Лабораторная работа 2

Многослойные сети. Алгоритм обратного распространения ошибки.

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Целью работы является исследование свойств многослойной нейронной сети прямого распространения и алгоритмов ее обучения, применение сети в задачах классификации и аппроксимации функции.

```
Вариант 12
import os
import keras
import tensorflow as tf
from keras.layers import *
import matplotlib.pyplot as plt
import numpy as np
import pylab
Задание №1
# Уравнение эллипса в параметрическом виде.
def ellipse(t, a, b, x0, y0):
    x = x0 + a * np.cos(t)
    y = y0 + b * np.sin(t)
    return x, y
# Функция вращения фигуры на заданный угол.
def rotate(x, y, alpha):
    xr = x * np.cos(alpha) - y * np.sin(alpha)
    yr = x * np.sin(alpha) + y * np.cos(alpha)
    return xr, yr
# Эллипс
a1 = 0.2
b1 = 0.2
alpha1 = np.pi/3
x01 = 0
y01 = 0.4
# Эллипс
a2 = 0.7
b2 = 0.5
alpha2 = -np.pi/3
x02 = 0.2
y02 = 0.18
# Эллипс
a3 = 1
b3 = 1
```

```
alpha3 = 0
x03 = 0
y03 = 0

t = np.arange(0, 2 * np.pi, 0.025)

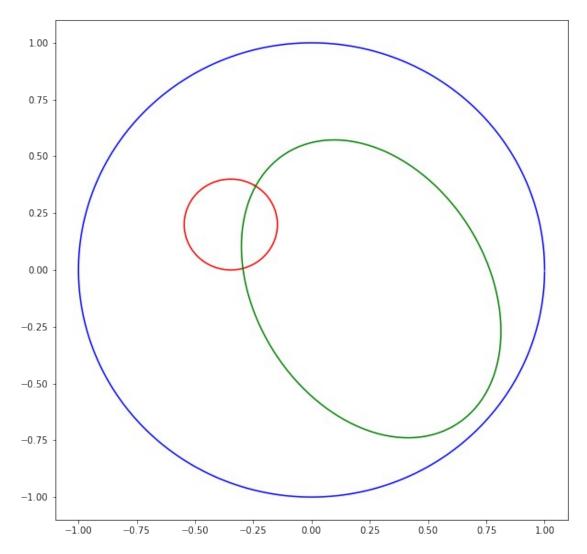
fig1x, fig1y = ellipse(t, a1, b1, x01, y01)
fig1x, fig1y = rotate(fig1x, fig1y, alpha1)

fig2x, fig2y = ellipse(t, a2, b2, x02, y02)
fig2x, fig2y = rotate(fig2x, fig2y, alpha2)

fig3x, fig3y = ellipse(t, a3, b3, x03, y03)
fig3x, fig3y = rotate(fig3x, fig3y, alpha3)

figure = plt.figure(figsize = (10, 10))

plt.plot(fig1x, fig1y, c = 'r')
plt.plot(fig2x, fig2y, c = 'g')
plt.plot(fig3x, fig3y, c = 'b')
plt.show()
```



```
datax = np.concatenate((fig1x, fig2x, fig3x), axis=0)
datay = np.concatenate((fig1y, fig2y, fig3y), axis=0)
```

```
data = np.array([datax, datay])

l1 = [[1, 0, 0] for _ in range(len(fig1x))]
```

labels = np.array(l1 + l2 + l3)

data = data.transpose()

from sklearn.model_selection import train_test_split

```
train, test, train_labels, test_labels = train_test_split(data,
labels, test_size = 0.2, random_state = 10, shuffle = True)
```

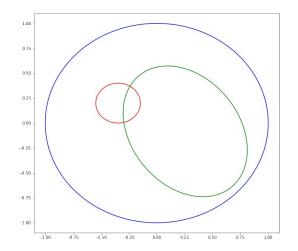
```
model = keras.models.Sequential()
model.add(Dense(10, input dim = 2,
kernel initializer=keras.initializers.RandomNormal(stddev=0.01)))
model.add(Dense(20, activation='tanh'))
model.add(Dense(10, activation='tanh'))
model.add(Dense(3, activation='sigmoid'))
model.compile(tf.keras.optimizers.SGD(0.05), 'mse')
hist = model.fit(train, train labels, batch size = 1, epochs = 100)
Epoch 1/100
Epoch 2/100
Epoch 3/100
604/604 [============= ] - 1s 2ms/step - loss: 0.1943
Epoch 4/100
Epoch 5/100
604/604 [============] - 1s 2ms/step - loss: 0.1865
Epoch 6/100
604/604 [============= ] - 1s 2ms/step - loss: 0.1817
Epoch 7/100
Epoch 8/100
Epoch 9/100
604/604 [============= ] - 1s 2ms/step - loss: 0.1579
Epoch 10/100
Epoch 11/100
Epoch 12/100
604/604 [============= ] - 1s 2ms/step - loss: 0.1419
Epoch 13/100
Epoch 14/100
604/604 [============] - 1s 2ms/step - loss: 0.1366
Epoch 15/100
Epoch 16/100
Epoch 17/100
604/604 [============] - 1s 2ms/step - loss: 0.1298
Epoch 18/100
604/604 [============= ] - 2s 3ms/step - loss: 0.1273
Epoch 19/100
```

