds): 16.047045
569 =====
      =====
570 Config n°5
571 [33, 21, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100,
```

```
571 12, 0.001, 'LSTM']  
572 C:\Users\lucas\PycharmProjects\pythonProject2\venv\  
Lib\site-packages\keras\src\layers\core\dense.py:87  
: UserWarning: Do not pass an `input_shape`/`  
input_dim` argument to a layer. When using  
Sequential models, prefer using an `Input(shape)`  
object as the first layer in the model instead.  
573     super().__init__(activity_regularizer=  
activity_regularizer, **kwargs)  
574 Model: "sequential_4"  
575  
576 | Layer (type)          | Param # | Output Shape  
577 |  
578 | dense_12 (Dense)      | 66      | (None, 33, 33)  
579 |  
580 | lstm_4 (LSTM)         | 25,088   | (None, 33, 64)  
581 |  
582 | lstm_5 (LSTM)         | 33,024   | (None, 64)  
583 |  
584 | dropout_4 (Dropout)   | 0        | (None, 64)  
585 |  
586 | dense_13 (Dense)      | 65      | (None, 1)  
587 |  
588 Total params: 58,243 (227.51 KB)  
589 Trainable params: 58,243 (227.51 KB)  
590 Non-trainable params: 0 (0.00 B)  
591 Epoch 1/100  
592 267/267 ━━━━━━━━━━ 7s 16ms/step - loss:
```

```
592 285.7400
593 Epoch 2/100
594 267/267 ━━━━━━━━ 5s 17ms/step - loss: 40
.8369
595 Epoch 3/100
596 267/267 ━━━━━━━━ 5s 17ms/step - loss: 26
.5639
597 Epoch 4/100
598 267/267 ━━━━━━━━ 5s 18ms/step - loss: 12
.3064
599 Epoch 5/100
600 267/267 ━━━━━━━━ 5s 18ms/step - loss: 10
.8048
601 Epoch 6/100
602 267/267 ━━━━━━━━ 5s 17ms/step - loss: 9.
7433
603 Epoch 7/100
604 267/267 ━━━━━━━━ 5s 17ms/step - loss: 8.
3724
605 Epoch 8/100
606 267/267 ━━━━━━━━ 4s 16ms/step - loss: 8.
0267
607 Epoch 9/100
608 267/267 ━━━━━━━━ 4s 16ms/step - loss: 7.
5491
609 Epoch 10/100
610 267/267 ━━━━━━━━ 4s 16ms/step - loss: 7.
8064
611 Epoch 11/100
612 267/267 ━━━━━━━━ 4s 16ms/step - loss: 7.
8051
613 Epoch 12/100
614 267/267 ━━━━━━━━ 4s 15ms/step - loss: 7.
5093
615 Epoch 13/100
616 267/267 ━━━━━━━━ 4s 16ms/step - loss: 6.
9039
617 Epoch 14/100
618 267/267 ━━━━━━━━ 4s 16ms/step - loss: 6.
9160
619 Epoch 15/100
```

```
620 267/267 ━━━━━━━━ 4s 16ms/step - loss: 7.  
0533  
621 Epoch 16/100  
622 267/267 ━━━━━━ 4s 17ms/step - loss: 6.  
4134  
623 Epoch 17/100  
624 267/267 ━━━━━━ 5s 18ms/step - loss: 6.  
9445  
625 Epoch 18/100  
626 267/267 ━━━━━━ 5s 17ms/step - loss: 6.  
8750  
627 Epoch 19/100  
628 267/267 ━━━━━━ 5s 20ms/step - loss: 6.  
7063  
629 Epoch 20/100  
630 267/267 ━━━━━━ 5s 19ms/step - loss: 6.  
8370  
631 Epoch 21/100  
632 267/267 ━━━━━━ 5s 18ms/step - loss: 6.  
5043  
633 Epoch 22/100  
634 267/267 ━━━━━━ 5s 17ms/step - loss: 6.  
2008  
635 Epoch 23/100  
636 267/267 ━━━━━━ 5s 17ms/step - loss: 6.  
5539  
637 Epoch 24/100  
638 267/267 ━━━━━━ 5s 17ms/step - loss: 6.  
3357  
639 Epoch 25/100  
640 267/267 ━━━━━━ 4s 17ms/step - loss: 6.  
6462  
641 Epoch 26/100  
642 267/267 ━━━━━━ 4s 16ms/step - loss: 6.  
1374  
643 Epoch 27/100  
644 267/267 ━━━━━━ 4s 16ms/step - loss: 6.  
1537  
645 Epoch 28/100  
646 267/267 ━━━━━━ 4s 16ms/step - loss: 6.  
0507
```

```
647 Epoch 29/100
648 267/267 ━━━━━━━━ 4s 16ms/step - loss: 6.
    7901
649 Epoch 30/100
650 267/267 ━━━━━━━━ 5s 17ms/step - loss: 6.
    3822
651 Epoch 31/100
652 267/267 ━━━━━━━━ 5s 17ms/step - loss: 6.
    0608
653 Epoch 32/100
654 267/267 ━━━━━━━━ 5s 19ms/step - loss: 6.
    4209
655 Epoch 33/100
656 267/267 ━━━━━━━━ 5s 18ms/step - loss: 5.
    9672
657 Epoch 34/100
658 267/267 ━━━━━━━━ 5s 18ms/step - loss: 6.
    3712
659 Epoch 35/100
660 267/267 ━━━━━━━━ 5s 17ms/step - loss: 6.
    2950
661 Epoch 36/100
662 267/267 ━━━━━━━━ 5s 18ms/step - loss: 6.
    3486
663 Epoch 37/100
664 267/267 ━━━━━━━━ 4s 17ms/step - loss: 6.
    2838
665 Epoch 38/100
666 267/267 ━━━━━━━━ 4s 16ms/step - loss: 6.
    6415
667 Epoch 39/100
668 267/267 ━━━━━━━━ 4s 16ms/step - loss: 5.
    7479
669 Epoch 40/100
670 267/267 ━━━━━━━━ 4s 16ms/step - loss: 5.
    9821
671 Epoch 41/100
672 267/267 ━━━━━━━━ 5s 17ms/step - loss: 6.
    1249
673 Epoch 42/100
674 267/267 ━━━━━━━━ 4s 16ms/step - loss: 6.
```

```
674 2211
675 Epoch 43/100
676 267/267 ━━━━━━━━ 5s 18ms/step - loss: 5.
6889
677 Epoch 44/100
678 267/267 ━━━━━━━━ 5s 19ms/step - loss: 5.
6157
679 Epoch 45/100
680 267/267 ━━━━━━━━ 5s 18ms/step - loss: 6.
1767
681 Epoch 46/100
682 267/267 ━━━━━━━━ 5s 19ms/step - loss: 6.
0860
683 Epoch 47/100
684 267/267 ━━━━━━━━ 5s 18ms/step - loss: 6.
2762
685 Epoch 48/100
686 267/267 ━━━━━━━━ 4s 16ms/step - loss: 5.
7310
687 Epoch 49/100
688 267/267 ━━━━━━━━ 4s 16ms/step - loss: 6.
2392
689 Epoch 50/100
690 267/267 ━━━━━━━━ 4s 16ms/step - loss: 5.
7914
691 Epoch 51/100
692 267/267 ━━━━━━━━ 4s 16ms/step - loss: 5.
4769
693 Epoch 52/100
694 267/267 ━━━━━━━━ 4s 16ms/step - loss: 6.
0109
695 Epoch 53/100
696 267/267 ━━━━━━━━ 4s 17ms/step - loss: 6.
1819
697 Epoch 54/100
698 267/267 ━━━━━━━━ 5s 17ms/step - loss: 6.
4276
699 Epoch 55/100
700 267/267 ━━━━━━━━ 5s 18ms/step - loss: 6.
2325
701 Epoch 56/100
```

```

702 267/267 ━━━━━━━━ 5s 18ms/step - loss: 5.
    7476
703 Epoch 57/100
704 267/267 ━━━━━━━━ 5s 18ms/step - loss: 5.
    9789
705 Epoch 58/100
706 267/267 ━━━━━━━━ 5s 17ms/step - loss: 6.
    1119
707 Epoch 59/100
708 267/267 ━━━━━━━━ 5s 17ms/step - loss: 6.
    4182
709 Epoch 60/100
710 267/267 ━━━━━━━━ 5s 17ms/step - loss: 5.
    9813
711 Score (MSE): 4.330844436903899
712 Score (RMSE): 2.081068100015927
713 Time (seconds): 321.014366
714 =====
715 Config n°6
716 [33, 21, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100,
    12, 0.001, 'BiLSTM']
717 C:\Users\lucas\PycharmProjects\pythonProject2\venv\
    Lib\site-packages\keras\src\layers\core\dense.py:87
        : UserWarning: Do not pass an `input_shape`/
        `input_dim` argument to a layer. When using
        Sequential models, prefer using an `Input(shape)`
        object as the first layer in the model instead.
718     super().__init__(activity_regularizer=
        activity_regularizer, **kwargs)
719 Model: "sequential_5"
720
721 | Layer (type) | Param # | Output Shape |
722 |             |          |              |
723 | dense_14 (Dense)|       66 | (None, 33, 33)
724 |                 |          |

```

