

```
1 C:\Users\mail2\AppData\Local\Programs\Python\Python38
  \python.exe "C:/Users/mail2/Documents/Nauka/PJA 2021/
  SEMESTR VII/NAI/Projekty/Neural_Network/Penguin/main.
  py"
2 {'Adelie': 0, 'Gentoo': 1, 'Chinstrap': 2}
3 Fold...
4 Epoch 1/500
5 6/6 [=====] - 1s 22ms/step
  - loss: 0.9634 - acc: 0.5410 - val_loss: 0.7272 -
  val_acc: 0.5543
6 Epoch 2/500
7 6/6 [=====] - 0s 3ms/step -
  loss: 0.6577 - acc: 0.7541 - val_loss: 0.5928 -
  val_acc: 0.6848
8 Epoch 3/500
9 6/6 [=====] - 0s 6ms/step -
  loss: 0.5254 - acc: 0.7869 - val_loss: 0.4777 -
  val_acc: 0.8370
10 Epoch 4/500
11 6/6 [=====] - 0s 6ms/step -
  loss: 0.4198 - acc: 0.8798 - val_loss: 0.4003 -
  val_acc: 0.9130
12 Epoch 5/500
13 6/6 [=====] - 0s 6ms/step -
  loss: 0.3833 - acc: 0.8579 - val_loss: 0.3409 -
  val_acc: 0.9565
14 Epoch 6/500
15 6/6 [=====] - 0s 6ms/step -
  loss: 0.3145 - acc: 0.9290 - val_loss: 0.2937 -
  val_acc: 0.9674
16 Epoch 7/500
17 6/6 [=====] - 0s 7ms/step -
  loss: 0.2686 - acc: 0.9454 - val_loss: 0.2536 -
  val_acc: 0.9674
18 Epoch 8/500
19 6/6 [=====] - 0s 6ms/step -
  loss: 0.2336 - acc: 0.9672 - val_loss: 0.2210 -
  val_acc: 0.9674
20 Epoch 9/500
21 6/6 [=====] - 0s 3ms/step -
  loss: 0.2011 - acc: 0.9672 - val_loss: 0.1918 -
```

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21 val_acc: 0.9674
22 Epoch 10/500
23 6/6 [=====] - 0s 2ms/step -
    loss: 0.1781 - acc: 0.9672 - val_loss: 0.1717 -
    val_acc: 0.9674
24 Epoch 11/500
25 6/6 [=====] - 0s 3ms/step -
    loss: 0.1555 - acc: 0.9781 - val_loss: 0.1487 -
    val_acc: 0.9674
26 Epoch 12/500
27 6/6 [=====] - 0s 3ms/step -
    loss: 0.1338 - acc: 0.9727 - val_loss: 0.1334 -
    val_acc: 0.9674
28 Epoch 13/500
29 6/6 [=====] - 0s 6ms/step -
    loss: 0.1150 - acc: 0.9836 - val_loss: 0.1305 -
    val_acc: 0.9674
30 Epoch 14/500
31 6/6 [=====] - 0s 6ms/step -
    loss: 0.1104 - acc: 0.9781 - val_loss: 0.1068 -
    val_acc: 0.9783
32 Epoch 15/500