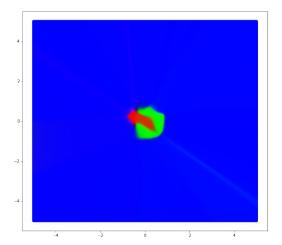
Epoch 20/100						
604/604 [==========]	_	1ς	2ms/sten	_	1055.	0 1222
Epoch 21/100		13	211137 3 CCP		.0551	011222
604/604 [==========]	_	1s	2ms/step	_	loss:	0.1184
Epoch 22/100			o, o cop			0.110.
604/604 [====================================	_	1s	2ms/step	_	loss:	0.1167
Epoch 23/100			,			
604/604 [====================================	_	1s	2ms/step	_	loss:	0.1130
Epoch 24/100			,			
604/604 [=========]	_	1s	2ms/step	_	loss:	0.1090
Epoch 25/100			-,,			
604/604 [==========]	_	1s	2ms/step	_	loss:	0.1061
Epoch 26/100			-,			
604/604 [====================================	_	1s	2ms/step	_	loss:	0.1001
Epoch 27/100			,			
604/604 [====================================	_	1s	2ms/step	_	loss:	0.0942
Epoch 28/100			,			
604/604 [====================================	_	1s	2ms/sten	_	loss:	0.0876
Epoch 29/100			o, o cop			0.0070
604/604 [====================================	_	1s	2ms/sten	_	loss:	0.0785
Epoch 30/100			23, 3 ccp		.0551	010703
604/604 [====================================	_	1ς	2ms/sten	_	1055.	0 0720
Epoch 31/100			2.113, 3 ccp		.0551	010720
604/604 [====================================	_	1s	2ms/sten	_	loss:	0.0683
Epoch 32/100			2.113, 3 ccp		.0551	010005
604/604 [====================================	_	1ς	2ms/sten	_	1055.	0 0634
Epoch 33/100		13	21113/3 CCP			0.0054
604/604 [====================================	_	1ς	2ms/sten	_	1055.	0 0602
Epoch 34/100		13	211137 3 CCP			010002
604/604 [====================================	_	1ς	2ms/sten	_	1055.	0 0580
Epoch 35/100			2.113, 3 ccp		.0551	010500
604/604 [====================================	_	1s	2ms/sten	_	loss:	0.0554
Epoch 36/100			2.113, 3 ccp		.0551	010331
604/604 [====================================	_	1s	2ms/sten	_	loss:	0.0542
Epoch 37/100			2.113, 3 ccp		.0551	010312
604/604 [=========]	_	1s	2ms/sten	_	loss:	0.0526
Epoch 38/100			o, o cop			0.0520
604/604 [====================================	_	1s	2ms/sten	_	loss:	0.0509
Epoch 39/100			o, o cop			0.0505
604/604 [=========]	_	1s	2ms/sten	_	loss:	0.0494
Epoch 40/100			2.113, 3 ccp		.0551	010151
604/604 [=========]	_	1s	2ms/sten	_	loss:	0.0468
Epoch 41/100		13	211137 3 CCP			010100
604/604 [==========]	_	1ς	2ms/sten	_	1055.	0 0488
Epoch 42/100		13	211137 3 CCP			010100
604/604 [====================================	_	1 c	2ms/sten	_	1055.	0 0471
Epoch 43/100		10	5, 5 ccp			3.01/I
604/604 [====================================	_	1 c	2ms/sten	_	1055.	0.0444
Epoch 44/100		10	5, 5 ccp			5.0177
604/604 [====================================	_	1¢	2ms/sten	_	1055.	0 0450
		10	-m3/ 3 ccρ			310733

Epoch 45	/100						
	[========]	_	1s	2ms/sten	_	1055:	0.0470
Epoch 46				23, 3 ccp			010170
	[========]	_	1s	2ms/step	_	loss:	0.0443
Epoch 47				,			
	[========]	_	1s	2ms/step	_	loss:	0.0436
Epoch 48				-,,			
604/604	[=========]	-	1s	2ms/step	-	loss:	0.0435
Epoch 49,	/100						
604/604	[==========]	-	1s	2ms/step	-	loss:	0.0451
Epoch 50,							
	[========]	-	1s	2ms/step	-	loss:	0.0405
Epoch 51,							
	[=======]	-	1s	2ms/step	-	loss:	0.0405
Epoch 52,			_			_	
	[========]	-	1s	2ms/step	-	loss:	0.0401
Epoch 53,			_	.		-	0 0400
	[========]	-	ls	2ms/step	-	loss:	0.0433
Epoch 54,			1 -	2		1	0 0400
	[========]	-	IS	2ms/step	-	loss:	0.0406
Epoch 55,	(190 [========]		1.	2mc/c+cn		1000.	0 0270
Epoch 56		-	15	ziiis/s cep	-	1055:	0.0370
	[=========]		1 c	2mc/cten		1000	0 0385
Epoch 57		-	12	Ziiis/step	-	1055.	0.0303
	[=========]	_	1 c	2mc/sten	_	1000	0 0385
Epoch 58,			13	211137 3 CCP			0.0303
	[========]	_	1s	2ms/step	_	loss:	0.0353
Epoch 59				0, 0 10 0			
	[======]	-	1s	2ms/step	_	loss:	0.0387
Epoch 60,	/100			-			
604/604	[=========]	-	1s	2ms/step	-	loss:	0.0372
Epoch 61,							
	[========]	-	1s	2ms/step	-	loss:	0.0400
Epoch 62,							
	[========]	-	2s	3ms/step	-	loss:	0.0357
Epoch 63,			_	.		_	
	[========]	-	ls	2ms/step	-	loss:	0.0369
Epoch 64,			1 -	2		1	0 0200
	[======================================	-	ıs	2ms/step	-	loss:	0.0300
Epoch 65,	[=========]		1.0	2mc/cton		1000.	0 0205
Epoch 66,		-	12	ziiis/step	-	1055;	0.0303
	[========]	_	1 c	2mc/ctan	_	1000	0 0288
Epoch 67,			13	21113/3 CEP			0.0200
	[========]	_	1s	2ms/sten	_	loss:	0.0327
Epoch 68				z, 5 cop			
	[=======]	-	1s	2ms/step	-	loss:	0.0377
Epoch 69			-	[*		-	
	[========]	-	1s	2ms/step	-	loss:	0.0339
				•			