```
725     bidirectional_2 (Bidirectional) | (None, 33, 128
    ) | 50,176 |
726
727     bidirectional_3 (Bidirectional) | (None, 128
    ) | 98,816 |
728
729     dropout_5 (Dropout) | (None, 128
    ) | 0 |
730
731     dense_15 (Dense) | (None, 1
    ) | 129 |
732
733 Total params: 149,187 (582.76 KB)
734 Trainable params: 149,187 (582.76 KB)
735 Non-trainable params: 0 (0.00 B)
736 Epoch 1/100
737 267/267 ━━━━━━━━━━ 12s 26ms/step - loss:
    159.4896
738 Epoch 2/100
739 267/267 ━━━━━━━━━━ 7s 27ms/step - loss: 15
    .1088
740 Epoch 3/100
741 267/267 ━━━━━━━━━━ 7s 25ms/step - loss: 9.
    9276
742 Epoch 4/100
743 267/267 ━━━━━━━━━━ 6s 23ms/step - loss: 8.
    1994
744 Epoch 5/100
745 267/267 ━━━━━━━━━━ 6s 23ms/step - loss: 7.
    0017
746 Epoch 6/100
747 267/267 ━━━━━━━━━━ 6s 23ms/step - loss: 6.
    4900
748 Epoch 7/100
749 267/267 ━━━━━━━━━━ 7s 24ms/step - loss: 6.
    4486
750 Epoch 8/100
```

```
751 267/267 ━━━━━━━━━━ 7s 25ms/step - loss: 5.  
2610  
752 Epoch 9/100  
753 267/267 ━━━━━━━━ 7s 27ms/step - loss: 5.  
3953  
754 Epoch 10/100  
755 267/267 ━━━━━━━━ 8s 30ms/step - loss: 6.  
0769  
756 Epoch 11/100  
757 267/267 ━━━━━━━━ 7s 26ms/step - loss: 5.  
6226  
758 Epoch 12/100  
759 267/267 ━━━━━━━━ 6s 24ms/step - loss: 6.  
0231  
760 Epoch 13/100  
761 267/267 ━━━━━━━━ 6s 23ms/step - loss: 5.  
5224  
762 Epoch 14/100  
763 267/267 ━━━━━━━━ 6s 23ms/step - loss: 5.  
3060  
764 Epoch 15/100  
765 267/267 ━━━━━━━━ 6s 23ms/step - loss: 5.  
9039  
766 Epoch 16/100  
767 267/267 ━━━━━━━━ 7s 24ms/step - loss: 5.  
4091  
768 Epoch 17/100  
769 267/267 ━━━━━━━━ 7s 26ms/step - loss: 5.  
8897  
770 Epoch 18/100  
771 267/267 ━━━━━━━━ 7s 28ms/step - loss: 5.  
1018  
772 Epoch 19/100  
773 267/267 ━━━━━━━━ 8s 30ms/step - loss: 5.  
4829  
774 Epoch 20/100  
775 267/267 ━━━━━━━━ 7s 27ms/step - loss: 5.  
2742  
776 Epoch 21/100  
777 267/267 ━━━━━━━━ 7s 25ms/step - loss: 4.  
8765
```

```
778 Epoch 22/100
779 267/267 ━━━━━━━━ 6s 24ms/step - loss: 5.
    8165
780 Epoch 23/100
781 267/267 ━━━━━━━━ 6s 23ms/step - loss: 5.
    6280
782 Epoch 24/100
783 267/267 ━━━━━━━━ 6s 24ms/step - loss: 5.
    0119
784 Epoch 25/100
785 267/267 ━━━━━━━━ 6s 24ms/step - loss: 5.
    1680
786 Epoch 26/100
787 267/267 ━━━━━━━━ 7s 25ms/step - loss: 4.
    9899
788 Epoch 27/100
789 267/267 ━━━━━━━━ 7s 27ms/step - loss: 5.
    3971
790 Epoch 28/100
791 267/267 ━━━━━━━━ 9s 32ms/step - loss: 4.
    8769
792 Epoch 29/100
793 267/267 ━━━━━━━━ 9s 34ms/step - loss: 5.
    2411
794 Epoch 30/100
795 267/267 ━━━━━━━━ 8s 28ms/step - loss: 5.
    1578
796 Epoch 31/100
797 267/267 ━━━━━━━━ 6s 24ms/step - loss: 5.
    0467
798 Epoch 32/100
799 267/267 ━━━━━━━━ 6s 23ms/step - loss: 5.
    0051
800 Epoch 33/100
801 267/267 ━━━━━━━━ 6s 23ms/step - loss: 5.
    3773
802 Epoch 34/100
803 267/267 ━━━━━━━━ 6s 21ms/step - loss: 5.
    3462
804 Epoch 35/100
805 267/267 ━━━━━━━━ 6s 22ms/step - loss: 5.
```

```
805 4459
806 Epoch 36/100
807 267/267 ━━━━━━━━━━ 6s 24ms/step - loss: 5.
2916
808 Epoch 37/100
809 267/267 ━━━━━━━━ 7s 26ms/step - loss: 5.
0163
810 Epoch 38/100
811 267/267 ━━━━━━ 7s 25ms/step - loss: 4.
9704
812 Epoch 39/100
813 267/267 ━━━━ 7s 27ms/step - loss: 4.
9451
814 Epoch 40/100
815 267/267 ━━━━ 8s 29ms/step - loss: 4.
6840
816 Epoch 41/100
817 267/267 ━━━━ 7s 27ms/step - loss: 4.
6969
818 Epoch 42/100
819 267/267 ━━━━ 7s 25ms/step - loss: 5.
0335
820 Epoch 43/100
821 267/267 ━━━━ 6s 24ms/step - loss: 4.
9115
822 Epoch 44/100
823 267/267 ━━━━ 6s 23ms/step - loss: 5.
4886
824 Epoch 45/100
825 267/267 ━━━━ 6s 22ms/step - loss: 5.
1371
826 Epoch 46/100
827 267/267 ━━━━ 6s 23ms/step - loss: 5.
2633
828 Epoch 47/100
829 267/267 ━━━━ 6s 24ms/step - loss: 5.
3919
830 Epoch 48/100
831 267/267 ━━━━ 7s 27ms/step - loss: 4.
9517
832 Score (MSE): 3.0552363388784984
```

```
833 Score (RMSE): 1.7479234362175302
834 Time (seconds): 373.337207
835 =====
836 Config n°7
837 [99, 7, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100,
12, 0.001, 'MLP']
838 C:\Users\lucas\PycharmProjects\pythonProject2\venv\
Lib\site-packages\keras\src\layers\core\dense.py:87
: UserWarning: Do not pass an `input_shape`/
`input_dim` argument to a layer. When using
Sequential models, prefer using an `Input(shape)`
object as the first layer in the model instead.
839     super().__init__(activity_regularizer=
activity_regularizer, **kwargs)
840 Model: "sequential_6"
841
842 | Layer (type)           | Param # | Output Shape
843 |
844 | dense_16 (Dense)       | 9,900   | (None, 99)
845 |
846 | dense_17 (Dense)       | 6,400   | (None, 64)
847 |
848 | dense_18 (Dense)       | 4,160   | (None, 64)
849 |
850 | dropout_6 (Dropout)    | 0        | (None, 64)
851 |
852 | dense_19 (Dense)       | 65      | (None, 1)
853
```

```
853 [REDACTED]
854 Total params: 20,525 (80.18 KB)
855 Trainable params: 20,525 (80.18 KB)
856 Non-trainable params: 0 (0.00 B)
857 Epoch 1/100
858 267/267 [REDACTED] 1s 914us/step - loss:
238.1320
859 Epoch 2/100
860 267/267 [REDACTED] 0s 1ms/step - loss: 13.
6983
861 Epoch 3/100
862 267/267 [REDACTED] 0s 1ms/step - loss: 10.
9318
863 Epoch 4/100
864 267/267 [REDACTED] 0s 1ms/step - loss: 12.
9459
865 Epoch 5/100
866 267/267 [REDACTED] 0s 1ms/step - loss: 10.
2670
867 Epoch 6/100
868 267/267 [REDACTED] 0s 1ms/step - loss: 11.
4168
869 Epoch 7/100
870 267/267 [REDACTED] 0s 1ms/step - loss: 10.
4688
871 Epoch 8/100
872 267/267 [REDACTED] 0s 994us/step - loss:
11.2800
873 Epoch 9/100
874 267/267 [REDACTED] 0s 1ms/step - loss: 10.
1866
875 Epoch 10/100
876 267/267 [REDACTED] 0s 1ms/step - loss: 10.
7083
877 Epoch 11/100
878 267/267 [REDACTED] 0s 1ms/step - loss: 9.
9584
879 Epoch 12/100
880 267/267 [REDACTED] 0s 1ms/step - loss: 9.
8686
881 Epoch 13/100
```

```
882 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.  
    5800  
883 Epoch 14/100  
884 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10.  
    2568  
885 Epoch 15/100  
886 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.  
    7005  
887 Epoch 16/100  
888 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.  
    0974  
889 Epoch 17/100  
890 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.  
    3705  
891 Epoch 18/100  
892 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.  
    6041  
893 Epoch 19/100  
894 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.  
    5037  
895 Epoch 20/100  
896 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.  
    0085  
897 Epoch 21/100  
898 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10.  
    5547  
899 Epoch 22/100  
900 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.  
    9467  
901 Epoch 23/100  
902 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.  
    5732  
903 Epoch 24/100  
904 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.  
    8505  
905 Epoch 25/100  
906 267/267 ━━━━━━━━ 0s 997us/step - loss: 8  
    .7538  
907 Epoch 26/100  
908 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.  
    5792
```