33 6/6 [=====] - 0s 6ms/step -
    loss: 0.0920 - acc: 0.9891 - val_loss: 0.0960 -
    val_acc: 0.9565
34 Epoch 16/500
35 6/6 [=====] - 0s 6ms/step -
    loss: 0.0795 - acc: 0.9891 - val_loss: 0.0880 -
    val_acc: 0.9565
36 Epoch 17/500
37 6/6 [=====] - 0s 7ms/step -
    loss: 0.0826 - acc: 0.9836 - val_loss: 0.0839 -
    val_acc: 0.9783
38 Epoch 18/500
39 6/6 [=====] - 0s 5ms/step -
    loss: 0.0658 - acc: 0.9891 - val_loss: 0.0772 -
    val_acc: 0.9783
40 Epoch 19/500
41 6/6 [=====] - 0s 6ms/step -
    loss: 0.0665 - acc: 0.9781 - val_loss: 0.0720 -
    val_acc: 0.9565
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42 Epoch 20/500
43 6/6 [=====] - 0s 3ms/step -
    loss: 0.0558 - acc: 0.9891 - val_loss: 0.0689 -
    val_acc: 0.9565
44 Epoch 21/500
45 6/6 [=====] - 0s 3ms/step -
    loss: 0.0511 - acc: 0.9945 - val_loss: 0.0651 -
    val_acc: 0.9565
46 Epoch 22/500
47 6/6 [=====] - 0s 6ms/step -
    loss: 0.0551 - acc: 0.9727 - val_loss: 0.0694 -
    val_acc: 0.9783
48 Epoch 23/500
49 6/6 [=====] - 0s 6ms/step -
    loss: 0.0553 - acc: 0.9781 - val_loss: 0.0606 -
    val_acc: 0.9565
50 Epoch 24/500
51 6/6 [=====] - 0s 7ms/step -
    loss: 0.0451 - acc: 0.9945 - val_loss: 0.0603 -
    val_acc: 0.9565
52 Epoch 25/500
53 6/6 [=====] - 0s 6ms/step -
    loss: 0.0465 - acc: 0.9945 - val_loss: 0.0581 -
    val_acc: 0.9783
54 Epoch 26/500
55 6/6 [=====] - 0s 6ms/step -
    loss: 0.0413 - acc: 0.9891 - val_loss: 0.0546 -
    val_acc: 0.9565
56 Epoch 27/500
57 6/6 [=====] - 0s 6ms/step -
    loss: 0.0421 - acc: 0.9945 - val_loss: 0.0581 -
    val_acc: 0.9783
58 Epoch 28/500
59 6/6 [=====] - 0s 3ms/step -
    loss: 0.0393 - acc: 0.9891 - val_loss: 0.0562 -
    val_acc: 0.9783
60 Epoch 29/500
61 6/6 [=====] - 0s 3ms/step -
    loss: 0.0348 - acc: 0.9945 - val_loss: 0.0492 -
    val_acc: 0.9674
62 Epoch 30/500
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63 6/6 [=====] - 0s 3ms/step