Epoch 70/10	36						
]	_	1s	2ms/step	_	loss:	0.0324
Epoch 71/10				,			
]	-	1s	2ms/step	-	loss:	0.0358
Epoch 72/10			_			_	
	=======================================	-	1s	2ms/step	-	loss:	0.0320
Epoch 73/10]		1.	2mc/cton		10001	0 0272
Epoch 74/10		-	12	Ziiis/step	-	1055.	0.0272
	=======================================	_	1s	2ms/step	_	loss:	0.0327
Epoch 75/10				-,			
]	-	1s	2ms/step	-	loss:	0.0356
Epoch 76/10			_			_	
_	=======================================	-	1s	2ms/step	-	loss:	0.0258
Epoch 77/10	90]		1.	2mc/cton		10001	0 0242
Epoch 78/10		-	15	ziiis/step	-	1055;	0.0242
	=======================================	_	1s	2ms/step	_	loss:	0.0254
Epoch 79/10	= -			25, 5 top			0.025.
]	-	1s	2ms/step	-	loss:	0.0250
Epoch 80/10							
	=======================================	-	1s	2ms/step	-	loss:	0.0261
Epoch 81/10			1 -	2/		1	0 0245
Epoch 82/10	=======================================	-	15	zms/step	-	toss:	0.0245
]	_	1ς	2ms/sten	_	1055	0 0245
Epoch 83/10			13	2m3/3ccp			010213
	=======================================	-	1s	2ms/step	-	loss:	0.0239
Epoch 84/10							
	=======================================	-	1s	2ms/step	-	loss:	0.0240
Epoch 85/10	90 ====================================		1.	2mc/cton		1000.	0 0225
Epoch 86/10		-	15	ziiis/step	-	1055:	0.0233
	=======================================	_	1s	2ms/sten	_	loss:	0.0233
Epoch 87/10				23, 3136			0.0255
]	-	1s	2ms/step	-	loss:	0.0227
Epoch 88/10	90					_	
	=======================================	-	1s	2ms/step	-	loss:	0.0236
Epoch 89/10			1.	2mc/cton		10001	0 0220
Epoch 90/10	======================================	-	15	ziiis/step	-	1055;	0.0239
]	_	1s	2ms/sten	_	loss:	0.0239
Epoch 91/10				23, 3136			0.0255
]	-	1s	2ms/step	-	loss:	0.0242
Epoch 92/10							
	=======================================	-	1s	2ms/step	-	loss:	0.0239
Epoch 93/10	90]		1.	2mc/c+on		1000	0 0000
Epoch 94/10	= -	-	12	ziiis/step	-	1055:	U.UZ3Z
	======================================	_	1s	2ms/sten	_	1055	0.0237
301,001 [,			э, э сер		.0551	3.0237

```
Epoch 95/100
Epoch 96/100
604/604 [============] - 1s 2ms/step - loss: 0.0237
Epoch 97/100
Epoch 98/100
Epoch 99/100
Epoch 100/100
import itertools
x = np.linspace(-5, 5, 200)
y = np.linspace(-5, 5, 200)
figure = plt.figure(figsize = (24, 10))
ax1 = figure.add_subplot(1, 2, 1)
ax2 = figure.add subplot(1, 2, 2)
ax1.plot(fig1x, fig1y, c = 'r')
ax1.plot(fig2x, fig2y, c = 'g')
ax1.plot(fig3x, fig3y, c = 'b')
data = np.array(list(itertools.product(x, y)))
xy = data.transpose()
pred = model.predict(data)
ax2.scatter(xy[0], xy[1], c = pred)
plt.show()
```





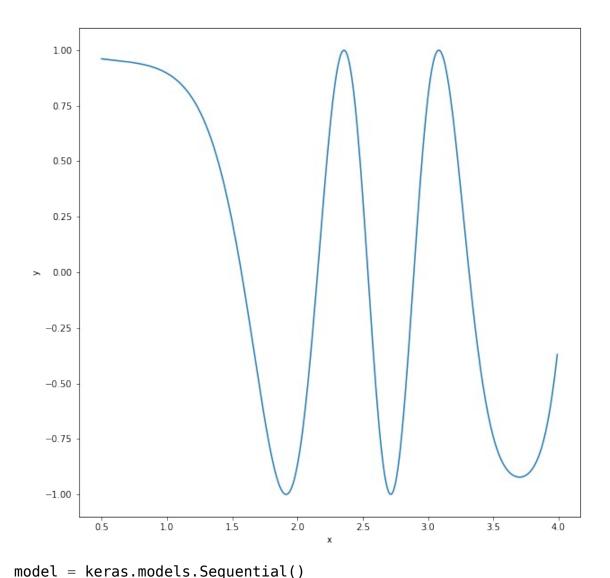
Задание №2

```
def x(t):
    return np.cos(-(np.cos(t)) * t**2 + t)

h = 0.01

train_x = np.arange(0.5, 4, h)
train_y = x(train_x)

figure = plt.figure(figsize = (10, 10))
plt.plot(train_x, train_y)
plt.ylabel("y")
plt.xlabel("x")
plt.show()
```