```
909 Epoch 27/100
910 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    2316
911 Epoch 28/100
912 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
    4655
913 Epoch 29/100
914 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
    7422
915 Epoch 30/100
916 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
    8613
917 Epoch 31/100
918 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    1473
919 Epoch 32/100
920 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    2086
921 Epoch 33/100
922 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    1367
923 Epoch 34/100
924 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
    7402
925 Epoch 35/100
926 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
    5651
927 Epoch 36/100
928 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
    4236
929 Epoch 37/100
930 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
    6488
931 Epoch 38/100
932 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
    1267
933 Epoch 39/100
934 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
    9494
935 Epoch 40/100
936 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
```

```
936 7497
937 Epoch 41/100
938 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
3181
939 Epoch 42/100
940 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
4318
941 Epoch 43/100
942 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
0852
943 Epoch 44/100
944 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
0934
945 Epoch 45/100
946 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
2145
947 Epoch 46/100
948 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
7937
949 Epoch 47/100
950 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
1036
951 Epoch 48/100
952 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
9142
953 Epoch 49/100
954 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
5253
955 Epoch 50/100
956 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
0931
957 Epoch 51/100
958 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
4878
959 Epoch 52/100
960 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
9856
961 Epoch 53/100
962 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
8433
963 Epoch 54/100
```

```
964 267/267 ━━━━━━ 0s 1ms/step - loss: 7.  
    7418  
965 Epoch 55/100  
966 267/267 ━━━━━━ 0s 1ms/step - loss: 7.  
    4218  
967 Epoch 56/100  
968 267/267 ━━━━━━ 0s 1ms/step - loss: 8.  
    1745  
969 Epoch 57/100  
970 267/267 ━━━━━━ 0s 1ms/step - loss: 8.  
    0213  
971 Epoch 58/100  
972 267/267 ━━━━━━ 0s 1ms/step - loss: 8.  
    0657  
973 Epoch 59/100  
974 267/267 ━━━━━━ 0s 1ms/step - loss: 7.  
    2263  
975 Epoch 60/100  
976 267/267 ━━━━━━ 0s 1ms/step - loss: 7.  
    5989  
977 Epoch 61/100  
978 267/267 ━━━━━━ 0s 1ms/step - loss: 7.  
    5297  
979 Epoch 62/100  
980 267/267 ━━━━━━ 0s 1ms/step - loss: 8.  
    0529  
981 Epoch 63/100  
982 267/267 ━━━━━━ 0s 1ms/step - loss: 7.  
    0479  
983 Epoch 64/100  
984 267/267 ━━━━━━ 0s 1ms/step - loss: 7.  
    4719  
985 Epoch 65/100  
986 267/267 ━━━━━━ 0s 1ms/step - loss: 7.  
    4338  
987 Epoch 66/100  
988 267/267 ━━━━━━ 0s 1ms/step - loss: 8.  
    2943  
989 Epoch 67/100  
990 267/267 ━━━━━━ 0s 1ms/step - loss: 7.  
    5207
```

```
991 Epoch 68/100
992 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    9445
993 Epoch 69/100
994 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    1828
995 Epoch 70/100
996 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    1554
997 Epoch 71/100
998 267/267 ━━━━━━━━ 0s 1ms/step - loss: 6.
    7514
999 Epoch 72/100
1000 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    8906
1001 Epoch 73/100
1002 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    7234
1003 Epoch 74/100
1004 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    2790
1005 Epoch 75/100
1006 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    5181
1007 Epoch 76/100
1008 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    6040
1009 Epoch 77/100
1010 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    3627
1011 Epoch 78/100
1012 267/267 ━━━━━━━━ 0s 1ms/step - loss: 6.
    6810
1013 Epoch 79/100
1014 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    3373
1015 Epoch 80/100
1016 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
    0280
1017 Epoch 81/100
1018 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
```

```
1018 1964
1019 Epoch 82/100
1020 267/267 ━━━━━━━━ 0s 1ms/step - loss: 6.
8620
1021 Epoch 83/100
1022 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
0858
1023 Epoch 84/100
1024 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
6163
1025 Epoch 85/100
1026 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
2518
1027 Epoch 86/100
1028 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
0458
1029 Epoch 87/100
1030 267/267 ━━━━━━━━ 0s 1ms/step - loss: 6.
8428
1031 Epoch 88/100
1032 267/267 ━━━━━━━━ 0s 1ms/step - loss: 6.
6508
1033 Epoch 89/100
1034 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
2340
1035 Epoch 90/100
1036 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
2965
1037 Epoch 91/100
1038 267/267 ━━━━━━━━ 0s 1ms/step - loss: 6.
4809
1039 Epoch 92/100
1040 267/267 ━━━━━━━━ 0s 1ms/step - loss: 6.
1990
1041 Epoch 93/100
1042 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
0875
1043 Epoch 94/100
1044 267/267 ━━━━━━━━ 0s 1ms/step - loss: 7.
0317
1045 Epoch 95/100
```

```

1046 267/267 ━━━━━━ 0s 1ms/step - loss: 6.
    8851
1047 Epoch 96/100
1048 267/267 ━━━━━━ 0s 1ms/step - loss: 6.
    3818
1049 Epoch 97/100
1050 267/267 ━━━━━━ 0s 1ms/step - loss: 6.
    5828
1051 Epoch 98/100
1052 267/267 ━━━━━━ 0s 1ms/step - loss: 7.
    0346
1053 Epoch 99/100
1054 267/267 ━━━━━━ 0s 1ms/step - loss: 6.
    7856
1055 Epoch 100/100
1056 267/267 ━━━━━━ 0s 1ms/step - loss: 6.
    5565
1057 22/22 ━━━━━━ 0s 3ms/step
1058 Score (MSE): 1.2216416295008568
1059 Score (RMSE): 1.105278982655898
1060 Time (seconds): 34.921491
1061 =====
=====
1062 Config n°8
1063 [99, 7, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100,
    12, 0.001, 'LSTM']
1064 C:\Users\lucas\PycharmProjects\pythonProject2\venv\
    Lib\site-packages\keras\src\layers\core\dense.py:87
        : UserWarning: Do not pass an `input_shape`/
        `input_dim` argument to a layer. When using
        Sequential models, prefer using an `Input(shape)`
        object as the first layer in the model instead.
1065     super().__init__(activity_regularizer=
        activity_regularizer, **kwargs)
1066 Model: "sequential_7"
1067 ┌─────────────────────────────────────────────────────────┐
1068 | Layer (type)           | Param # | Output Shape |
1069 └────────────────────────────────────────────────────────┘

```

1070	dense_20 (Dense)		(None, 99, 99)
1071	)	198	
1072	lstm_8 (LSTM)		(None, 99, 64)
1073	)	41,984	
1074	lstm_9 (LSTM)		(None, 64)
1075	)	33,024	
1076	dropout_7 (Dropout)		(None, 64)
1077	)	0	
1078	dense_21 (Dense)		(None, 1)
1079	)	65	
1080	Total params: 75,271 (294.03 KB)		
1081	Trainable params: 75,271 (294.03 KB)		
1082	Non-trainable params: 0 (0.00 B)		
1083	Epoch 1/100		
1084	267/267	17s 53ms/step - loss:	
		280.8319	
1085	Epoch 2/100		
1086	267/267	14s 51ms/step - loss:	
		38.6183	
1087	Epoch 3/100		
1088	267/267	13s 47ms/step - loss:	
		30.9259	
1089	Epoch 4/100		
1090	267/267	14s 52ms/step - loss:	
		24.1415	
1091	Epoch 5/100		
1092	267/267	14s 53ms/step - loss:	
		9.3020	
1093	Epoch 6/100		
1094	267/267	14s 52ms/step - loss:	
		6.2961	

```
1095 Epoch 7/100
1096 267/267 ━━━━━━━━━━ 13s 49ms/step - loss:
    6.4146
1097 Epoch 8/100
1098 267/267 ━━━━━━━━━━ 13s 50ms/step - loss:
    5.5300
1099 Epoch 9/100
1100 267/267 ━━━━━━━━━━ 14s 53ms/step - loss:
    5.6372
1101 Epoch 10/100
1102 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
    5.3108
1103 Epoch 11/100
1104 267/267 ━━━━━━━━━━ 13s 49ms/step - loss:
    4.7715
1105 Epoch 12/100
1106 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
    4.6188
1107 Epoch 13/100
1108 267/267 ━━━━━━━━━━ 14s 54ms/step - loss:
    4.8374
1109 Epoch 14/100
1110 267/267 ━━━━━━━━━━ 14s 52ms/step - loss:
    4.4337
1111 Epoch 15/100
1112 267/267 ━━━━━━━━━━ 13s 50ms/step - loss:
    4.4856
1113 Epoch 16/100
1114 267/267 ━━━━━━━━━━ 13s 48ms/step - loss:
    4.3684
1115 Epoch 17/100
1116 267/267 ━━━━━━━━━━ 13s 50ms/step - loss:
    4.2718
1117 Epoch 18/100
1118 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
    4.2882
1119 Epoch 19/100
1120 267/267 ━━━━━━━━━━ 15s 55ms/step - loss:
    4.2420
1121 Epoch 20/100
1122 267/267 ━━━━━━━━━━ 14s 52ms/step - loss:
```