    - loss: 0.0321 - acc: 0.9891 - val_loss: 0.0535 -
    val_acc: 0.9783
64 Epoch 31/500
65 6/6 [=====] - 0s 3ms/step
    - loss: 0.0318 - acc: 0.9891 - val_loss: 0.0558 -
    val_acc: 0.9783
66 Epoch 32/500
67 6/6 [=====] - 0s 3ms/step
    - loss: 0.0303 - acc: 0.9945 - val_loss: 0.0460 -
    val_acc: 0.9783
68 Epoch 33/500
69 6/6 [=====] - 0s 6ms/step
    - loss: 0.0287 - acc: 0.9836 - val_loss: 0.0455 -
    val_acc: 0.9783
70 Epoch 34/500
71 6/6 [=====] - 0s 7ms/step
    - loss: 0.0301 - acc: 0.9945 - val_loss: 0.0436 -
    val_acc: 0.9674
72 Epoch 35/500
73 6/6 [=====] - 0s 6ms/step
    - loss: 0.0274 - acc: 0.9945 - val_loss: 0.0430 -
    val_acc: 0.9783
74 Epoch 36/500
75 6/6 [=====] - 0s 6ms/step
    - loss: 0.0231 - acc: 0.9945 - val_loss: 0.0446 -
    val_acc: 0.9783
76 Epoch 37/500
77 6/6 [=====] - 0s 6ms/step
    - loss: 0.0244 - acc: 0.9945 - val_loss: 0.0505 -
    val_acc: 0.9783
78 Epoch 38/500
79 6/6 [=====] - 0s 6ms/step
    - loss: 0.0303 - acc: 0.9836 - val_loss: 0.0386 -
    val_acc: 0.9674
80 Epoch 39/500
81 6/6 [=====] - 0s 3ms/step
    - loss: 0.0283 - acc: 0.9891 - val_loss: 0.0383 -
    val_acc: 0.9783
82 Fold...
83 Epoch 1/500
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84 6/6 [=====] - 0s 19ms/step
    - loss: 0.8840 - acc: 0.5792 - val_loss: 0.5735 -
    val_acc: 0.7500
85 Epoch 2/500
86 6/6 [=====] - 0s 6ms/step
    - loss: 0.5816 - acc: 0.7650 - val_loss: 0.4192 -
    val_acc: 0.9565
87 Epoch 3/500
88 6/6 [=====] - 0s 6ms/step
    - loss: 0.4728 - acc: 0.8361 - val_loss: 0.3460 -
    val_acc: 0.9565
89 Epoch 4/500
90 6/6 [=====] - 0s 6ms/step
    - loss: 0.3750 - acc: 0.9126 - val_loss: 0.2880 -
    val_acc: 0.9783
91 Epoch 5/500
92 6/6 [=====] - 0s 6ms/step
    - loss: 0.3372 - acc: 0.9126 - val_loss: 0.2386 -
    val_acc: 0.9891
93 Epoch 6/500
94 6/6 [=====] - 0s 6ms/step
    - loss: 0.2823 - acc: 0.9454 - val_loss: 0.1978 -
    val_acc: 0.9565
95 Epoch 7/500
96 6/6 [=====] - 0s 6ms/step
    - loss: 0.2271 - acc: 0.9727 - val_loss: 0.1690 -
    val_acc: 1.0000
97 Epoch 8/500
98 6/6 [=====] - 0s 7ms/step
    - loss: 0.2222 - acc: 0.9399 - val_loss: 0.1433 -
    val_acc: 0.9891
99 Epoch 9/500
100 6/6 [=====] - 0s 5ms/step
    - loss: 0.1969 - acc: 0.9508 - val_loss: 0.1245 -
    val_acc: 1.0000
101 Epoch 10/500
102 6/6 [=====] - 0s 6ms/step
    - loss: 0.1493 - acc: 0.9836 - val_loss: 0.1115 -
    val_acc: 0.9891
103 Epoch 11/500
104 6/6 [=====] - 0s 6ms/step
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104 - loss: 0.1470 - acc: 0.9781 - val_loss: 0.0928 -  
    val_acc: 1.0000  
105 Epoch 12/500  
106 6/6 [=====] - 0s 6ms/step  
    - loss: 0.1302 - acc: 0.9781 - val_loss: 0.0865 -  
    val_acc: 0.9891  
107 Epoch 13/500  
108 6/6 [=====] - 0s 6ms/step  
    - loss: 0.1065 - acc: 0.9781 - val_loss: 0.0715 -  
    val_acc: 1.0000  
109 Epoch 14/500  
110 6/6 [=====] - 0s 6ms/step  