Epoch 3/800	
350/350 [====================================	: 0.4124
Epoch 4/800	
350/350 [============	: 0.3983
Epoch 5/800	
350/350 [============] - 1s 3ms/step - loss	: 0.3895
Epoch 6/800	
350/350 [====================================	: 0.3943
Epoch 7/800	0 2026
350/350 [====================================	: 0.3836
Epoch 8/800 350/350 [====================================	. 0 2052
Epoch 9/800	: 0.3633
350/350 [====================================	. 0 3767
Epoch 10/800	. 0.5707
350/350 [====================================	: 0.3666
Epoch 11/800	. 0.5000
350/350 [====================================	: 0.3731
Epoch 12/800	
350/350 [==============] - 1s 2ms/step - loss	: 0.3698
Epoch 13/800	
350/350 [====================================	: 0.3661
Epoch 14/800	
350/350 [============] - 1s 2ms/step - loss	: 0.3678
Epoch 15/800	
350/350 [====================================	: 0.3705
Epoch 16/800	0 2651
350/350 [====================================	: 0.3651
Epoch 17/800 350/350 [====================================	. 0 2577
Epoch 18/800	. 0.3377
350/350 [====================================	. 0 3560
Epoch 19/800	. 0.5500
350/350 [====================================	: 0.3507
Epoch 20/800	. 0.5507
350/350 [====================================	: 0.3518
Epoch 21/800	
350/350 [============] - 1s 2ms/step - loss	: 0.3549
Epoch 22/800	
350/350 [=============] - 1s 2ms/step - loss	: 0.3504
Epoch 23/800	
350/350 [====================================	: 0.3524
Epoch 24/800	0 2401
350/350 [====================================	: 0.3481
Epoch 25/800 350/350 [====================================	. 0 3/30
Epoch 26/800	. 0.3420
350/350 [====================================	: 0.3416
Epoch 27/800	. 0.5.10
350/350 [====================================	: 0.3363
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Epoch 28/800							
350/350 [====================================	====]	_	1s	2ms/step	_	loss:	0.3365
Epoch 29/800							
350/350 [====================================	====]	-	1s	2ms/step	-	loss:	0.3324
Epoch 30/800 350/350 [====================================	1		1.0	2ms/ston		10001	0 2206
Epoch 31/800	====]	-	15	ziiis/s tep	-	1055:	0.3290
350/350 [====================================	====1	_	1s	2ms/step	_	loss:	0.3202
Epoch 32/800							
350/350 [====================================	====]	-	1s	2ms/step	-	loss:	0.3273
Epoch 33/800	,		1 _	2		1	0 2226
350/350 [====================================	====]	-	15	zms/step	-	loss:	0.3230
350/350 [====================================	====1	_	1s	2ms/step	_	loss:	0.3256
Epoch 35/800	_			•			
350/350 [====================================	====]	-	1s	2ms/step	-	loss:	0.3157
Epoch 36/800	,		1.	2		1	0 2227
350/350 [====================================	====]	-	IS	2ms/step	-	loss:	0.3237
350/350 [====================================	====1	_	1s	2ms/sten	_	loss:	0.3050
Epoch 38/800	•			o, o cop			0.5050
350/350 [====================================	====]	-	1s	2ms/step	-	loss:	0.3203
Epoch 39/800	,			2 / 1		,	0 2174
350/350 [====================================	====]	-	IS	2ms/step	-	loss:	0.31/4
350/350 [====================================	====1	_	1s	2ms/sten	_	1055:	0.3136
Epoch 41/800	•			o, o cop			0.5250
350/350 [====================================	====]	-	1s	2ms/step	-	loss:	0.3154
Epoch 42/800	,		_	2			
350/350 [====================================	====]	-	IS	2ms/step	-	loss:	0.3039
350/350 [====================================	====1	_	1s	2ms/sten	_	1055:	0.3060
Epoch 44/800	•			0, 0.10p			
350/350 [====================================	====]	-	1s	2ms/step	-	loss:	0.3082
Epoch 45/800	,			2 / 1		,	0 2070
350/350 [====================================	====]	-	IS	2ms/step	-	loss:	0.3079
350/350 [====================================	====1	_	1s	2ms/sten	_	loss:	0.2949
Epoch 47/800	,			23, 3 ccp			012313
350/350 [====================================	====]	-	1s	3ms/step	-	loss:	0.3117
Epoch 48/800	_		_	.		_	
350/350 [====================================	====]	-	1s	3ms/step	-	loss:	0.28/4
350/350 [====================================	1	_	1 c	2ms/sten	_	1055	ი 2006
Epoch 50/800	-1		10	2.113, 3 ccρ		.055.	3.2330
350/350 [====================================	====]	-	1s	2ms/step	-	loss:	0.3004
Epoch 51/800	_		_				
350/350 [====================================	====]	-	1s	2ms/step	-	loss:	0.2835
Epoch 52/800 350/350 [====================================	1	_	1 c	2ms/stan	_	1000	0 2076
550, 550 []	_	13	21113/3 LEP	-	.0331	0.23/0

Epoch 53/800							
350/350 [=========]	-	1s	2ms/step	_	loss:	0.2894
Epoch 54/800				-			
350/350 [=========	=======]	-	1s	2ms/step	-	loss:	0.2846
Epoch 55/800 350/350 [====================================	1		1.	2mc/cton		10001	0 2972
Epoch 56/800		-	12	ziiis/step	-	1055;	0.2072
350/350 [=========	=======]	-	1s	2ms/step	-	loss:	0.2847
Epoch 57/800	_					_	
350/350 [====================================	-=======]	-	1s	2ms/step	-	loss:	0.2748
Epoch 58/800 350/350 [====================================	1	_	1ς	2ms/sten	_	1055.	0 2823
Epoch 59/800	•		13	211137 3 CCP			012023
350/350 [=========	=======]	-	1s	2ms/step	-	loss:	0.2731
Epoch 60/800	1		1.	2		1	0. 2640
350/350 [========== Epoch 61/800	=======================================	-	IS	2ms/step	-	loss:	0.2649
350/350 [=========	-======]	_	1s	2ms/step	_	loss:	0.2680
Epoch 62/800				•			
350/350 [========	=======]	-	1s	2ms/step	-	loss:	0.2645
Epoch 63/800 350/350 [===========	1		1.0	2ms/ston		10001	0 2467
Epoch 64/800		-	15	ziiis/step	-	1055:	0.2407
350/350 [=========	-======]	-	1s	2ms/step	-	loss:	0.2567
Epoch 65/800							
350/350 [====================================	-======]	-	1s	2ms/step	-	loss:	0.2316
Epoch 66/800 350/350 [==========	1	_	1ς	2ms/sten	_	1055.	0 2543
Epoch 67/800	•		13	211137 3 CCP			012313
350/350 [========	=======]	-	1s	2ms/step	-	loss:	0.2424
Epoch 68/800	1		1 _	2		1	0 2401
350/350 [========== Epoch 69/800	=======================================	-	15	zms/step	-	toss:	0.2401
350/350 [=========]	_	1s	2ms/step	_	loss:	0.2358
Epoch 70/800	_			•			
350/350 [=========	=======]	-	1s	2ms/step	-	loss:	0.2315
Epoch 71/800 350/350 [====================================	1	_	1 c	2mc/stan		1000	0 2230
Epoch 72/800		_	13	21113/3 CCP	_	1033.	0.2230
350/350 [=========	=======]	-	1s	2ms/step	-	loss:	0.2294
Epoch 73/800	_		_			_	
350/350 [=========== Epoch 74/800		-	1s	2ms/step	-	loss:	0.2295
350/350 [=========	1	_	1s	2ms/sten	_	1055:	0.2332
Epoch 75/800	•			23, 3 ccp			012332
350/350 [========	======]	-	1s	2ms/step	-	loss:	0.2321
Epoch 76/800	1		1 -	2ma/a+a=		1000	0 2266
350/350 [====================================	-=======]	-	ıs	ziiis/step	-	LUSS:	⊍.∠∠00
350/350 [=========	1	_	1s	2ms/step	_	loss:	0.2162
-	•			- 1			