```
1122 4.2324
1123 Epoch 21/100
1124 267/267 ━━━━━━━━━━ 13s 49ms/step - loss:
4.1090
1125 Epoch 22/100
1126 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
4.2765
1127 Epoch 23/100
1128 267/267 ━━━━━━━━━━ 14s 52ms/step - loss:
3.9210
1129 Epoch 24/100
1130 267/267 ━━━━━━━━━━ 15s 55ms/step - loss:
4.1061
1131 Epoch 25/100
1132 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
4.0198
1133 Epoch 26/100
1134 267/267 ━━━━━━━━━━ 13s 50ms/step - loss:
3.8631
1135 Epoch 27/100
1136 267/267 ━━━━━━━━━━ 14s 52ms/step - loss:
4.1085
1137 Epoch 28/100
1138 267/267 ━━━━━━━━━━ 14s 53ms/step - loss:
4.1597
1139 Epoch 29/100
1140 267/267 ━━━━━━━━━━ 13s 50ms/step - loss:
4.2326
1141 Epoch 30/100
1142 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
3.8168
1143 Epoch 31/100
1144 267/267 ━━━━━━━━━━ 14s 53ms/step - loss:
3.8211
1145 Epoch 32/100
1146 267/267 ━━━━━━━━━━ 15s 56ms/step - loss:
3.7002
1147 Epoch 33/100
1148 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
3.7049
1149 Epoch 34/100
```

```
1150 267/267 ━━━━━━━━ 13s 49ms/step - loss:  
      3.7751  
1151 Epoch 35/100  
1152 267/267 ━━━━━━ 17s 65ms/step - loss:  
      3.8915  
1153 Epoch 36/100  
1154 267/267 ━━━━━━ 15s 55ms/step - loss:  
      4.3027  
1155 Epoch 37/100  
1156 267/267 ━━━━━━ 15s 55ms/step - loss:  
      3.9977  
1157 Epoch 38/100  
1158 267/267 ━━━━━━ 14s 51ms/step - loss:  
      3.8606  
1159 Epoch 39/100  
1160 267/267 ━━━━━━ 13s 48ms/step - loss:  
      3.8422  
1161 Epoch 40/100  
1162 267/267 ━━━━━━ 14s 51ms/step - loss:  
      3.6142  
1163 Epoch 41/100  
1164 267/267 ━━━━━━ 15s 55ms/step - loss:  
      4.1482  
1165 Epoch 42/100  
1166 267/267 ━━━━━━ 14s 53ms/step - loss:  
      3.8239  
1167 Epoch 43/100  
1168 267/267 ━━━━━━ 14s 52ms/step - loss:  
      3.8695  
1169 Epoch 44/100  
1170 267/267 ━━━━━━ 14s 51ms/step - loss:  
      4.1044  
1171 Epoch 45/100  
1172 267/267 ━━━━━━ 14s 51ms/step - loss:  
      3.5117  
1173 Epoch 46/100  
1174 267/267 ━━━━━━ 14s 54ms/step - loss:  
      3.9008  
1175 Epoch 47/100  
1176 267/267 ━━━━━━ 14s 51ms/step - loss:  
      3.5543
```

```
1177 Epoch 48/100
1178 267/267 ━━━━━━━━━━ 13s 49ms/step - loss:
    3.7526
1179 Epoch 49/100
1180 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
    3.9217
1181 Epoch 50/100
1182 267/267 ━━━━━━━━━━ 16s 59ms/step - loss:
    4.0220
1183 Epoch 51/100
1184 267/267 ━━━━━━━━━━ 15s 56ms/step - loss:
    3.7228
1185 Epoch 52/100
1186 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
    4.0141
1187 Epoch 53/100
1188 267/267 ━━━━━━━━━━ 15s 55ms/step - loss:
    3.6006
1189 Epoch 54/100
1190 267/267 ━━━━━━━━━━ 15s 55ms/step - loss:
    4.0038
1191 Epoch 55/100
1192 267/267 ━━━━━━━━━━ 17s 62ms/step - loss:
    3.4685
1193 Epoch 56/100
1194 267/267 ━━━━━━━━━━ 15s 58ms/step - loss:
    3.4282
1195 Epoch 57/100
1196 267/267 ━━━━━━━━━━ 17s 65ms/step - loss:
    3.8653
1197 Epoch 58/100
1198 267/267 ━━━━━━━━━━ 19s 69ms/step - loss:
    3.6297
1199 Epoch 59/100
1200 267/267 ━━━━━━━━━━ 20s 76ms/step - loss:
    3.6663
1201 Epoch 60/100
1202 267/267 ━━━━━━━━━━ 19s 70ms/step - loss:
    3.9304
1203 Epoch 61/100
1204 267/267 ━━━━━━━━━━ 16s 59ms/step - loss:
```

```

1204 4.1709
1205 Epoch 62/100
1206 267/267 ━━━━━━━━━━ 17s 63ms/step - loss:
3.5032
1207 Epoch 63/100
1208 267/267 ━━━━━━━━━━ 21s 77ms/step - loss:
3.7366
1209 Epoch 64/100
1210 267/267 ━━━━━━━━━━ 20s 74ms/step - loss:
4.0322
1211 Epoch 65/100
1212 267/267 ━━━━━━━━━━ 15s 57ms/step - loss:
3.7486
1213 Score (MSE): 1.9588819186949946
1214 Score (RMSE): 1.3996006282847242
1215 Time (seconds): 1002.847957
1216 =====
=====
1217 Config n°9
1218 [99, 7, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100,
12, 0.001, 'BiLSTM']
1219 C:\Users\lucas\PycharmProjects\pythonProject2\venv\
Lib\site-packages\keras\src\layers\core\dense.py:87
: UserWarning: Do not pass an `input_shape`/
`input_dim` argument to a layer. When using
Sequential models, prefer using an `Input(shape)`
object as the first layer in the model instead.
1220     super().__init__(activity_regularizer=
activity_regularizer, **kwargs)
1221 Model: "sequential_8"
1222
1223 | Layer (type) | Param # | Output Shape |
1224 |-----|-----|-----|
1225 | dense_22 (Dense) | 198 | (None, 99, 99)
1226 |-----|-----|-----|
1227 | bidirectional_4 (Bidirectional) | (None, 99, 128)

```

```
1227 ) | 83,968 |
1228 | |
1229 | bidirectional_5 (Bidirectional) | (None, 128
| ) | 98,816 |
1230 |
1231 | dropout_8 (Dropout) | (None, 128
| ) | 0 |
1232 |
1233 | dense_23 (Dense) | (None, 1
| ) | 129 |
1234 |
1235 Total params: 183,111 (715.28 KB)
1236 Trainable params: 183,111 (715.28 KB)
1237 Non-trainable params: 0 (0.00 B)
1238 Epoch 1/100
1239 267/267 ━━━━━━━━ 25s 72ms/step - loss:
167.1791
1240 Epoch 2/100
1241 267/267 ━━━━━━━━ 30s 113ms/step - loss
: 27.1872
1242 Epoch 3/100
1243 267/267 ━━━━━━━━ 20s 76ms/step - loss:
7.7519
1244 Epoch 4/100
1245 267/267 ━━━━━━━━ 25s 93ms/step - loss:
4.7229
1246 Epoch 5/100
1247 267/267 ━━━━━━━━ 29s 109ms/step - loss
: 4.1584
1248 Epoch 6/100
1249 267/267 ━━━━━━━━ 19s 70ms/step - loss:
4.1281
1250 Epoch 7/100
1251 267/267 ━━━━━━━━ 20s 76ms/step - loss:
3.5944
1252 Epoch 8/100
1253 267/267 ━━━━━━━━ 23s 84ms/step - loss:
```

```
1253 3.3428
1254 Epoch 9/100
1255 267/267 ━━━━━━━━ 21s 77ms/step - loss:
3.4516
1256 Epoch 10/100
1257 267/267 ━━━━━━ 18s 69ms/step - loss:
3.6923
1258 Epoch 11/100
1259 267/267 ━━━━━━ 21s 80ms/step - loss:
3.4907
1260 Epoch 12/100
1261 267/267 ━━━━━━ 20s 75ms/step - loss:
3.2601
1262 Epoch 13/100
1263 267/267 ━━━━━━ 18s 66ms/step - loss:
3.4834
1264 Epoch 14/100
1265 267/267 ━━━━━━ 20s 76ms/step - loss:
3.1696
1266 Epoch 15/100
1267 267/267 ━━━━━━ 24s 89ms/step - loss:
3.2438
1268 Epoch 16/100
1269 267/267 ━━━━━━ 19s 70ms/step - loss:
3.2369
1270 Epoch 17/100
1271 267/267 ━━━━━━ 24s 89ms/step - loss:
2.9174
1272 Epoch 18/100
1273 267/267 ━━━━━━ 27s 103ms/step - loss
: 3.2104
1274 Epoch 19/100
1275 267/267 ━━━━━━ 32s 119ms/step - loss
: 3.1337
1276 Epoch 20/100
1277 267/267 ━━━━━━ 26s 96ms/step - loss:
2.7394
1278 Epoch 21/100
1279 267/267 ━━━━━━ 26s 97ms/step - loss:
2.7243
1280 Epoch 22/100
```

