```
C:\Users\lucas\PycharmProjects\pythonProject2\venv\Scripts\python.exe C:\Users\lucas\PycharmProjects\pythonProject2\main.py
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`.
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`.
Runtime Seed: 07062024_205323
Total configs: 12
Número de GPUs disponíveis:  0
================================================================================
Config nº1
[33, 7, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100, 12, 0.001, 'MLP']
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.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
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.
To enable the following instructions: AVX2 FMA, in other operations, rebuild TensorFlow with the appropriate compiler flags.
Model: "sequential"
┌─────────────────────────────────────┬─────────────────────────────┬─────────────────┐
```

```
┃ Layer (type)                         ┃ Output Shape              ┃       Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━┩
│ dense (Dense)                        │ (None, 33)                │         1,122 │
├──────────────────────────────────────┼───────────────────────────┼───────────────┤
│ dense_1 (Dense)                      │ (None, 64)                │         2,176 │
├──────────────────────────────────────┼───────────────────────────┼───────────────┤
│ dense_2 (Dense)                      │ (None, 64)                │         4,160 │
├──────────────────────────────────────┼───────────────────────────┼───────────────┤
│ dropout (Dropout)                    │ (None, 64)                │             0 │
├──────────────────────────────────────┼───────────────────────────┼───────────────┤
│ dense_3 (Dense)                      │ (None, 1)                 │            65 │
└──────────────────────────────────────┴───────────────────────────┴───────────────┘
 Total params: 7,523 (29.39 KB)
 Trainable params: 7,523 (29.39 KB)
 Non-trainable params: 0 (0.00 B)
Epoch 1/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 1s 848us/step - loss: 42.2244
Epoch 2/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 809us/step - loss: 11.3310
Epoch 3/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 818us/step - loss: 10.9450
Epoch 4/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 847us/step - loss: 11.5588
Epoch 5/100
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
```

```
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 893us/step - loss: 8.9345
Epoch 20/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 824us/step - loss: 8.9818
Epoch 21/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 820us/step - loss: 8.8623
Epoch 22/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 809us/step - loss: 10.0751
Epoch 23/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 809us/step - loss: 9.1437
Epoch 24/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 831us/step - loss: 8.7693
Epoch 25/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 816us/step - loss: 8.8494
Epoch 26/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 808us/step - loss: 9.2006
Epoch 27/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 833us/step - loss: 9.0742
Epoch 28/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 823us/step - loss: 9.3915
Epoch 29/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 807us/step - loss: 9.4279
Epoch 30/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 814us/step - loss: 9.1465
Epoch 31/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 832us/step - loss: 9.1947
Epoch 32/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 835us/step - loss: 9.6595
```

```
 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
```

```
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
```

```
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
```

```
Epoch 74/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 839us/step - loss: 7.5630
Epoch 75/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 806us/step - loss: 7.4649
Epoch 76/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 837us/step - loss: 7.1811
Epoch 77/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 849us/step - loss: 7.4156
Epoch 78/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 819us/step - loss: 6.9992
Epoch 79/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 819us/step - loss: 6.8268
Epoch 80/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 832us/step - loss: 6.4515
Epoch 81/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 814us/step - loss: 7.1046
Epoch 82/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 851us/step - loss: 6.9715
Epoch 83/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 814us/step - loss: 7.0909
Epoch 84/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 858us/step - loss: 6.6760
Epoch 85/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 837us/step - loss: 6.3712
Epoch 86/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 833us/step - loss: 6.6753
Epoch 87/100
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)                          ┃ Output Shape
                ┃       Param # ┃
221 ┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━
    ━━━━━━┩
222 │ dense_4 (Dense)                       │ (None, 33, 33
    )          │             66 │
223 ├─────────────────────────────────────────┼──────────────────────────────────────────┼─────────────────
    ──────┤
224 │ lstm (LSTM)                           │ (None, 33, 64
    )          │         25,088 │
225 ├─────────────────────────────────────────┼──────────────────────────────────────────┼─────────────────
    ──────┤
226 │ lstm_1 (LSTM)                         │ (None, 64
    )                │         33,024 │
```

```
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━
┃                                 ┃                        ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━
│ dropout_1 (Dropout)             │ (None, 64
)                │               0 │
┣━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┼━━━━━━━━━━━━━━━━━━━━━━━━┼━━━━━━━━━━━━━━━
┃                                 ┃                        ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━
│ dense_5 (Dense)                 │ (None, 1
)                │              65 │
┗━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┷━━━━━━━━━━━━━━━━━━━━━━━━┷━━━━━━━━━━━━━━━
 Total params: 58,243 (227.51 KB)
 Trainable params: 58,243 (227.51 KB)
 Non-trainable params: 0 (0.00 B)
Epoch 1/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 13ms/step - loss:
250.2489
Epoch 2/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 3s 12ms/step - loss: 37
.2319
Epoch 3/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 24
.3697
Epoch 4/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 3s 12ms/step - loss: 9.