Epoch 78/800						
350/350 [===========]	_	1s	2ms/step	_	loss:	0.2210
Epoch 79/800			, 0 10			
350/350 [=========]	-	1s	2ms/step	-	loss:	0.2095
Epoch 80/800					_	
350/350 [=========]	-	1s	2ms/step	-	loss:	0.2169
Epoch 81/800		1.	2mc/ston		1000.	0 2102
350/350 [==========] Epoch 82/800	-	15	ziiis/s cep	-	1055:	0.2102
350/350 [===========]	_	1s	3ms/sten	_	1055:	0.2137
Epoch 83/800			55, 5 top			0.225,
350/350 [====================================	-	1s	3ms/step	-	loss:	0.2152
Epoch 84/800						
350/350 [=========]	-	1s	3ms/step	-	loss:	0.2176
Epoch 85/800 350/350 [============]		1.	2mc/ston		1000.	0 2152
Epoch 86/800	-	15	ziiis/s cep	-	1055:	0.2152
350/350 [===========]	_	1s	2ms/sten	_	loss:	0.2126
Epoch 87/800			o, o cop			0.2220
350/350 [====================================	-	1s	2ms/step	-	loss:	0.2203
Epoch 88/800					_	
350/350 [=========]	-	1s	2ms/step	-	loss:	0.2163
Epoch 89/800 350/350 [====================================		1.	2mc/ston		10001	0 2124
Epoch 90/800	-	15	ziiis/step	-	1055;	0.2134
350/350 [===========]	_	1s	2ms/sten	_	loss:	0.2172
Epoch 91/800			o, o cop			0.2272
350/350 [==========]	-	1s	2ms/step	-	loss:	0.2114
Epoch 92/800					_	
350/350 [=========]	-	1s	2ms/step	-	loss:	0.2132
Epoch 93/800 350/350 [====================================		1.0	2mc/cton		10001	a 2021
Epoch 94/800	-	12	Ziiis/step	-	1055.	0.2001
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2127
Epoch 95/800						•
350/350 [=========]	-	1s	2ms/step	-	loss:	0.2121
Epoch 96/800		_			_	
350/350 [========]	-	1s	2ms/step	-	loss:	0.2178
Epoch 97/800 350/350 [===========]		1 c	2mc/sten		1000	0 2026
Epoch 98/800	_	13	21113/3 CEP	-	1055.	0.2020
350/350 [==========]	_	1s	2ms/step	_	loss:	0.2130
Epoch 99/800			•			
350/350 [========]	-	1s	2ms/step	-	loss:	0.2151
Epoch 100/800		_			_	
350/350 [====================================	-	ls	2ms/step	-	loss:	0.2148
Epoch 101/800 350/350 [===========]	_	1 c	2mc/cton	_	1000	0 2086
Epoch 102/800	-	т.Э	21113/31Ch	-	.033	0.2000
350/350 [====================================	-	1s	2ms/step	_	loss:	0.2143
· •			· 1			

Epoch 103/800						
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2180
Epoch 104/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.2105
Epoch 105/800		_			_	
350/350 [====================================	-	ls	2ms/step	-	loss:	0.1929
Epoch 106/800 350/350 [====================================		1 c	2mc/sten		1000	0 2132
Epoch 107/800	-	13	21113/3 CEP	_	1055.	0.2132
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2085
Epoch 108/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.2077
Epoch 109/800		_			_	
350/350 [====================================	-	ls	2ms/step	-	loss:	0.2110
Epoch 110/800 350/350 [====================================		1 c	2mc/sten		1000	0 2001
Epoch 111/800	-	13	21113/3 CEP	_	1055.	0.2091
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2051
Epoch 112/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.2069
Epoch 113/800		_			_	
350/350 [====================================	-	1s	2ms/step	-	loss:	0.2080
Epoch 114/800 350/350 [====================================		1.0	2mc/cton		10001	0 2043
Epoch 115/800	-	12	Ziiis/step	-	1055.	0.2043
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2059
Epoch 116/800			-,,-			
350/350 [========]	-	1s	2ms/step	-	loss:	0.2051
Epoch 117/800		_			_	
350/350 [====================================	-	ls	2ms/step	-	loss:	0.2011
Epoch 118/800 350/350 [====================================		1 c	2mc/sten		1000	0 2044
Epoch 119/800	_	13	21113/3 CEP	_		0.2044
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2014
Epoch 120/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.2050
Epoch 121/800			2 / 1		,	0 2006
350/350 [====================================	-	IS	2ms/step	-	loss:	0.2006
Epoch 122/800 350/350 [====================================		1 c	2mc/sten	_	1000	0 1066
Epoch 123/800	_	13	21113/3 CEP	_		0.1900
350/350 [====================================	_	1s	2ms/step	_	loss:	0.1910
Epoch 124/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.1934
Epoch 125/800		_			-	0 1001
350/350 [====================================	-	IS	∠ms/step	-	LOSS:	⊎.1891
Epoch 126/800 350/350 [====================================	_	1 c	2ms/stan	_	1066.	A 188A
Epoch 127/800		13	211137 3 CCP	_		0.1000
350/350 [====================================	-	1s	2ms/step	-	loss:	0.1801
-			•			

Epoch 128/800						
350/350 [====================================	_	1s	2ms/step	_	loss:	0.1797
Epoch 129/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.1687
Epoch 130/800		1 -	2		1	0 1700
350/350 [===========] Epoch 131/800	-	15	2ms/step	-	LOSS:	0.1/22
350/350 [====================================	_	1s	2ms/sten	_	1055:	0.1586
Epoch 132/800			23, 3 ccp			0.1500
350/350 [====================================	-	1s	2ms/step	-	loss:	0.1631
Epoch 133/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.1542
Epoch 134/800		1.	2/		1	0 1420
350/350 [===========] Epoch 135/800	-	15	zms/step	-	toss:	0.1439
350/350 [====================================	_	1ς	2ms/sten	_	1055.	0 1384
Epoch 136/800		13	211137 3 CCP		.0551	0.1501
350/350 [====================================	-	1s	2ms/step	-	loss:	0.1269
Epoch 137/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.1478
Epoch 138/800			2 / 1		,	0 1100
350/350 [====================================	-	ls	2ms/step	-	loss:	0.1198
Epoch 139/800 350/350 [====================================		1 c	2mc/sten	_	1000	0 1510
Epoch 140/800	_	13	21113/3 CEP	_	(033.	0.1510
350/350 [====================================	_	1s	2ms/step	_	loss:	0.1084
Epoch 141/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.1325
Epoch 142/800		_			-	0 1150
350/350 [====================================	-	ls	2ms/step	-	loss:	0.1150
Epoch 143/800 350/350 [====================================		1 c	2mc/sten		1000	0 0088
Epoch 144/800	_	13	21113/3 CEP	_		0.0300
350/350 [====================================	_	1s	2ms/step	_	loss:	0.1153
Epoch 145/800			-,,-			
350/350 [========]	-	1s	2ms/step	-	loss:	0.3349
Epoch 146/800		_			_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.2738
Epoch 147/800 350/350 [====================================		1.0	2mc/ston		10001	0 2404
Epoch 148/800	-	15	ziiis/step	-	1055:	0.2404
350/350 [====================================	_	1s	2ms/sten	_	loss:	0.2408
Epoch 149/800			23, 3 ccp			012100
350/350 [====================================	-	1s	2ms/step	-	loss:	0.2233
Epoch 150/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.2119
Epoch 151/800		1 ^	2mc/s+s=		1000	0 2010
350/350 [===========] Epoch 152/800	-	τS	ziiis/step	-	LUSS:	₩.∠₩ 1 ₩
350/350 [====================================	_	1ς	2ms/sten	_	1055.	0.2000
330,330 []		13	J/ J CCP		.055.	0.2099