```
1281 267/267 ━━━━━━━━ 21s 79ms/step - loss:  
    2.9598  
1282 Epoch 23/100  
1283 267/267 ━━━━━━ 22s 82ms/step - loss:  
    2.8752  
1284 Epoch 24/100  
1285 267/267 ━━━━━━ 23s 85ms/step - loss:  
    2.8873  
1286 Epoch 25/100  
1287 267/267 ━━━━━━ 27s 101ms/step - loss:  
    : 3.0635  
1288 Epoch 26/100  
1289 267/267 ━━━━━━ 19s 70ms/step - loss:  
    3.2196  
1290 Epoch 27/100  
1291 267/267 ━━━━━━ 25s 93ms/step - loss:  
    2.7883  
1292 Epoch 28/100  
1293 267/267 ━━━━━━ 19s 71ms/step - loss:  
    3.0129  
1294 Epoch 29/100  
1295 267/267 ━━━━━━ 20s 74ms/step - loss:  
    2.9266  
1296 Epoch 30/100  
1297 267/267 ━━━━━━ 19s 72ms/step - loss:  
    2.9762  
1298 Epoch 31/100  
1299 267/267 ━━━━━━ 18s 69ms/step - loss:  
    2.9195  
1300 Epoch 32/100  
1301 267/267 ━━━━━━ 21s 77ms/step - loss:  
    2.9469  
1302 Epoch 33/100  
1303 267/267 ━━━━━━ 20s 74ms/step - loss:  
    2.7278  
1304 Epoch 34/100  
1305 267/267 ━━━━━━ 18s 66ms/step - loss:  
    2.7862  
1306 Epoch 35/100  
1307 267/267 ━━━━━━ 20s 76ms/step - loss:  
    2.8059
```

```
1308 Epoch 36/100
1309 267/267 ━━━━━━━━ 23s 88ms/step - loss:
    2.9127
1310 Epoch 37/100
1311 267/267 ━━━━━━━━ 23s 87ms/step - loss:
    2.7440
1312 Epoch 38/100
1313 267/267 ━━━━━━━━ 29s 109ms/step - loss
    : 2.5617
1314 Epoch 39/100
1315 267/267 ━━━━━━━━ 21s 77ms/step - loss:
    2.6618
1316 Epoch 40/100
1317 267/267 ━━━━━━━━ 25s 92ms/step - loss:
    2.7224
1318 Epoch 41/100
1319 267/267 ━━━━━━━━ 19s 71ms/step - loss:
    2.7664
1320 Epoch 42/100
1321 267/267 ━━━━━━━━ 19s 70ms/step - loss:
    2.7257
1322 Epoch 43/100
1323 267/267 ━━━━━━━━ 21s 80ms/step - loss:
    2.9150
1324 Epoch 44/100
1325 267/267 ━━━━━━━━ 22s 83ms/step - loss:
    2.6870
1326 Epoch 45/100
1327 267/267 ━━━━━━━━ 24s 89ms/step - loss:
    2.8052
1328 Epoch 46/100
1329 267/267 ━━━━━━━━ 22s 82ms/step - loss:
    2.6671
1330 Epoch 47/100
1331 267/267 ━━━━━━━━ 21s 80ms/step - loss:
    2.7809
1332 Epoch 48/100
1333 267/267 ━━━━━━━━ 21s 77ms/step - loss:
    2.6604
1334 Epoch 49/100
1335 267/267 ━━━━━━━━ 19s 72ms/step - loss:
```

```
1335 2.5828
1336 Epoch 50/100
1337 267/267 ━━━━━━━━ 20s 74ms/step - loss:
2.4992
1338 Epoch 51/100
1339 267/267 ━━━━━━━━ 21s 77ms/step - loss:
2.5386
1340 Epoch 52/100
1341 267/267 ━━━━━━━━ 25s 94ms/step - loss:
2.5747
1342 Epoch 53/100
1343 267/267 ━━━━━━━━ 24s 88ms/step - loss:
2.6583
1344 Epoch 54/100
1345 267/267 ━━━━━━━━ 18s 69ms/step - loss:
2.4235
1346 Epoch 55/100
1347 267/267 ━━━━━━━━ 21s 77ms/step - loss:
2.5332
1348 Epoch 56/100
1349 267/267 ━━━━━━━━ 22s 81ms/step - loss:
2.9822
1350 Epoch 57/100
1351 267/267 ━━━━━━━━ 22s 81ms/step - loss:
2.5433
1352 Epoch 58/100
1353 267/267 ━━━━━━━━ 22s 82ms/step - loss:
2.6213
1354 Epoch 59/100
1355 267/267 ━━━━━━━━ 22s 82ms/step - loss:
2.6075
1356 Epoch 60/100
1357 267/267 ━━━━━━━━ 20s 73ms/step - loss:
2.8378
1358 Epoch 61/100
1359 267/267 ━━━━━━━━ 23s 85ms/step - loss:
2.5415
1360 Epoch 62/100
1361 267/267 ━━━━━━━━ 20s 76ms/step - loss:
2.8423
1362 Epoch 63/100
```

```
1363 267/267 ━━━━━━━━ 18s 68ms/step - loss:  
    2.5436  
1364 Epoch 64/100  
1365 267/267 ━━━━━━ 21s 77ms/step - loss:  
    2.5147  
1366 Epoch 65/100  
1367 267/267 ━━━━━━ 19s 70ms/step - loss:  
    2.8179  
1368 Epoch 66/100  
1369 267/267 ━━━━━━ 19s 70ms/step - loss:  
    2.5265  
1370 Epoch 67/100  
1371 267/267 ━━━━━━ 21s 80ms/step - loss:  
    2.6412  
1372 Epoch 68/100  
1373 267/267 ━━━━━━ 29s 109ms/step - loss:  
    : 2.7663  
1374 Epoch 69/100  
1375 267/267 ━━━━━━ 17s 65ms/step - loss:  
    2.6947  
1376 Epoch 70/100  
1377 267/267 ━━━━━━ 23s 84ms/step - loss:  
    2.7422  
1378 Epoch 71/100  
1379 267/267 ━━━━━━ 21s 79ms/step - loss:  
    2.4978  
1380 Epoch 72/100  
1381 267/267 ━━━━━━ 17s 65ms/step - loss:  
    2.4738  
1382 Epoch 73/100  
1383 267/267 ━━━━━━ 27s 100ms/step - loss:  
    : 2.4398  
1384 Epoch 74/100  
1385 267/267 ━━━━━━ 26s 96ms/step - loss:  
    2.7192  
1386 Epoch 75/100  
1387 267/267 ━━━━━━ 18s 68ms/step - loss:  
    2.5322  
1388 Epoch 76/100  
1389 267/267 ━━━━━━ 23s 88ms/step - loss:  
    2.5894
```

```
1390 Epoch 77/100
1391 267/267 ━━━━━━━━━━ 18s 68ms/step - loss:
    2.4902
1392 Epoch 78/100
1393 267/267 ━━━━━━━━━━ 19s 71ms/step - loss:
    2.4767
1394 Epoch 79/100
1395 267/267 ━━━━━━━━━━ 27s 100ms/step - loss
    : 2.5050
1396 Epoch 80/100
1397 267/267 ━━━━━━━━━━ 24s 90ms/step - loss:
    2.3220
1398 Epoch 81/100
1399 267/267 ━━━━━━━━━━ 21s 79ms/step - loss:
    2.3233
1400 Epoch 82/100
1401 267/267 ━━━━━━━━━━ 23s 85ms/step - loss:
    2.5330
1402 Epoch 83/100
1403 267/267 ━━━━━━━━━━ 22s 81ms/step - loss:
    2.5995
1404 Epoch 84/100
1405 267/267 ━━━━━━━━━━ 17s 65ms/step - loss:
    2.7125
1406 Epoch 85/100
1407 267/267 ━━━━━━━━━━ 25s 95ms/step - loss:
    2.5472
1408 Epoch 86/100
1409 267/267 ━━━━━━━━━━ 27s 103ms/step - loss
    : 2.6928
1410 Epoch 87/100
1411 267/267 ━━━━━━━━━━ 20s 74ms/step - loss:
    2.4645
1412 Epoch 88/100
1413 267/267 ━━━━━━━━━━ 21s 77ms/step - loss:
    2.5775
1414 Epoch 89/100
1415 267/267 ━━━━━━━━━━ 20s 75ms/step - loss:
    2.4355
1416 Epoch 90/100
1417 267/267 ━━━━━━━━━━ 18s 69ms/step - loss:
```

```

1417 2.5220
1418 Score (MSE): 2.2786839310548666
1419 Score (RMSE): 1.5095310301729032
1420 Time (seconds): 2019.166786
1421 =====
1422 Config n°10
1423 [99, 21, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100
, 12, 0.001, 'MLP']
1424 C:\Users\lucas\PycharmProjects\pythonProject2\venv\
Lib\site-packages\keras\src\layers\core\dense.py:87
: UserWarning: Do not pass an `input_shape`/`input_dim` argument to a layer. When using
Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.
1425     super().__init__(activity_regularizer=
activity_regularizer, **kwargs)
1426 Model: "sequential_9"
1427
1428 | Layer (type)           | Param # | Output Shape
1429 |
1430 | dense_24 (Dense)       | 9,900   | (None, 99
)
1431 |
1432 | dense_25 (Dense)       | 6,400   | (None, 64
)
1433 |
1434 | dense_26 (Dense)       | 4,160   | (None, 64
)
1435 |
1436 | dropout_9 (Dropout)    | 0        | (None, 64
)
1437 |
1438 | dense_27 (Dense)       |          | (None, 1
)

```