    - loss: 0.1116 - acc: 0.9617 - val_loss: 0.0632 -  
    val_acc: 1.0000  
111 Epoch 15/500  
112 6/6 [=====] - 0s 6ms/step  
    - loss: 0.0844 - acc: 0.9836 - val_loss: 0.0592 -  
    val_acc: 0.9891  
113 Epoch 16/500  
114 6/6 [=====] - 0s 6ms/step  
    - loss: 0.0846 - acc: 0.9836 - val_loss: 0.0548 -  
    val_acc: 0.9891  
115 Epoch 17/500  
116 6/6 [=====] - 0s 6ms/step  
    - loss: 0.0878 - acc: 0.9727 - val_loss: 0.0468 -  
    val_acc: 1.0000  
117 Epoch 18/500  
118 6/6 [=====] - 0s 6ms/step  
    - loss: 0.0671 - acc: 0.9891 - val_loss: 0.0483 -  
    val_acc: 0.9891  
119 Epoch 19/500  
120 6/6 [=====] - 0s 6ms/step  
    - loss: 0.0654 - acc: 0.9781 - val_loss: 0.0387 -  
    val_acc: 1.0000  
121 Epoch 20/500  
122 6/6 [=====] - 0s 6ms/step  
    - loss: 0.0654 - acc: 0.9727 - val_loss: 0.0387 -  
    val_acc: 0.9891  
123 Epoch 21/500  
124 6/6 [=====] - 0s 6ms/step  
    - loss: 0.0569 - acc: 0.9836 - val_loss: 0.0331 -
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124 val_acc: 1.0000
125 Epoch 22/500
126 6/6 [=====] - 0s 6ms/step
    - loss: 0.0493 - acc: 1.0000 - val_loss: 0.0308 -
    val_acc: 1.0000
127 Epoch 23/500
128 6/6 [=====] - 0s 6ms/step
    - loss: 0.0581 - acc: 0.9727 - val_loss: 0.0302 -
    val_acc: 1.0000
129 Epoch 24/500
130 6/6 [=====] - 0s 7ms/step
    - loss: 0.0439 - acc: 0.9945 - val_loss: 0.0299 -
    val_acc: 0.9891
131 Epoch 25/500
132 6/6 [=====] - 0s 6ms/step
    - loss: 0.0454 - acc: 0.9836 - val_loss: 0.0265 -
    val_acc: 1.0000
133 Epoch 26/500
134 6/6 [=====] - 0s 6ms/step
    - loss: 0.0448 - acc: 0.9945 - val_loss: 0.0280 -
    val_acc: 1.0000
135 Epoch 27/500
136 6/6 [=====] - 0s 8ms/step
    - loss: 0.0444 - acc: 0.9891 - val_loss: 0.0240 -
    val_acc: 1.0000
137 Fold...
138 Epoch 1/500
139 6/6 [=====] - 0s 19ms/step
    - loss: 1.1040 - acc: 0.4076 - val_loss: 0.7498 -
    val_acc: 0.7033
140 Epoch 2/500
141 6/6 [=====] - 0s 3ms/step
    - loss: 0.6935 - acc: 0.7554 - val_loss: 0.5686 -
    val_acc: 0.8022
142 Epoch 3/500
143 6/6 [=====] - 0s 5ms/step
    - loss: 0.5295 - acc: 0.8261 - val_loss: 0.4593 -
    val_acc: 0.9451
144 Epoch 4/500
145 6/6 [=====] - 0s 6ms/step
    - loss: 0.4211 - acc: 0.8696 - val_loss: 0.3836 -
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145 val_acc: 0.9780
146 Epoch 5/500
147 6/6 [=====] - 0s 6ms/step
    - loss: 0.3378 - acc: 0.9239 - val_loss: 0.3259 -
    val_acc: 0.9670
148 Epoch 6/500
149 6/6 [=====] - 0s 6ms/step
    - loss: 0.3290 - acc: 0.8967 - val_loss: 0.2751 -
    val_acc: 0.9780
150 Epoch 7/500
151 6/6 [=====] - 0s 6ms/step
    - loss: 0.2553 - acc: 0.9728 - val_loss: 0.2335 -
    val_acc: 0.9780
152 Epoch 8/500
153 6/6 [=====] - 0s 6ms/step
    - loss: 0.2237 - acc: 0.9457 - val_loss: 0.1983 -
    val_acc: 1.0000
154 Epoch 9/500
155 6/6 [=====] - 0s 6ms/step
    - loss: 0.1810 - acc: 0.9674 - val_loss: 0.1707 -