Epoch 153/800						
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2017
Epoch 154/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.2018
Epoch 155/800			2 / 1		,	0 1700
350/350 [===========] Epoch 156/800	-	IS	2ms/step	-	loss:	0.1/28
350/350 [====================================	_	1ς	2ms/sten	_	1055.	0 1578
Epoch 157/800		13	211137 3 CCP		.0551	0.1570
350/350 [==========]	-	1s	2ms/step	-	loss:	0.1508
Epoch 158/800					_	
350/350 [====================================	-	1s	2ms/step	-	loss:	0.2347
Epoch 159/800 350/350 [====================================		1 c	2mc/cton		1000	0 2650
Epoch 160/800	_	13	21113/3 LEP	_	1055.	0.2039
350/350 [====================================	-	1s	3ms/step	-	loss:	0.2632
Epoch 161/800			-			
350/350 [=======]	-	1s	3ms/step	-	loss:	0.2573
Epoch 162/800		1 -	2		1	0 2404
350/350 [===========] Epoch 163/800	-	IS	3ms/step	-	LOSS:	0.2494
350/350 [====================================	_	1ς	2ms/sten	_	1055.	0 2418
Epoch 164/800		13	211137 3 CCP		.0551	012110
350/350 [====================================	-	1s	2ms/step	-	loss:	0.2486
Epoch 165/800						
350/350 [===========]	-	1s	2ms/step	-	loss:	0.2366
Epoch 166/800 350/350 [====================================		1.0	2mc/cton		10001	0 2340
Epoch 167/800	-	13	21113/3 CEP	_	1055.	0.2340
350/350 [====================================	-	1s	2ms/step	-	loss:	0.2562
Epoch 168/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.2512
Epoch 169/800		1 -	2ma/atan		1	0 2407
350/350 [===========] Epoch 170/800	-	15	ziiis/s cep	-	1055:	0.2407
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2372
Epoch 171/800			-			
350/350 [=======]	-	1s	2ms/step	-	loss:	0.2253
Epoch 172/800		_	2		-	0 0406
350/350 [====================================	-	ls	2ms/step	-	loss:	0.2436
Epoch 173/800 350/350 [====================================		1 c	2mc/cton		1000	0 2246
Epoch 174/800	_	13	21113/3 LEP	_	1055.	0.2240
350/350 [====================================	-	1s	2ms/step	-	loss:	0.2365
Epoch 175/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.2328
Epoch 176/800		1 -	2ma /a+a=		1000	0 2220
350/350 [===========] Epoch 177/800	-	TS	ziiis/step	-	LOSS:	⊍.∠∠39
350/350 [====================================	_	1ς	2ms/sten	_	1055.	0.2271
		13	J/ J CCP		.055.	J. ZZ/ I

Epoch 178/800						
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2405
Epoch 179/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.2219
Epoch 180/800		1.	2		1	0 2200
350/350 [===========] Epoch 181/800	-	15	zms/step	-	LOSS:	0.2200
350/350 [====================================	_	1s	2ms/sten	_	1055:	0.2159
Epoch 182/800			23, 3 ccp			012133
350/350 [============]	-	1s	2ms/step	-	loss:	0.2274
Epoch 183/800					_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.2222
Epoch 184/800 350/350 [====================================		1.	2mc/ston		10001	0 2127
Epoch 185/800	-	15	ziiis/step	-	1055:	0.2137
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2199
Epoch 186/800			-			
350/350 [=======]	-	1s	2ms/step	-	loss:	0.2144
Epoch 187/800		_			_	
350/350 [===========]	-	1s	2ms/step	-	loss:	0.2156
Epoch 188/800 350/350 [====================================		1 c	2mc/sten		1000	0 105/
Epoch 189/800	_	13	21113/3 CEP	_		0.1334
350/350 [====================================	-	1s	2ms/step	-	loss:	0.2037
Epoch 190/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.1832
Epoch 191/800		1 -	2		1	0 1070
350/350 [===========] Epoch 192/800	-	15	2ms/step	-	LOSS:	0.18/0
350/350 [====================================	_	1ς	2ms/sten	_	1055.	0 1731
Epoch 193/800		13	211137 3 CCP		.0551	0.1751
350/350 [====================================	-	1s	2ms/step	-	loss:	0.1712
Epoch 194/800						
350/350 [===========]	-	1s	2ms/step	-	loss:	0.1420
Epoch 195/800 350/350 [====================================		1.	2mc/cton		10001	0 1242
Epoch 196/800	-	15	ziiis/step	-	1055;	0.1342
350/350 [====================================	_	1s	2ms/step	_	loss:	0.1221
Epoch 197/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.1281
Epoch 198/800		_			_	
350/350 [====================================	-	1s	2ms/step	-	loss:	0.26/3
Epoch 199/800 350/350 [====================================		1 c	2mc/cton		1000	0 2350
Epoch 200/800	-	13	21113/3 LEP	_	1055.	0.2330
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2277
Epoch 201/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.2263
Epoch 202/800		-	2		1.	0 0100
350/350 [==========]	-	IS	∠ms/step	-	LOSS:	U.2182