7334
Epoch 5/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 3s 12ms/step - loss: 7.
1328
Epoch 6/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 6.
2763
Epoch 7/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 6.
1646
Epoch 8/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 5.
1196
Epoch 9/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 4.
5755
Epoch 10/100
```

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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
```

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Epoch 24/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 14ms/step - loss: 3.9254
Epoch 25/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 14ms/step - loss: 3.8522
Epoch 26/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 14ms/step - loss: 3.6067
Epoch 27/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 3.8563
Epoch 28/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 4.2675
Epoch 29/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 3.8052
Epoch 30/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 16ms/step - loss: 3.6228
Epoch 31/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 16ms/step - loss: 4.1392
Epoch 32/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 16ms/step - loss: 3.6418
Epoch 33/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 3.8353
Epoch 34/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 3.9495
Epoch 35/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 3.7528
Epoch 36/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 14ms/step - loss: 3.8066
Epoch 37/100
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
```

```
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 16ms/step - loss: 3.6778
Epoch 52/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 17ms/step - loss: 3.6876
Epoch 53/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 16ms/step - loss: 3.6942
Epoch 54/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 17ms/step - loss: 3.7290
Epoch 55/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 17ms/step - loss: 3.5005
Score (MSE): 1.3520792852354024
Score (RMSE): 1.1627894414877538
Time (seconds): 269.153842
================================================================================
Config n°3
[33, 7, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100, 12, 0.001, 'BiLSTM']
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.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Model: "sequential_2"
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓
┃ Layer (type)                         ┃ Output Shape                ┃         Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩
│ dense_6 (Dense)                      │ (None, 33, 33)              │              66 │
└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘
```

```
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
```

```
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 24ms/step - loss: 3.5346
Epoch 9/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 24ms/step - loss: 3.5611
Epoch 10/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 22ms/step - loss: 3.0969
Epoch 11/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 21ms/step - loss: 3.1386
Epoch 12/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 22ms/step - loss: 3.1019
Epoch 13/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 3.1308
Epoch 14/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 2.9319
Epoch 15/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 25ms/step - loss: 3.0313
Epoch 16/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 26ms/step - loss: 3.0463
Epoch 17/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 25ms/step - loss: 2.9188
Epoch 18/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 25ms/step - loss: 3.2321
Epoch 19/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 24ms/step - loss: 2.7626
Epoch 20/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 25ms/step - loss: 3.0829
Epoch 21/100
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)                         ┃ Output Shape
                ┃       Param # ┃
457 ┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━
    ━━━━━━━━━━━━━┩
458 │ dense_8 (Dense)                      │ (None, 33
    )              │         1,122 │
459 ├──────────────────────────────────────┼─────────────
    ─────────────┤
460 │ dense_9 (Dense)                      │ (None, 64
    )              │         2,176 │
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
```

```
Epoch 37/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.2027
Epoch 38/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 974us/step - loss: 9.3464
Epoch 39/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 976us/step - loss: 9.3941
Epoch 40/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.2552
Epoch 41/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 966us/step - loss: 9.4792
Epoch 42/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.7269
Epoch 43/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 985us/step - loss: 9.3141
Epoch 44/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 997us/step - loss: 9.1413
Epoch 45/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 975us/step - loss: 10.2941
Epoch 46/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 973us/step - loss: 9.4114
Epoch 47/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.5958
24/24 ━━━━━━━━━━━━━━━━━━━━ 0s 2ms/step
Score (MSE): 3.2732230480721607
Score (RMSE): 1.8092050873442074
Time (seconds): 16.047045
================================================================================
Config n°5
[33, 21, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100,
```

```
12, 0.001, 'LSTM']
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.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Model: "sequential_4"
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓
┃ Layer (type)                         ┃ Output Shape                ┃         Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩
│ dense_12 (Dense)                     │ (None, 33, 33)              │              66 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ lstm_4 (LSTM)                        │ (None, 33, 64)              │          25,088 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ lstm_5 (LSTM)                        │ (None, 64)                  │          33,024 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dropout_4 (Dropout)                  │ (None, 64)                  │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dense_13 (Dense)                     │ (None, 1)                   │              65 │
└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘
 Total params: 58,243 (227.51 KB)
 Trainable params: 58,243 (227.51 KB)
 Non-trainable params: 0 (0.00 B)
Epoch 1/100
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
```

```
Epoch 29/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 16ms/step - loss: 6.7901
Epoch 30/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 17ms/step - loss: 6.3822
Epoch 31/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 17ms/step - loss: 6.0608
Epoch 32/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 19ms/step - loss: 6.4209