    val_acc: 1.0000
156 Epoch 10/500
157 6/6 [=====] - 0s 6ms/step
    - loss: 0.1513 - acc: 0.9728 - val_loss: 0.1499 -
    val_acc: 0.9890
158 Epoch 11/500
159 6/6 [=====] - 0s 6ms/step
    - loss: 0.1450 - acc: 0.9783 - val_loss: 0.1338 -
    val_acc: 0.9890
160 Epoch 12/500
161 6/6 [=====] - 0s 6ms/step
    - loss: 0.1194 - acc: 0.9783 - val_loss: 0.1158 -
    val_acc: 1.0000
162 Epoch 13/500
163 6/6 [=====] - 0s 6ms/step
    - loss: 0.1046 - acc: 0.9891 - val_loss: 0.1096 -
    val_acc: 0.9780
164 Epoch 14/500
165 6/6 [=====] - 0s 7ms/step
    - loss: 0.0929 - acc: 0.9891 - val_loss: 0.0918 -
    val_acc: 1.0000
```



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166 Epoch 15/500
167 6/6 [=====] - 0s 6ms/step
    - loss: 0.0890 - acc: 0.9837 - val_loss: 0.0840 -
    val_acc: 0.9780
168 Epoch 16/500
169 6/6 [=====] - 0s 6ms/step
    - loss: 0.0749 - acc: 0.9891 - val_loss: 0.0935 -
    val_acc: 0.9670
170 Epoch 17/500
171 6/6 [=====] - 0s 6ms/step
    - loss: 0.0767 - acc: 0.9674 - val_loss: 0.0731 -
    val_acc: 0.9890
172 Epoch 18/500
173 6/6 [=====] - 0s 6ms/step
    - loss: 0.0688 - acc: 0.9728 - val_loss: 0.0663 -
    val_acc: 0.9890
174 Epoch 19/500
175 6/6 [=====] - 0s 6ms/step
    - loss: 0.0554 - acc: 0.9891 - val_loss: 0.0617 -
    val_acc: 0.9890
176 Epoch 20/500
177 6/6 [=====] - 0s 3ms/step
    - loss: 0.0531 - acc: 0.9837 - val_loss: 0.0779 -
    val_acc: 0.9670
178 Epoch 21/500
179 6/6 [=====] - 0s 6ms/step
    - loss: 0.0552 - acc: 0.9946 - val_loss: 0.0575 -
    val_acc: 0.9780
180 Epoch 22/500
181 6/6 [=====] - 0s 6ms/step
    - loss: 0.0513 - acc: 0.9837 - val_loss: 0.0533 -
    val_acc: 1.0000
182 Epoch 23/500
183 6/6 [=====] - 0s 6ms/step
    - loss: 0.0517 - acc: 0.9891 - val_loss: 0.0498 -
    val_acc: 0.9890
184 Epoch 24/500
185 6/6 [=====] - 0s 6ms/step
    - loss: 0.0392 - acc: 0.9891 - val_loss: 0.0596 -
    val_acc: 0.9890
186 Epoch 25/500
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187 6/6 [=====] - 0s 6ms/step
    - loss: 0.0490 - acc: 0.9837 - val_loss: 0.0446 -
    val_acc: 0.9890
188 Epoch 26/500
189 6/6 [=====] - 0s 6ms/step
    - loss: 0.0353 - acc: 0.9891 - val_loss: 0.0429 -
    val_acc: 0.9890
190 Epoch 27/500
191 6/6 [=====] - 0s 6ms/step
    - loss: 0.0347 - acc: 0.9946 - val_loss: 0.0413 -
    val_acc: 1.0000
192 Epoch 28/500
193 6/6 [=====] - 0s 6ms/step
    - loss: 0.0288 - acc: 1.0000 - val_loss: 0.0402 -
    val_acc: 0.9890
194 Epoch 29/500
195 6/6 [=====] - 0s 6ms/step
    - loss: 0.0479 - acc: 0.9837 - val_loss: 0.0375 -
    val_acc: 1.0000
196 Epoch 30/500
197 6/6 [=====] - 0s 5ms/step
    - loss: 0.0298 - acc: 0.9891 - val_loss: 0.0380 -
    val_acc: 0.9890
198 Epoch 31/500
199 6/6 [=====] - 0s 6ms/step
    - loss: 0.0252 - acc: 0.9946 - val_loss: 0.0358 -
    val_acc: 0.9890
200 Epoch 32/500
201 6/6 [=====] - 0s 6ms/step
    - loss: 0.0272 - acc: 0.9891 - val_loss: 0.0371 -