```
1438 )           |       65 |  
1439 |  
  
1440 Total params: 20,525 (80.18 KB)  
1441 Trainable params: 20,525 (80.18 KB)  
1442 Non-trainable params: 0 (0.00 B)  
1443 Epoch 1/100  
1444 267/267 ━━━━━━━━ 1s 1ms/step - loss:  
      115.5417  
1445 Epoch 2/100  
1446 267/267 ━━━━━━━━ 0s 1ms/step - loss: 17  
      .5022  
1447 Epoch 3/100  
1448 267/267 ━━━━━━━━ 0s 1ms/step - loss: 15  
      .4673  
1449 Epoch 4/100  
1450 267/267 ━━━━━━━━ 0s 1ms/step - loss: 15  
      .9345  
1451 Epoch 5/100  
1452 267/267 ━━━━━━━━ 0s 1ms/step - loss: 13  
      .3954  
1453 Epoch 6/100  
1454 267/267 ━━━━━━━━ 0s 1ms/step - loss: 14  
      .6906  
1455 Epoch 7/100  
1456 267/267 ━━━━━━━━ 0s 1ms/step - loss: 14  
      .0385  
1457 Epoch 8/100  
1458 267/267 ━━━━━━━━ 0s 1ms/step - loss: 13  
      .6747  
1459 Epoch 9/100  
1460 267/267 ━━━━━━━━ 0s 1ms/step - loss: 14  
      .8966  
1461 Epoch 10/100  
1462 267/267 ━━━━━━━━ 0s 1ms/step - loss: 14  
      .9143  
1463 Epoch 11/100  
1464 267/267 ━━━━━━━━ 0s 1ms/step - loss: 15  
      .9014  
1465 Epoch 12/100  
1466 267/267 ━━━━━━━━ 0s 1ms/step - loss: 13
```

```
1466 .1440
1467 Epoch 13/100
1468 267/267 ━━━━━━━━ 0s 1ms/step - loss: 14
    .3742
1469 Epoch 14/100
1470 267/267 ━━━━━━━━ 0s 1ms/step - loss: 12
    .4263
1471 Epoch 15/100
1472 267/267 ━━━━━━━━ 0s 1ms/step - loss: 14
    .1383
1473 Epoch 16/100
1474 267/267 ━━━━━━━━ 0s 1ms/step - loss: 13
    .3762
1475 Epoch 17/100
1476 267/267 ━━━━━━━━ 0s 1ms/step - loss: 11
    .9853
1477 Epoch 18/100
1478 267/267 ━━━━━━━━ 0s 1ms/step - loss: 11
    .5762
1479 Epoch 19/100
1480 267/267 ━━━━━━━━ 0s 1ms/step - loss: 12
    .6442
1481 Epoch 20/100
1482 267/267 ━━━━━━━━ 0s 1ms/step - loss: 12
    .3578
1483 Epoch 21/100
1484 267/267 ━━━━━━━━ 0s 1ms/step - loss: 11
    .9736
1485 Epoch 22/100
1486 267/267 ━━━━━━━━ 0s 1ms/step - loss: 12
    .9056
1487 Epoch 23/100
1488 267/267 ━━━━━━━━ 0s 1ms/step - loss: 12
    .3216
1489 Epoch 24/100
1490 267/267 ━━━━━━━━ 0s 1ms/step - loss: 12
    .5268
1491 Epoch 25/100
1492 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .5657
1493 Epoch 26/100
```

1494	267/267	0s 1ms/step - loss: 11 .0752
1495	Epoch 27/100	
1496	267/267	0s 1ms/step - loss: 11 .8942
1497	Epoch 28/100	
1498	267/267	0s 1ms/step - loss: 10 .7721
1499	Epoch 29/100	
1500	267/267	0s 1ms/step - loss: 12 .1592
1501	Epoch 30/100	
1502	267/267	0s 1ms/step - loss: 11 .4102
1503	Epoch 31/100	
1504	267/267	0s 1ms/step - loss: 11 .5269
1505	Epoch 32/100	
1506	267/267	0s 1ms/step - loss: 11 .3536
1507	Epoch 33/100	
1508	267/267	0s 1ms/step - loss: 11 .2259
1509	Epoch 34/100	
1510	267/267	0s 1ms/step - loss: 10 .6538
1511	Epoch 35/100	
1512	267/267	0s 1ms/step - loss: 10 .7343
1513	Epoch 36/100	
1514	267/267	0s 1ms/step - loss: 10 .6631
1515	Epoch 37/100	
1516	267/267	0s 1ms/step - loss: 10 .8384
1517	Epoch 38/100	
1518	267/267	0s 1ms/step - loss: 11 .2648
1519	Epoch 39/100	
1520	267/267	0s 1ms/step - loss: 10 .5903

```
1521 Epoch 40/100
1522 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .5821
1523 Epoch 41/100
1524 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .0070
1525 Epoch 42/100
1526 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .3853
1527 Epoch 43/100
1528 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .2720
1529 Epoch 44/100
1530 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    4585
1531 Epoch 45/100
1532 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    5350
1533 Epoch 46/100
1534 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .5241
1535 Epoch 47/100
1536 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .9469
1537 Epoch 48/100
1538 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .4781
1539 Epoch 49/100
1540 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    5568
1541 Epoch 50/100
1542 267/267 ━━━━━━━━ 0s 1ms/step - loss: 8.
    9694
1543 Epoch 51/100
1544 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .3649
1545 Epoch 52/100
1546 267/267 ━━━━━━━━ 0s 1ms/step - loss: 11
    .2185
1547 Epoch 53/100
1548 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
```

```
1548 4984
1549 Epoch 54/100
1550 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    8727
1551 Epoch 55/100
1552 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .0228
1553 Epoch 56/100
1554 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .7146
1555 Epoch 57/100
1556 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    9969
1557 Epoch 58/100
1558 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    2700
1559 Epoch 59/100
1560 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    3722
1561 Epoch 60/100
1562 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    2262
1563 Epoch 61/100
1564 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    8714
1565 Epoch 62/100
1566 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    8119
1567 Epoch 63/100
1568 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    7249
1569 Epoch 64/100
1570 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    4033
1571 Epoch 65/100
1572 267/267 ━━━━━━━━ 0s 1ms/step - loss: 10
    .6464
1573 Epoch 66/100
1574 267/267 ━━━━━━━━ 0s 1ms/step - loss: 9.
    4326
1575 Epoch 67/100
```

```
1576 267/267 ━━━━━━ 0s 1ms/step - loss: 8.  
    9859  
1577 Epoch 68/100  
1578 267/267 ━━━━━━ 0s 1ms/step - loss: 9.  
    8815  
1579 Epoch 69/100  
1580 267/267 ━━━━━━ 0s 1ms/step - loss: 9.  
    2156  
1581 Epoch 70/100  
1582 267/267 ━━━━━━ 0s 1ms/step - loss: 9.  
    6946  
1583 Epoch 71/100  
1584 267/267 ━━━━━━ 0s 1ms/step - loss: 9.  
    0255  
1585 Epoch 72/100  
1586 267/267 ━━━━━━ 0s 1ms/step - loss: 9.  
    6601  
1587 Epoch 73/100  
1588 267/267 ━━━━━━ 0s 1ms/step - loss: 9.  
    5755  
1589 Epoch 74/100  
1590 267/267 ━━━━━━ 0s 1ms/step - loss: 10  
    .0115  
1591 Epoch 75/100  
1592 267/267 ━━━━━━ 0s 1ms/step - loss: 9.  
    1548  
1593 Epoch 76/100  
1594 267/267 ━━━━━━ 0s 1ms/step - loss: 8.  
    8964  
1595 22/22 ━━━━━━ 0s 4ms/step  
1596 Score (MSE): 3.972775782018481  
1597 Score (RMSE): 1.9931823253326528  
1598 Time (seconds): 27.595955  
1599 =====  
=====  
1600 Config n°11  
1601 [99, 21, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100  
    , 12, 0.001, 'LSTM']  
1602 C:\Users\lucas\PycharmProjects\pythonProject2\venv\  
    Lib\site-packages\keras\src\layers\core\dense.py:87  
    : UserWarning: Do not pass an `input_shape` /
```

```

1602 `input_dim` argument to a layer. When using
    Sequential models, prefer using an `Input(shape)`
    object as the first layer in the model instead.
1603     super().__init__(activity_regularizer=
        activity_regularizer, **kwargs)
1604 Model: "sequential_10"
1605
1606 | Layer (type)           | Param # | Output Shape
1607 |
1608 | dense_28 (Dense)       | 198    | (None, 99, 99
1609 |
1610 | lstm_12 (LSTM)         | 41,984 | (None, 99, 64
1611 |
1612 | lstm_13 (LSTM)         | 33,024 | (None, 64
1613 |
1614 | dropout_10 (Dropout)   | 0      | (None, 64
1615 |
1616 | dense_29 (Dense)       | 65    | (None, 1
1617
1618 Total params: 75,271 (294.03 KB)
1619 Trainable params: 75,271 (294.03 KB)
1620 Non-trainable params: 0 (0.00 B)
1621 Epoch 1/100
1622 267/267 ━━━━━━━━━━ 15s 47ms/step - loss:
    273.4117
1623 Epoch 2/100
1624 267/267 ━━━━━━━━━━ 18s 67ms/step - loss:
    38.3948

```