Epoch 33/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 18ms/step - loss: 5.9672
Epoch 34/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 18ms/step - loss: 6.3712
Epoch 35/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 17ms/step - loss: 6.2950
Epoch 36/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 18ms/step - loss: 6.3486
Epoch 37/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 17ms/step - loss: 6.2838
Epoch 38/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 16ms/step - loss: 6.6415
Epoch 39/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 16ms/step - loss: 5.7479
Epoch 40/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 4s 16ms/step - loss: 5.9821
Epoch 41/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 17ms/step - loss: 6.1249
Epoch 42/100
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
```

```
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 18ms/step - loss: 5.7476
Epoch 57/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 18ms/step - loss: 5.9789
Epoch 58/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 17ms/step - loss: 6.1119
Epoch 59/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 17ms/step - loss: 6.4182
Epoch 60/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 5s 17ms/step - loss: 5.9813
Score (MSE): 4.330844436903899
Score (RMSE): 2.081068100015927
Time (seconds): 321.014366
================================================================================
Config n°6
[33, 21, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100, 12, 0.001, 'BiLSTM']
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.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Model: "sequential_5"
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓
┃ Layer (type)                         ┃ Output Shape                ┃         Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩
│ dense_14 (Dense)                     │ (None, 33, 33)              │              66 │
└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘
```

```
┃ bidirectional_2 (Bidirectional) ┃ (None, 33, 128)  ┃        50,176 ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━┩
┃ bidirectional_3 (Bidirectional) ┃ (None, 128)      ┃        98,816 ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━┩
┃ dropout_5 (Dropout)             ┃ (None, 128)      ┃             0 ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━┩
┃ dense_15 (Dense)                ┃ (None, 1)        ┃           129 ┃
└─────────────────────────────────┴──────────────────┴───────────────┘
 Total params: 149,187 (582.76 KB)
 Trainable params: 149,187 (582.76 KB)
 Non-trainable params: 0 (0.00 B)
Epoch 1/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 12s 26ms/step - loss: 159.4896
Epoch 2/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 27ms/step - loss: 15.1088
Epoch 3/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 25ms/step - loss: 9.9276
Epoch 4/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 8.1994
Epoch 5/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 7.0017
Epoch 6/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 6.4900
Epoch 7/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 24ms/step - loss: 6.4486
Epoch 8/100
```

```
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 25ms/step - loss: 5.2610
Epoch 9/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 27ms/step - loss: 5.3953
Epoch 10/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 8s 30ms/step - loss: 6.0769
Epoch 11/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 26ms/step - loss: 5.6226
Epoch 12/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 24ms/step - loss: 6.0231
Epoch 13/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 5.5224
Epoch 14/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 5.3060
Epoch 15/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 5.9039
Epoch 16/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 24ms/step - loss: 5.4091
Epoch 17/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 26ms/step - loss: 5.8897
Epoch 18/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 28ms/step - loss: 5.1018
Epoch 19/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 8s 30ms/step - loss: 5.4829
Epoch 20/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 27ms/step - loss: 5.2742
Epoch 21/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 25ms/step - loss: 4.8765
```

```
Epoch 22/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 24ms/step - loss: 5.8165
Epoch 23/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 5.6280
Epoch 24/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 24ms/step - loss: 5.0119
Epoch 25/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 24ms/step - loss: 5.1680
Epoch 26/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 25ms/step - loss: 4.9899
Epoch 27/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 7s 27ms/step - loss: 5.3971
Epoch 28/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 9s 32ms/step - loss: 4.8769
Epoch 29/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 9s 34ms/step - loss: 5.2411
Epoch 30/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 8s 28ms/step - loss: 5.1578
Epoch 31/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 24ms/step - loss: 5.0467
Epoch 32/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 5.0051
Epoch 33/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 23ms/step - loss: 5.3773
Epoch 34/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 6s 21ms/step - loss: 5.3462
Epoch 35/100
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
```

```
Score (RMSE): 1.7479234362175302
Time (seconds): 373.337207
================================================================================
Config n°7
[99, 7, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100, 12, 0.001, 'MLP']
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.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Model: "sequential_6"
┌─────────────────────────────────┬────────────────────────┬───────────────┐
│ Layer (type)                    │ Output Shape           │       Param # │
├─────────────────────────────────┼────────────────────────┼───────────────┤
│ dense_16 (Dense)                │ (None, 99)             │         9,900 │
├─────────────────────────────────┼────────────────────────┼───────────────┤
│ dense_17 (Dense)                │ (None, 64)             │         6,400 │
├─────────────────────────────────┼────────────────────────┼───────────────┤
│ dense_18 (Dense)                │ (None, 64)             │         4,160 │
├─────────────────────────────────┼────────────────────────┼───────────────┤
│ dropout_6 (Dropout)             │ (None, 64)             │             0 │
├─────────────────────────────────┼────────────────────────┼───────────────┤
│ dense_19 (Dense)                │ (None, 1)              │            65 │
└─────────────────────────────────┴────────────────────────┴───────────────┘
```

```
853 ──────┴──────────────────┘
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 ━━━━━━━━━━━━━━━━━━━━ 1s 914us/step - loss:
    238.1320
859 Epoch 2/100
860 267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 13.