Epoch 203/800						
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2261
Epoch 204/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.2399
Epoch 205/800			2 / 1		,	0 1070
350/350 [====================================	-	IS	2ms/step	-	loss:	0.1870
Epoch 206/800 350/350 [====================================	_	1 c	2ms/sten	_	1055.	ი 1966
Epoch 207/800		13	211137 3 CCP			0.1500
350/350 [====================================	-	1s	2ms/step	-	loss:	0.1555
Epoch 208/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.1239
Epoch 209/800		٦.	2		1	0 1100
350/350 [===========] Epoch 210/800	-	IS	2ms/step	-	loss:	0.1123
350/350 [====================================	_	1 c	2ms/sten	_	1000	0 0026
Epoch 211/800		13	21113/3 CCP		(033.	0.0320
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0781
Epoch 212/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.1783
Epoch 213/800		_			_	
350/350 [====================================	-	1s	2ms/step	-	loss:	0.2362
Epoch 214/800 350/350 [====================================		1.	2mc/ston		10001	0 2211
Epoch 215/800	-	12	ziiis/step	-	1055;	0.2311
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2179
Epoch 216/800			o, o cop			0.2270
350/350 [=========]	-	1s	2ms/step	-	loss:	0.2238
Epoch 217/800					_	
350/350 [===========]	-	1s	2ms/step	-	loss:	0.2222
Epoch 218/800 350/350 [====================================		1.0	2mc/ston		10001	0 2221
Epoch 219/800	-	15	ziiis/step	-	10551	0.2221
350/350 [====================================	_	1s	2ms/step	_	loss:	0.2308
Epoch 220/800			o, o cop			0.2500
350/350 [==========]	-	1s	2ms/step	-	loss:	0.2284
Epoch 221/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.2202
Epoch 222/800		1 -	2/		1	0 2272
350/350 [===========] Epoch 223/800	-	15	zms/step	-	toss:	0.2272
350/350 [====================================	_	1 c	2ms/sten	_	1055.	0 2232
Epoch 224/800		13	211137 3 CCP			0.2232
350/350 [====================================	-	1s	2ms/step	-	loss:	0.2212
Epoch 225/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.2101
Epoch 226/800		٦.	2		1	0 2125
350/350 [====================================	-	IS	∠ms/step	-	LOSS:	⊍.2125
Epoch 227/800 350/350 [====================================	_	1 c	2mc/cton	_	1000	0 2058
330/330 []	-	т2	21113/3 LEP	-	(035)	0.2030

Epoch 228/800						
350/350 [====================================	_	1s	2ms/step	_	loss:	0.1936
Epoch 229/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.1811
Epoch 230/800		_			_	
350/350 [====================================	-	ls	2ms/step	-	loss:	0.1821
Epoch 231/800 350/350 [====================================		1 c	2mc/sten		1000	0 1/61
Epoch 232/800	-	13	21113/3 CEP	_	1055.	0.1401
350/350 [====================================	_	1s	2ms/step	_	loss:	0.1369
Epoch 233/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.1059
Epoch 234/800		_			_	
350/350 [====================================	-	ls	2ms/step	-	loss:	0.1227
Epoch 235/800 350/350 [====================================		1.0	2mc/cton		10001	0 0702
Epoch 236/800	-	12	3iiis/s tep	-	1055;	0.0792
350/350 [====================================	_	1s	3ms/step	_	loss:	0.1251
Epoch 237/800			J5, 5 15p			
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0876
Epoch 238/800					_	
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0974
Epoch 239/800		1.	2mc/ston		1000.	0 1002
350/350 [===========] Epoch 240/800	-	15	zms/step	-	toss:	0.1083
350/350 [====================================	_	1s	2ms/sten	_	1055:	0.0895
Epoch 241/800			23, 3 ccp			0.0055
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0646
Epoch 242/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0512
Epoch 243/800 350/350 [====================================		1.0	2mc/ston		10001	0 0765
Epoch 244/800	-	15	ziiis/step	-	10551	0.0703
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0467
Epoch 245/800			o, o cop			0.0.07
350/350 [========]	-	1s	2ms/step	-	loss:	0.1296
Epoch 246/800					_	
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0692
Epoch 247/800		1.	2mc/ston		1000.	0 0420
350/350 [===========] Epoch 248/800	-	15	ziiis/s cep	-	1055:	0.0430
350/350 [====================================	_	1ς	2ms/sten	_	1055.	0 0685
Epoch 249/800		13	211137 3 CCP			010005
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0256
Epoch 250/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0172
Epoch 251/800		1 ~	2mc / c ± c =		1000	0 0500
350/350 [===========] Epoch 252/800	-	ıs	ziiis/step	-	LOSS:	U
350/350 [====================================	_	1 c	2ms/sten	_	1055.	0 0580
330,330 []		13	J/ J CCP		.055.	5.0500

Epoch 253/800						
350/350 [====================================	_	1s	2ms/step	-	loss:	0.1078
Epoch 254/800			·			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0529
Epoch 255/800		_	.		-	
350/350 [==========]	-	ls	2ms/step	-	loss:	0.0305
Epoch 256/800 350/350 [====================================		1.	2mc/cton		1000.	0 0166
Epoch 257/800	-	12	ziiis/step	-	(055)	0.0100
350/350 [====================================	_	1s	2ms/sten	_	loss:	0.0116
Epoch 258/800			23, 5 1 6 6			0.0110
350/350 [============]	-	1s	2ms/step	-	loss:	0.0159
Epoch 259/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0250
Epoch 260/800		1 -	2		1	0 0120
350/350 [===========] Epoch 261/800	-	15	2ms/step	-	LOSS:	0.0126
350/350 [====================================	_	1 c	2ms/sten	_	1000	0 0622
Epoch 262/800		13	21113/3 CCP			0.0022
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0298
Epoch 263/800			•			
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0098
Epoch 264/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0266
Epoch 265/800		1 -	2/		1	0 0202
350/350 [===========] Epoch 266/800	-	15	zms/step	-	toss:	0.0382
350/350 [====================================	_	1ς	2ms/sten	_	1055.	0 0292
Epoch 267/800			2m3, 3 ccp			010232
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0191
Epoch 268/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0142
Epoch 269/800		1 -	2		1	0 0100
350/350 [===========] Epoch 270/800	-	15	2ms/step	-	LOSS:	0.0183
350/350 [====================================	_	1 c	2ms/sten	_	1055.	0 0067
Epoch 271/800		13	211137 3 CCP			0.0007
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0072
Epoch 272/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0077
Epoch 273/800					_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0109
Epoch 274/800		1.	2mc/cton		1000.	0 0000
350/350 [==========] Epoch 275/800	-	15	ziiis/step	-	1055:	0.0089
350/350 [====================================	_	1s	2ms/sten	_	1055.	0 0079
Epoch 276/800			о, о сор		.0001	3.00,3
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0081
Epoch 277/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.0189