```
1625 Epoch 3/100
1626 267/267 ━━━━━━━━ 23s 84ms/step - loss:
    33.5894
1627 Epoch 4/100
1628 267/267 ━━━━━━ 17s 63ms/step - loss:
    18.6507
1629 Epoch 5/100
1630 267/267 ━━━━━━ 15s 57ms/step - loss:
    10.9165
1631 Epoch 6/100
1632 267/267 ━━━━━━ 15s 55ms/step - loss:
    9.7514
1633 Epoch 7/100
1634 267/267 ━━━━━━ 17s 64ms/step - loss:
    7.6778
1635 Epoch 8/100
1636 267/267 ━━━━━━ 19s 69ms/step - loss:
    7.7776
1637 Epoch 9/100
1638 267/267 ━━━━━━ 17s 65ms/step - loss:
    8.5516
1639 Epoch 10/100
1640 267/267 ━━━━━━ 15s 55ms/step - loss:
    7.5995
1641 Epoch 11/100
1642 267/267 ━━━━━━ 16s 58ms/step - loss:
    6.8452
1643 Epoch 12/100
1644 267/267 ━━━━━━ 17s 65ms/step - loss:
    7.7402
1645 Epoch 13/100
1646 267/267 ━━━━━━ 29s 107ms/step - loss
    : 6.8915
1647 Epoch 14/100
1648 267/267 ━━━━━━ 14s 54ms/step - loss:
    6.7014
1649 Epoch 15/100
1650 267/267 ━━━━━━ 15s 55ms/step - loss:
    6.5339
1651 Epoch 16/100
1652 267/267 ━━━━━━ 16s 60ms/step - loss:
```

```
1652 6.8497
1653 Epoch 17/100
1654 267/267 ━━━━━━━━━━ 18s 66ms/step - loss:
6.8210
1655 Epoch 18/100
1656 267/267 ━━━━━━━━ 16s 59ms/step - loss:
6.6712
1657 Epoch 19/100
1658 267/267 ━━━━━━ 15s 56ms/step - loss:
7.0270
1659 Epoch 20/100
1660 267/267 ━━━━━━ 16s 58ms/step - loss:
6.3585
1661 Epoch 21/100
1662 267/267 ━━━━━━ 17s 64ms/step - loss:
6.7500
1663 Epoch 22/100
1664 267/267 ━━━━━━ 17s 64ms/step - loss:
6.5656
1665 Epoch 23/100
1666 267/267 ━━━━━━ 15s 56ms/step - loss:
6.5338
1667 Epoch 24/100
1668 267/267 ━━━━━━ 15s 58ms/step - loss:
6.9933
1669 Epoch 25/100
1670 267/267 ━━━━━━ 17s 65ms/step - loss:
6.5768
1671 Epoch 26/100
1672 267/267 ━━━━━━ 20s 74ms/step - loss:
6.3654
1673 Epoch 27/100
1674 267/267 ━━━━━━ 18s 66ms/step - loss:
6.1702
1675 Epoch 28/100
1676 267/267 ━━━━━━ 20s 73ms/step - loss:
6.7589
1677 Epoch 29/100
1678 267/267 ━━━━━━ 24s 91ms/step - loss:
6.5664
1679 Epoch 30/100
```

```
1680 267/267 ━━━━━━━━ 22s 81ms/step - loss:  
       6.6047  
1681 Epoch 31/100  
1682 267/267 ━━━━━━ 16s 59ms/step - loss:  
       5.8574  
1683 Epoch 32/100  
1684 267/267 ━━━━━━ 15s 55ms/step - loss:  
       6.5166  
1685 Epoch 33/100  
1686 267/267 ━━━━━━ 16s 59ms/step - loss:  
       6.0131  
1687 Epoch 34/100  
1688 267/267 ━━━━━━ 14s 54ms/step - loss:  
       6.0055  
1689 Epoch 35/100  
1690 267/267 ━━━━━━ 14s 51ms/step - loss:  
       6.7406  
1691 Epoch 36/100  
1692 267/267 ━━━━━━ 13s 50ms/step - loss:  
       6.3873  
1693 Epoch 37/100  
1694 267/267 ━━━━━━ 14s 54ms/step - loss:  
       6.5469  
1695 Epoch 38/100  
1696 267/267 ━━━━━━ 15s 58ms/step - loss:  
       5.9731  
1697 Epoch 39/100  
1698 267/267 ━━━━━━ 14s 52ms/step - loss:  
       5.9934  
1699 Epoch 40/100  
1700 267/267 ━━━━━━ 14s 51ms/step - loss:  
       6.2605  
1701 Epoch 41/100  
1702 267/267 ━━━━━━ 14s 51ms/step - loss:  
       6.0941  
1703 Epoch 42/100  
1704 267/267 ━━━━━━ 15s 56ms/step - loss:  
       6.1987  
1705 Epoch 43/100  
1706 267/267 ━━━━━━ 14s 53ms/step - loss:  
       6.2680
```

```
1707 Epoch 44/100
1708 267/267 ━━━━━━━━━━ 14s 53ms/step - loss:
  6.1742
1709 Epoch 45/100
1710 267/267 ━━━━━━━━━━ 15s 55ms/step - loss:
  5.8766
1711 Epoch 46/100
1712 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
  6.0378
1713 Epoch 47/100
1714 267/267 ━━━━━━━━━━ 14s 52ms/step - loss:
  6.2610
1715 Epoch 48/100
1716 267/267 ━━━━━━━━━━ 18s 67ms/step - loss:
  5.8369
1717 Epoch 49/100
1718 267/267 ━━━━━━━━━━ 16s 61ms/step - loss:
  5.9550
1719 Epoch 50/100
1720 267/267 ━━━━━━━━━━ 17s 64ms/step - loss:
  6.6731
1721 Epoch 51/100
1722 267/267 ━━━━━━━━━━ 16s 60ms/step - loss:
  6.1636
1723 Epoch 52/100
1724 267/267 ━━━━━━━━━━ 15s 54ms/step - loss:
  5.8952
1725 Epoch 53/100
1726 267/267 ━━━━━━━━━━ 14s 53ms/step - loss:
  6.2755
1727 Epoch 54/100
1728 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
  6.0431
1729 Epoch 55/100
1730 267/267 ━━━━━━━━━━ 14s 51ms/step - loss:
  5.7164
1731 Epoch 56/100
1732 267/267 ━━━━━━━━━━ 14s 54ms/step - loss:
  5.8106
1733 Epoch 57/100
1734 267/267 ━━━━━━━━━━ 16s 58ms/step - loss:
```

```
1734 5.7155
1735 Epoch 58/100
1736 267/267 ━━━━━━━━ 13s 50ms/step - loss:
      5.2849
1737 Epoch 59/100
1738 267/267 ━━━━━━━━ 18s 68ms/step - loss:
      5.6743
1739 Epoch 60/100
1740 267/267 ━━━━━━━━ 23s 86ms/step - loss:
      5.9149
1741 Epoch 61/100
1742 267/267 ━━━━━━━━ 19s 72ms/step - loss:
      5.6733
1743 Epoch 62/100
1744 267/267 ━━━━━━━━ 19s 72ms/step - loss:
      6.0676
1745 Epoch 63/100
1746 267/267 ━━━━━━━━ 30s 107ms/step - loss
      : 5.6393
1747 Epoch 64/100
1748 267/267 ━━━━━━━━ 19s 70ms/step - loss:
      5.7622
1749 Epoch 65/100
1750 267/267 ━━━━━━━━ 16s 62ms/step - loss:
      5.4664
1751 Epoch 66/100
1752 267/267 ━━━━━━━━ 18s 69ms/step - loss:
      5.3389
1753 Epoch 67/100
1754 267/267 ━━━━━━━━ 23s 85ms/step - loss:
      6.3434
1755 Epoch 68/100
1756 267/267 ━━━━━━━━ 24s 90ms/step - loss:
      5.8201
1757 Epoch 69/100
1758 267/267 ━━━━━━━━ 23s 84ms/step - loss:
      5.7871
1759 Epoch 70/100
1760 267/267 ━━━━━━━━ 22s 81ms/step - loss:
      5.3731
1761 Epoch 71/100
```

```
1762 267/267 ━━━━━━━━ 19s 73ms/step - loss:  
      5.6449  
1763 Epoch 72/100  
1764 267/267 ━━━━━━ 23s 82ms/step - loss:  
      5.5234  
1765 Epoch 73/100  
1766 267/267 ━━━━━━ 19s 72ms/step - loss:  
      5.6530  
1767 Epoch 74/100  
1768 267/267 ━━━━━━ 20s 76ms/step - loss:  
      5.9883  
1769 Epoch 75/100  
1770 267/267 ━━━━━━ 22s 81ms/step - loss:  
      5.7179  
1771 Epoch 76/100  
1772 267/267 ━━━━━━ 17s 64ms/step - loss:  
      5.9959  
1773 Epoch 77/100  
1774 267/267 ━━━━━━ 19s 70ms/step - loss:  
      5.3149  
1775 Epoch 78/100  
1776 267/267 ━━━━━━ 22s 82ms/step - loss:  
      5.5820  
1777 Epoch 79/100  
1778 267/267 ━━━━━━ 20s 73ms/step - loss:  
      5.7772  
1779 Epoch 80/100  
1780 267/267 ━━━━━━ 17s 63ms/step - loss:  
      5.2779  
1781 Epoch 81/100  
1782 267/267 ━━━━━━ 19s 73ms/step - loss:  
      5.5984  
1783 Epoch 82/100  
1784 267/267 ━━━━━━ 20s 76ms/step - loss:  
      5.4992  
1785 Epoch 83/100  
1786 267/267 ━━━━━━ 17s 64ms/step - loss:  
      5.6594  
1787 Epoch 84/100  
1788 267/267 ━━━━━━ 16s 60ms/step - loss:  
      5.4686
```