    6983
861 Epoch 3/100
862 267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.
    9318
863 Epoch 4/100
864 267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 12.
    9459
865 Epoch 5/100
866 267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.
    2670
867 Epoch 6/100
868 267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 11.
    4168
869 Epoch 7/100
870 267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.
    4688
871 Epoch 8/100
872 267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 994us/step - loss:
    11.2800
873 Epoch 9/100
874 267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.
    1866
875 Epoch 10/100
876 267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.
    7083
877 Epoch 11/100
878 267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.
    9584
879 Epoch 12/100
880 267/267 ━━━━━━━━━━━━━━━━━━━━ 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
```

```
Epoch 27/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.2316
Epoch 28/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 8.4655
Epoch 29/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 8.7422
Epoch 30/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 8.8613
Epoch 31/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.1473
Epoch 32/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.2086
Epoch 33/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.1367
Epoch 34/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 8.7402
Epoch 35/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 8.5651
Epoch 36/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 8.4236
Epoch 37/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 8.6488
Epoch 38/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 8.1267
Epoch 39/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 8.9494
Epoch 40/100
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.
```

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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
```

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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)                         ┃ Output Shape
                ┃       Param # ┃
1069 ┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━
     ━━━━━╇━━━━━━━━━━━━━━━━━━━┩
```

```
┃ dense_20 (Dense)                     ┃ (None, 99, 99)              ┃           198 ┃
┃ lstm_8 (LSTM)                        ┃ (None, 99, 64)              ┃        41,984 ┃
┃ lstm_9 (LSTM)                        ┃ (None, 64)                  ┃        33,024 ┃
┃ dropout_7 (Dropout)                  ┃ (None, 64)                  ┃             0 ┃
┃ dense_21 (Dense)                     ┃ (None, 1)                   ┃            65 ┃
 Total params: 75,271 (294.03 KB)
 Trainable params: 75,271 (294.03 KB)
 Non-trainable params: 0 (0.00 B)
Epoch 1/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 53ms/step - loss: 280.8319
Epoch 2/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss: 38.6183
Epoch 3/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 47ms/step - loss: 30.9259
Epoch 4/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 52ms/step - loss: 24.1415
Epoch 5/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 53ms/step - loss: 9.3020
Epoch 6/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 52ms/step - loss: 6.2961
```

```
Epoch 7/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 49ms/step - loss:
    6.4146
Epoch 8/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 50ms/step - loss:
    5.5300
Epoch 9/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 53ms/step - loss:
    5.6372
Epoch 10/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss:
    5.3108
Epoch 11/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 49ms/step - loss:
    4.7715
Epoch 12/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss:
    4.6188
Epoch 13/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 54ms/step - loss:
    4.8374
Epoch 14/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 52ms/step - loss:
    4.4337
Epoch 15/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 50ms/step - loss:
    4.4856
Epoch 16/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 48ms/step - loss:
    4.3684
Epoch 17/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 50ms/step - loss:
    4.2718
Epoch 18/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss:
    4.2882
Epoch 19/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 55ms/step - loss:
    4.2420
Epoch 20/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 52ms/step - loss:
```

```
4.2324
Epoch 21/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 49ms/step - loss:
4.1090
Epoch 22/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss:
4.2765
Epoch 23/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 52ms/step - loss:
3.9210
Epoch 24/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 55ms/step - loss:
4.1061
Epoch 25/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss:
4.0198
Epoch 26/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 50ms/step - loss:
3.8631
Epoch 27/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 52ms/step - loss:
4.1085
Epoch 28/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 53ms/step - loss:
4.1597
Epoch 29/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 50ms/step - loss:
4.2326
Epoch 30/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss:
3.8168
Epoch 31/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 53ms/step - loss:
3.8211
Epoch 32/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 56ms/step - loss:
3.7002
Epoch 33/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss:
3.7049
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
```

```
Epoch 48/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 13s 49ms/step - loss: 3.7526
Epoch 49/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss: 3.9217