    val_acc: 0.9890
202 Epoch 33/500
203 6/6 [=====] - 0s 6ms/step
    - loss: 0.0317 - acc: 0.9837 - val_loss: 0.0350 -
    val_acc: 0.9890
204 Epoch 34/500
205 6/6 [=====] - 0s 6ms/step
    - loss: 0.0193 - acc: 1.0000 - val_loss: 0.0405 -
    val_acc: 0.9890
206 Epoch 35/500
207 6/6 [=====] - 0s 6ms/step
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207 - loss: 0.0261 - acc: 1.0000 - val_loss: 0.0338 -  
    val_acc: 0.9890  
208 Epoch 36/500  
209 6/6 [=====] - 0s 6ms/step  
    - loss: 0.0229 - acc: 0.9891 - val_loss: 0.0303 -  
    val_acc: 0.9890  
210 Epoch 37/500  
211 6/6 [=====] - 0s 6ms/step  
    - loss: 0.0323 - acc: 0.9783 - val_loss: 0.0356 -  
    val_acc: 0.9890  
212  
213 Average loss is: 0.03835797868669033  
214 26  
215 Epoch 1/26  
216 9/9 [=====] - 0s 4ms/step  
    - loss: 0.7111 - acc: 0.7345  
217 Epoch 2/26  
218 9/9 [=====] - 0s 3ms/step  
    - loss: 0.4753 - acc: 0.8000  
219 Epoch 3/26  
220 9/9 [=====] - 0s 3ms/step  
    - loss: 0.3741 - acc: 0.8873  
221 Epoch 4/26  
222 9/9 [=====] - 0s 4ms/step  
    - loss: 0.2945 - acc: 0.9564  
223 Epoch 5/26  
224 9/9 [=====] - 0s 2ms/step  
    - loss: 0.2330 - acc: 0.9527  
225 Epoch 6/26  
226 9/9 [=====] - 0s 4ms/step  
    - loss: 0.1854 - acc: 0.9745  
227 Epoch 7/26  
228 9/9 [=====] - 0s 2ms/step  
    - loss: 0.1552 - acc: 0.9673  
229 Epoch 8/26  
230 9/9 [=====] - 0s 2ms/step  
    - loss: 0.1199 - acc: 0.9782  
231 Epoch 9/26  
232 9/9 [=====] - 0s 2ms/step  
    - loss: 0.1054 - acc: 0.9782  
233 Epoch 10/26
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234 9/9 [=====] - 0s 2ms/step
    - loss: 0.0887 - acc: 0.9782
235 Epoch 11/26
236 9/9 [=====] - 0s 2ms/step
    - loss: 0.0730 - acc: 0.9891
237 Epoch 12/26
238 9/9 [=====] - 0s 2ms/step
    - loss: 0.0644 - acc: 0.9891
239 Epoch 13/26
240 9/9 [=====] - 0s 4ms/step
    - loss: 0.0646 - acc: 0.9818
241 Epoch 14/26
242 9/9 [=====] - 0s 4ms/step
    - loss: 0.0494 - acc: 0.9855
243 Epoch 15/26
244 9/9 [=====] - 0s 2ms/step
    - loss: 0.0486 - acc: 0.9855
245 Epoch 16/26
246 9/9 [=====] - 0s 2ms/step
    - loss: 0.0443 - acc: 0.9927
247 Epoch 17/26
248 9/9 [=====] - 0s 2ms/step
    - loss: 0.0430 - acc: 0.9855
249 Epoch 18/26
250 9/9 [=====] - 0s 4ms/step
    - loss: 0.0370 - acc: 0.9891
251 Epoch 19/26
252 9/9 [=====] - 0s 2ms/step
    - loss: 0.0422 - acc: 0.9818
253 Epoch 20/26
254 9/9 [=====] - 0s 751us/step
    - loss: 0.0251 - acc: 0.9964
255 Epoch 21/26
256 9/9 [=====] - 0s 2ms/step
    - loss: 0.0266 - acc: 0.9964
257 Epoch 22/26
258 9/9 [=====] - 0s 2ms/step
    - loss: 0.0317 - acc: 0.9855
259 Epoch 23/26
260 9/9 [=====] - 0s 2ms/step
    - loss: 0.0273 - acc: 0.9927

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261 3/3 [=====] - 0s 8ms/step  
    - loss: 0.0127 - acc: 1.0000  
262 [0.012713386677205563, 1.0]  
263  
264 Process finished with exit code 0  
265
```