```
1789 Epoch 85/100
1790 267/267 ━━━━━━━━━━ 19s 72ms/step - loss:
      5.3686
1791 Epoch 86/100
1792 267/267 ━━━━━━━━━━ 19s 71ms/step - loss:
      5.0367
1793 Epoch 87/100
1794 267/267 ━━━━━━━━━━ 16s 61ms/step - loss:
      5.0587
1795 Score (MSE): 3.4949923251617
1796 Score (RMSE): 1.8694898569293443
1797 Time (seconds): 1566.446107
1798 =====
1799 Config n°12
1800 [99, 21, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100
      , 12, 0.001, 'BiLSTM']
1801 C:\Users\lucas\PycharmProjects\pythonProject2\venv\lib\site-packages\keras\src\layers\core\dense.py:87
      : UserWarning: Do not pass an `input_shape`/`input_dim` argument to a layer. When using
      Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.
1802     super().__init__(activity_regularizer=
      activity_regularizer, **kwargs)
1803 Model: "sequential_11"
1804
1805 | Layer (type)           | Param # | Output Shape
1806 |
1807 | dense_30 (Dense)       | 198    | (None, 99, 99)
1808 |
1809 | bidirectional_6 (Bidirectional) | 83,968 | (None, 99, 128)
1810 |
1811 | bidirectional_7 (Bidirectional) | 128   | (None, 128)
```

```
1811 ) | 98,816 |
1812 | |
1813 | dropout_11 (Dropout) | (None, 128
1814 | ) | 0 |
1815 | dense_31 (Dense) | (None, 1
1816 | ) | 129 |
1817 Total params: 183,111 (715.28 KB)
1818 Trainable params: 183,111 (715.28 KB)
1819 Non-trainable params: 0 (0.00 B)
1820 Epoch 1/100
1821 267/267 ━━━━━━━━ 23s 66ms/step - loss:
164.4588
1822 Epoch 2/100
1823 267/267 ━━━━━━ 20s 75ms/step - loss:
27.0200
1824 Epoch 3/100
1825 267/267 ━━━━━━ 22s 81ms/step - loss:
9.5786
1826 Epoch 4/100
1827 267/267 ━━━━━━ 18s 67ms/step - loss:
6.6399
1828 Epoch 5/100
1829 267/267 ━━━━━━ 17s 65ms/step - loss:
6.8523
1830 Epoch 6/100
1831 267/267 ━━━━━━ 21s 77ms/step - loss:
6.7894
1832 Epoch 7/100
1833 267/267 ━━━━━━ 19s 69ms/step - loss:
6.5838
1834 Epoch 8/100
1835 267/267 ━━━━━━ 17s 64ms/step - loss:
6.2616
1836 Epoch 9/100
1837 267/267 ━━━━━━ 20s 74ms/step - loss:
6.2897
```

```
1838 Epoch 10/100
1839 267/267 ━━━━━━━━ 24s 89ms/step - loss:
    6.3119
1840 Epoch 11/100
1841 267/267 ━━━━━━ 18s 66ms/step - loss:
    5.5521
1842 Epoch 12/100
1843 267/267 ━━━━━━ 21s 77ms/step - loss:
    5.2200
1844 Epoch 13/100
1845 267/267 ━━━━━━ 20s 74ms/step - loss:
    5.8402
1846 Epoch 14/100
1847 267/267 ━━━━━━ 17s 64ms/step - loss:
    5.2746
1848 Epoch 15/100
1849 267/267 ━━━━━━ 18s 68ms/step - loss:
    5.1323
1850 Epoch 16/100
1851 267/267 ━━━━━━ 21s 80ms/step - loss:
    4.9045
1852 Epoch 17/100
1853 267/267 ━━━━━━ 18s 69ms/step - loss:
    5.5481
1854 Epoch 18/100
1855 267/267 ━━━━━━ 17s 62ms/step - loss:
    5.2853
1856 Epoch 19/100
1857 267/267 ━━━━━━ 19s 71ms/step - loss:
    4.9720
1858 Epoch 20/100
1859 267/267 ━━━━━━ 20s 75ms/step - loss:
    5.0743
1860 Epoch 21/100
1861 267/267 ━━━━━━ 17s 65ms/step - loss:
    5.1307
1862 Epoch 22/100
1863 267/267 ━━━━━━ 19s 70ms/step - loss:
    5.3761
1864 Epoch 23/100
1865 267/267 ━━━━━━ 20s 76ms/step - loss:
```

```
1865 4.9537
1866 Epoch 24/100
1867 267/267 ━━━━━━━━━━ 18s 66ms/step - loss:
      5.4254
1868 Epoch 25/100
1869 267/267 ━━━━━━━━━━ 18s 68ms/step - loss:
      5.1893
1870 Epoch 26/100
1871 267/267 ━━━━━━━━━━ 26s 96ms/step - loss:
      5.2167
1872 Epoch 27/100
1873 267/267 ━━━━━━━━━━ 18s 68ms/step - loss:
      5.3364
1874 Epoch 28/100
1875 267/267 ━━━━━━━━━━ 18s 66ms/step - loss:
      5.0779
1876 Epoch 29/100
1877 267/267 ━━━━━━━━━━ 21s 79ms/step - loss:
      4.8371
1878 Epoch 30/100
1879 267/267 ━━━━━━━━━━ 18s 67ms/step - loss:
      5.2673
1880 Epoch 31/100
1881 267/267 ━━━━━━━━━━ 17s 65ms/step - loss:
      4.9685
1882 Epoch 32/100
1883 267/267 ━━━━━━━━━━ 19s 72ms/step - loss:
      5.3692
1884 Epoch 33/100
1885 267/267 ━━━━━━━━━━ 19s 73ms/step - loss:
      5.0587
1886 Epoch 34/100
1887 267/267 ━━━━━━━━━━ 17s 63ms/step - loss:
      5.4148
1888 Epoch 35/100
1889 267/267 ━━━━━━━━━━ 19s 69ms/step - loss:
      5.0569
1890 Epoch 36/100
1891 267/267 ━━━━━━━━━━ 20s 73ms/step - loss:
      5.3562
1892 Epoch 37/100
```

```
1893 267/267 ━━━━━━━━ 18s 66ms/step - loss:  
        4.7635  
1894 Epoch 38/100  
1895 267/267 ━━━━━━━━ 19s 69ms/step - loss:  
        4.8733  
1896 Epoch 39/100  
1897 267/267 ━━━━━━━━ 18s 66ms/step - loss:  
        4.8131  
1898 Epoch 40/100  
1899 267/267 ━━━━━━━━ 20s 73ms/step - loss:  
        5.4023  
1900 Epoch 41/100  
1901 267/267 ━━━━━━━━ 18s 65ms/step - loss:  
        5.3022  
1902 Epoch 42/100  
1903 267/267 ━━━━━━━━ 20s 74ms/step - loss:  
        4.9117  
1904 Epoch 43/100  
1905 267/267 ━━━━━━━━ 19s 69ms/step - loss:  
        4.8291  
1906 Epoch 44/100  
1907 267/267 ━━━━━━━━ 18s 66ms/step - loss:  
        4.8830  
1908 Epoch 45/100  
1909 267/267 ━━━━━━━━ 20s 74ms/step - loss:  
        4.8050  
1910 Epoch 46/100  
1911 267/267 ━━━━━━━━ 18s 68ms/step - loss:  
        4.8520  
1912 Epoch 47/100  
1913 267/267 ━━━━━━━━ 18s 67ms/step - loss:  
        4.9663  
1914 Epoch 48/100  
1915 267/267 ━━━━━━━━ 20s 76ms/step - loss:  
        4.9866  
1916 Epoch 49/100  
1917 267/267 ━━━━━━━━ 17s 65ms/step - loss:  
        4.7993  
1918 Score (MSE): 2.842431251592426  
1919 Score (RMSE): 1.685951141519951  
1920 Time (seconds): 983.091391
```

```
1921
1922 -----Resultados Finais
-----
1923 Config n°3 - MSE: 1.036445, RMSE: 1.018059
1924 Config n°1 - MSE: 1.048601, RMSE: 1.024012
1925 Config n°7 - MSE: 1.221642, RMSE: 1.105279
1926 Config n°2 - MSE: 1.352079, RMSE: 1.162789
1927 Config n°8 - MSE: 1.958882, RMSE: 1.399601
1928 Config n°9 - MSE: 2.278684, RMSE: 1.509531
1929 Config n°12 - MSE: 2.842431, RMSE: 1.685951
1930 Config n°6 - MSE: 3.055236, RMSE: 1.747923
1931 Config n°4 - MSE: 3.273223, RMSE: 1.809205
1932 Config n°11 - MSE: 3.494992, RMSE: 1.869490
1933 Config n°10 - MSE: 3.972776, RMSE: 1.993182
1934 Config n°5 - MSE: 4.330844, RMSE: 2.081068
1935 --- End: 6931.289 seconds ---
1936 Done
1937
1938 Process finished with exit code 0
1939
```