Epoch 50/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 16s 59ms/step - loss: 4.0220
Epoch 51/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 56ms/step - loss: 3.7228
Epoch 52/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss: 4.0141
Epoch 53/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 55ms/step - loss: 3.6006
Epoch 54/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 55ms/step - loss: 4.0038
Epoch 55/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 62ms/step - loss: 3.4685
Epoch 56/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 58ms/step - loss: 3.4282
Epoch 57/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 65ms/step - loss: 3.8653
Epoch 58/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 69ms/step - loss: 3.6297
Epoch 59/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 76ms/step - loss: 3.6663
Epoch 60/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 70ms/step - loss: 3.9304
Epoch 61/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 16s 59ms/step - loss:
```

```
4.1709
Epoch 62/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 63ms/step - loss: 3.5032
Epoch 63/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 77ms/step - loss: 3.7366
Epoch 64/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 74ms/step - loss: 4.0322
Epoch 65/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 57ms/step - loss: 3.7486
Score (MSE): 1.9588819186949946
Score (RMSE): 1.3996006282847242
Time (seconds): 1002.847957
====================================================================================================
Config n°9
[99, 7, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100, 12, 0.001, 'BiLSTM']
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.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Model: "sequential_8"
┌─────────────────────────────────┬────────────────────────┬───────────────┐
│ Layer (type)                    │ Output Shape           │       Param # │
├─────────────────────────────────┼────────────────────────┼───────────────┤
│ dense_22 (Dense)                │ (None, 99, 99)         │           198 │
├─────────────────────────────────┼────────────────────────┼───────────────┤
│ bidirectional_4 (Bidirectional) │ (None, 99, 128
```

```
)          │          83,968 │
├──────────────────────────────────────┼─────────────
──────┼──────────────────────┤
│ bidirectional_5 (Bidirectional) │ (None, 128
)              │         98,816 │
├──────────────────────────────────────┼─────────────
──────┼──────────────────────┤
│ dropout_8 (Dropout)                  │ (None, 128
)              │              0 │
├──────────────────────────────────────┼─────────────
──────┼──────────────────────┤
│ dense_23 (Dense)                     │ (None, 1
)                │            129 │
└──────────────────────────────────────┴─────────────
──────┴──────────────────────┘

 Total params: 183,111 (715.28 KB)
 Trainable params: 183,111 (715.28 KB)
 Non-trainable params: 0 (0.00 B)
Epoch 1/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 25s 72ms/step - loss:
167.1791
Epoch 2/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 30s 113ms/step - loss
: 27.1872
Epoch 3/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 76ms/step - loss:
7.7519
Epoch 4/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 25s 93ms/step - loss:
4.7229
Epoch 5/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 29s 109ms/step - loss
: 4.1584
Epoch 6/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 70ms/step - loss:
4.1281
Epoch 7/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 76ms/step - loss:
3.5944
Epoch 8/100
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
```

```
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 79ms/step - loss:
2.9598
Epoch 23/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 82ms/step - loss:
2.8752
Epoch 24/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 23s 85ms/step - loss:
2.8873
Epoch 25/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 27s 101ms/step - loss
: 3.0635
Epoch 26/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 70ms/step - loss:
3.2196
Epoch 27/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 25s 93ms/step - loss:
2.7883
Epoch 28/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 71ms/step - loss:
3.0129
Epoch 29/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 74ms/step - loss:
2.9266
Epoch 30/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 72ms/step - loss:
2.9762
Epoch 31/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 69ms/step - loss:
2.9195
Epoch 32/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 77ms/step - loss:
2.9469
Epoch 33/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 74ms/step - loss:
2.7278
Epoch 34/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 66ms/step - loss:
2.7862
Epoch 35/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 76ms/step - loss:
2.8059
```

```
Epoch 36/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 23s 88ms/step - loss: 2.9127
Epoch 37/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 23s 87ms/step - loss: 2.7440
Epoch 38/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 29s 109ms/step - loss: 2.5617
Epoch 39/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 77ms/step - loss: 2.6618
Epoch 40/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 25s 92ms/step - loss: 2.7224
Epoch 41/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 71ms/step - loss: 2.7664
Epoch 42/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 70ms/step - loss: 2.7257
Epoch 43/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 80ms/step - loss: 2.9150
Epoch 44/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 83ms/step - loss: 2.6870
Epoch 45/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 24s 89ms/step - loss: 2.8052
Epoch 46/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 82ms/step - loss: 2.6671
Epoch 47/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 80ms/step - loss: 2.7809
Epoch 48/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 77ms/step - loss: 2.6604
Epoch 49/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 72ms/step - loss:
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```
2.5828
Epoch 50/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 74ms/step - loss:
2.4992
Epoch 51/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 77ms/step - loss:
2.5386
Epoch 52/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 25s 94ms/step - loss:
2.5747
Epoch 53/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 24s 88ms/step - loss:
2.6583
Epoch 54/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 69ms/step - loss:
2.4235
Epoch 55/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 77ms/step - loss:
2.5332
Epoch 56/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 81ms/step - loss:
2.9822
Epoch 57/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 81ms/step - loss:
2.5433
Epoch 58/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 82ms/step - loss:
2.6213
Epoch 59/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 82ms/step - loss:
2.6075
Epoch 60/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 73ms/step - loss:
2.8378
Epoch 61/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 23s 85ms/step - loss:
2.5415
Epoch 62/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 76ms/step - loss:
2.8423
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
```

```
Epoch 77/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 68ms/step - loss:
    2.4902
Epoch 78/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 71ms/step - loss:
    2.4767
Epoch 79/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 27s 100ms/step - loss
    : 2.5050
Epoch 80/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 24s 90ms/step - loss:
    2.3220
Epoch 81/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 79ms/step - loss:
    2.3233
Epoch 82/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 23s 85ms/step - loss:
    2.5330
Epoch 83/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 81ms/step - loss:
    2.5995
Epoch 84/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 65ms/step - loss:
    2.7125
Epoch 85/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 25s 95ms/step - loss:
    2.5472
Epoch 86/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 27s 103ms/step - loss
    : 2.6928
Epoch 87/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 74ms/step - loss:
    2.4645
Epoch 88/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 77ms/step - loss:
    2.5775
Epoch 89/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 75ms/step - loss:
    2.4355
Epoch 90/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 69ms/step - loss:
```

```
2.5220
Score (MSE): 2.2786839310548666
Score (RMSE): 1.5095310301729032
Time (seconds): 2019.166786
================================================================================
Config n°10
[99, 21, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100, 12, 0.001, 'MLP']
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.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Model: "sequential_9"
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓
┃ Layer (type)                         ┃ Output Shape                ┃         Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩
│ dense_24 (Dense)                     │ (None, 99)                  │           9,900 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dense_25 (Dense)                     │ (None, 64)                  │           6,400 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dense_26 (Dense)                     │ (None, 64)                  │           4,160 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dropout_9 (Dropout)                  │ (None, 64)                  │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ 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
```

```
Epoch 40/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.5821
Epoch 41/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.0070
Epoch 42/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.3853
Epoch 43/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.2720
Epoch 44/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.4585
Epoch 45/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.5350
Epoch 46/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.5241
Epoch 47/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.9469
Epoch 48/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.4781
Epoch 49/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 9.5568
Epoch 50/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 8.9694
Epoch 51/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 10.3649
Epoch 52/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step - loss: 11.2185
Epoch 53/100
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`/`
```

```
input_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Model: "sequential_10"
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓
┃ Layer (type)                         ┃ Output Shape                ┃         Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩
│ dense_28 (Dense)                     │ (None, 99, 99)              │             198 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ lstm_12 (LSTM)                       │ (None, 99, 64)              │          41,984 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ lstm_13 (LSTM)                       │ (None, 64)                  │          33,024 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dropout_10 (Dropout)                 │ (None, 64)                  │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dense_29 (Dense)                     │ (None, 1)                   │              65 │
└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘
 Total params: 75,271 (294.03 KB)
 Trainable params: 75,271 (294.03 KB)
 Non-trainable params: 0 (0.00 B)
Epoch 1/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 47ms/step - loss: 273.4117
Epoch 2/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 67ms/step - loss: 38.3948
```

```
Epoch 3/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 23s 84ms/step - loss:
    33.5894
Epoch 4/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 63ms/step - loss:
    18.6507
Epoch 5/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 57ms/step - loss:
    10.9165
Epoch 6/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 55ms/step - loss:
    9.7514
Epoch 7/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 64ms/step - loss:
    7.6778
Epoch 8/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 69ms/step - loss:
    7.7776
Epoch 9/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 65ms/step - loss:
    8.5516
Epoch 10/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 55ms/step - loss:
    7.5995
Epoch 11/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 16s 58ms/step - loss:
    6.8452
Epoch 12/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 65ms/step - loss:
    7.7402
Epoch 13/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 29s 107ms/step - loss
    : 6.8915
Epoch 14/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 54ms/step - loss:
    6.7014
Epoch 15/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 55ms/step - loss:
    6.5339
Epoch 16/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 16s 60ms/step - loss:
```

```
6.8497
Epoch 17/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 66ms/step - loss:
6.8210
Epoch 18/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 16s 59ms/step - loss:
6.6712
Epoch 19/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 56ms/step - loss:
7.0270
Epoch 20/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 16s 58ms/step - loss:
6.3585
Epoch 21/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 64ms/step - loss:
6.7500
Epoch 22/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 64ms/step - loss:
6.5656
Epoch 23/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 56ms/step - loss:
6.5338
Epoch 24/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 58ms/step - loss:
6.9933
Epoch 25/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 65ms/step - loss:
6.5768
Epoch 26/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 74ms/step - loss:
6.3654
Epoch 27/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 66ms/step - loss:
6.1702
Epoch 28/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 73ms/step - loss:
6.7589
Epoch 29/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 24s 91ms/step - loss:
6.5664
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
```

```
Epoch 44/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 53ms/step - loss:
    6.1742
Epoch 45/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 55ms/step - loss:
    5.8766
Epoch 46/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss:
    6.0378
Epoch 47/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 52ms/step - loss:
    6.2610
Epoch 48/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 67ms/step - loss:
    5.8369
Epoch 49/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 16s 61ms/step - loss:
    5.9550
Epoch 50/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 64ms/step - loss:
    6.6731
Epoch 51/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 16s 60ms/step - loss:
    6.1636
Epoch 52/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 15s 54ms/step - loss:
    5.8952
Epoch 53/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 53ms/step - loss:
    6.2755
Epoch 54/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss:
    6.0431
Epoch 55/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 51ms/step - loss:
    5.7164
Epoch 56/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 14s 54ms/step - loss:
    5.8106
Epoch 57/100
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
```

```
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 73ms/step - loss:
5.6449
Epoch 72/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 23s 82ms/step - loss:
5.5234
Epoch 73/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 72ms/step - loss:
5.6530
Epoch 74/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 76ms/step - loss:
5.9883
Epoch 75/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 81ms/step - loss:
5.7179
Epoch 76/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 64ms/step - loss:
5.9959
Epoch 77/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 70ms/step - loss:
5.3149
Epoch 78/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 82ms/step - loss:
5.5820
Epoch 79/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 73ms/step - loss:
5.7772
Epoch 80/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 63ms/step - loss:
5.2779
Epoch 81/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 73ms/step - loss:
5.5984
Epoch 82/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 76ms/step - loss:
5.4992
Epoch 83/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 64ms/step - loss:
5.6594
Epoch 84/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 16s 60ms/step - loss:
5.4686
```

```
Epoch 85/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 72ms/step - loss:
    5.3686
Epoch 86/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 71ms/step - loss:
    5.0367
Epoch 87/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 16s 61ms/step - loss:
    5.0587
Score (MSE): 3.4949923251617
Score (RMSE): 1.8694898569293443
Time (seconds): 1566.446107
================================================
    ========================================
Config n°12
[99, 21, 0.8, 64, 2, 1, 0.2, [True, 10, True], 100
    , 12, 0.001, 'BiLSTM']
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.
  super().__init__(activity_regularizer=
    activity_regularizer, **kwargs)
Model: "sequential_11"
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓
┃ Layer (type)                          ┃ Output Shape                ┃         Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩
│ dense_30 (Dense)                      │ (None, 99, 99)              │             198 │
├───────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ bidirectional_6 (Bidirectional)       │ (None, 99, 128)             │          83,968 │
├───────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ bidirectional_7 (Bidirectional)       │ (None, 128                  │
```

```
)                    │              98,816 │
├─────────────────────┼──────────────────────┤
│ dropout_11 (Dropout)                      │ (None, 128
)                    │                   0 │
├─────────────────────┼──────────────────────┤
│ dense_31 (Dense)                          │ (None, 1
)                    │                 129 │
└─────────────────────┴──────────────────────┘

 Total params: 183,111 (715.28 KB)
 Trainable params: 183,111 (715.28 KB)
 Non-trainable params: 0 (0.00 B)
Epoch 1/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 23s 66ms/step - loss:
164.4588
Epoch 2/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 75ms/step - loss:
27.0200
Epoch 3/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 22s 81ms/step - loss:
9.5786
Epoch 4/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 67ms/step - loss:
6.6399
Epoch 5/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 65ms/step - loss:
6.8523
Epoch 6/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 77ms/step - loss:
6.7894
Epoch 7/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 69ms/step - loss:
6.5838
Epoch 8/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 64ms/step - loss:
6.2616
Epoch 9/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 74ms/step - loss:
6.2897
```

```
Epoch 10/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 24s 89ms/step - loss:
6.3119
Epoch 11/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 66ms/step - loss:
5.5521
Epoch 12/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 77ms/step - loss:
5.2200
Epoch 13/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 74ms/step - loss:
5.8402
Epoch 14/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 64ms/step - loss:
5.2746
Epoch 15/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 68ms/step - loss:
5.1323
Epoch 16/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 80ms/step - loss:
4.9045
Epoch 17/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 69ms/step - loss:
5.5481
Epoch 18/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 62ms/step - loss:
5.2853
Epoch 19/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 71ms/step - loss:
4.9720
Epoch 20/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 75ms/step - loss:
5.0743
Epoch 21/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 65ms/step - loss:
5.1307
Epoch 22/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 70ms/step - loss:
5.3761
Epoch 23/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 76ms/step - loss:
```

```
4.9537
Epoch 24/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 66ms/step - loss:
5.4254
Epoch 25/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 68ms/step - loss:
5.1893
Epoch 26/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 26s 96ms/step - loss:
5.2167
Epoch 27/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 68ms/step - loss:
5.3364
Epoch 28/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 66ms/step - loss:
5.0779
Epoch 29/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 21s 79ms/step - loss:
4.8371
Epoch 30/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 67ms/step - loss:
5.2673
Epoch 31/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 65ms/step - loss:
4.9685
Epoch 32/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 72ms/step - loss:
5.3692
Epoch 33/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 73ms/step - loss:
5.0587
Epoch 34/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 63ms/step - loss:
5.4148
Epoch 35/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 69ms/step - loss:
5.0569
Epoch 36/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 73ms/step - loss:
5.3562
Epoch 37/100
```

```
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 66ms/step - loss: 4.7635
Epoch 38/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 69ms/step - loss: 4.8733
Epoch 39/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 66ms/step - loss: 4.8131
Epoch 40/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 73ms/step - loss: 5.4023
Epoch 41/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 65ms/step - loss: 5.3022
Epoch 42/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 74ms/step - loss: 4.9117
Epoch 43/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 19s 69ms/step - loss: 4.8291
Epoch 44/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 66ms/step - loss: 4.8830
Epoch 45/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 74ms/step - loss: 4.8050
Epoch 46/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 68ms/step - loss: 4.8520
Epoch 47/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 18s 67ms/step - loss: 4.9663
Epoch 48/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 20s 76ms/step - loss: 4.9866
Epoch 49/100
267/267 ━━━━━━━━━━━━━━━━━━━━ 17s 65ms/step - loss: 4.7993
Score (MSE): 2.842431251592426
Score (RMSE): 1.685951141519951
Time (seconds): 983.091391
```

```
1921
1922 ----------------------------Resultados Finais
     ----------------------------
1923 Config nº3 - MSE: 1.036445, RMSE: 1.018059
1924 Config nº1 - MSE: 1.048601, RMSE: 1.024012
1925 Config nº7 - MSE: 1.221642, RMSE: 1.105279
1926 Config nº2 - MSE: 1.352079, RMSE: 1.162789
1927 Config nº8 - MSE: 1.958882, RMSE: 1.399601
1928 Config nº9 - MSE: 2.278684, RMSE: 1.509531
1929 Config nº12 - MSE: 2.842431, RMSE: 1.685951
1930 Config nº6 - MSE: 3.055236, RMSE: 1.747923
1931 Config nº4 - MSE: 3.273223, RMSE: 1.809205
1932 Config nº11 - MSE: 3.494992, RMSE: 1.869490
1933 Config nº10 - MSE: 3.972776, RMSE: 1.993182
1934 Config nº5 - MSE: 4.330844, RMSE: 2.081068
1935 --- End: 6931.289 seconds ---
1936 Done
1937
1938 Process finished with exit code 0
1939
```