Epoch 278/800						
350/350 [===========]	_	1s	2ms/step	_	loss:	0.0103
Epoch 279/800			o, o cop			0.0200
350/350 [==========]	_	1s	2ms/step	-	loss:	0.0083
Epoch 280/800						
350/350 [====================================	-	1s	2ms/step	_	loss:	0.0085
Epoch 281/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0128
Epoch 282/800			_			
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0082
Epoch 283/800						
350/350 [========]	-	1s	2ms/step	-	loss:	0.0100
Epoch 284/800					_	
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0257
Epoch 285/800		_			-	0 0044
350/350 [==========]	-	ls	2ms/step	-	loss:	0.0244
Epoch 286/800		1 -	2		1	0 0101
350/350 [====================================	-	IS	2ms/step	-	loss:	0.0101
Epoch 287/800		1.	2/		1	0 0072
350/350 [====================================	-	15	zms/step	-	toss:	0.00/3
Epoch 288/800 350/350 [==========]		1.0	2mc/cton		10001	0 0007
Epoch 289/800	-	12	ziiis/step	-	10551	0.0097
350/350 [====================================		1 c	2mc/ctan	_	1000	0 0068
Epoch 290/800		13	21113/3 CEP			0.0000
350/350 [===========]	_	1s	2ms/sten	_	1055.	0 0227
Epoch 291/800		13	211137 3 CCP			010227
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0097
Epoch 292/800						
350/350 [============]	-	1s	2ms/step	-	loss:	0.0095
Epoch 293/800			_			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0087
Epoch 294/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0371
Epoch 295/800					_	
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0082
Epoch 296/800		_			_	
350/350 [====================================	-	Is	2ms/step	-	loss:	0.006/
Epoch 297/800		٦ _	2		1	0 0100
350/350 [====================================	-	15	2ms/step	-	loss:	0.0169
Epoch 298/800 350/350 [==========]		1.0	2mc/cton		1000.	0 0060
Epoch 299/800	-	15	ziiis/step	-	1055;	0.0000
350/350 [===========]		1 c	2mc/ctan	_	1000	0 0260
Epoch 300/800		13	21113/3 CCP			0.0200
350/350 [===========]	_	1s	2ms/sten	_	loss:	0.0084
Epoch 301/800			2, 5 ccp		-3551	3.0001
350/350 [===========================	_	1s	2ms/step	-	loss:	0.0082
Epoch 302/800		-	[-		- '	
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0067
			•			

Epoch 303/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0143
Epoch 304/800		_	2		-	
350/350 [===========] Epoch 305/800	-	Is	2ms/step	-	loss:	0.0279
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0071
Epoch 306/800			-			
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0054
Epoch 307/800 350/350 [====================================	_	1 c	2ms/sten	_	1055	o o187
Epoch 308/800		13	211137 3 CCP			0.0107
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0099
Epoch 309/800 350/350 [====================================		1.	2ms/ston		1	0 0120
Epoch 310/800	-	15	ziiis/s tep	-	LOSS:	0.0128
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0076
Epoch 311/800		_			_	
350/350 [===========] Epoch 312/800	-	1s	3ms/step	-	loss:	0.0096
350/350 [====================================	_	1s	3ms/sten	_	1055:	0.0114
Epoch 313/800			-			
350/350 [========]	-	1s	3ms/step	-	loss:	0.0106
Epoch 314/800 350/350 [====================================		1.0	2ms/ston		10001	0 0072
Epoch 315/800	-	15	ziiis/step	-	1055:	0.0072
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0107
Epoch 316/800		_	.		_	
350/350 [===========] Epoch 317/800	-	ls	2ms/step	-	loss:	0.00/0
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0072
Epoch 318/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0223
Epoch 319/800 350/350 [====================================		1.	2mc/cton		10001	0 0100
Epoch 320/800	-	12	Ziiis/step	-	1055.	0.0109
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0309
Epoch 321/800			2 ()		-	0 0000
350/350 [===========] Epoch 322/800	-	IS	2ms/step	-	loss:	0.0068
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0108
Epoch 323/800			-			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0079
Epoch 324/800 350/350 [====================================		1 c	2mc/cton		1000	0 0056
Epoch 325/800	_	13	21113/3 CCP	_		0.0050
350/350 [========]	-	1s	2ms/step	-	loss:	0.0077
Epoch 326/800		٦.	2		1	0 0000
350/350 [===========] Epoch 327/800	-	IS	∠ms/step	-	LOSS:	0.0060
350/350 [====================================	_	1s	2ms/sten	_	loss:	0.0171
· •			-, p			· -

Epoch 328/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0192
Epoch 329/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0061
Epoch 330/800		_			_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0057
Epoch 331/800		1 -	2		1	0 0160
350/350 [==========] Epoch 332/800	-	15	zms/step	-	LOSS:	0.0100
350/350 [==========]		1.	2mc/cton		10001	0 0006
Epoch 333/800	_	15	ziiis/step	-	1055.	0.0090
350/350 [============]	_	1s	2ms/sten	_	1055.	0 0103
Epoch 334/800			2.113, 3 ccp		.0551	010103
350/350 [====================================	_	1s	2ms/step	-	loss:	0.0087
Epoch 335/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0060
Epoch 336/800						
350/350 [========]	-	1s	2ms/step	-	loss:	0.0153
Epoch 337/800					_	
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0122
Epoch 338/800		-	2 / 1		,	0 0054
350/350 [==========]	-	IS	2ms/step	-	loss:	0.0054
Epoch 339/800 350/350 [====================================		1.	2mc/cton		10001	0 0065
Epoch 340/800	-	15	ziiis/s cep	-	1055:	0.0005
350/350 [==========]	_	1 c	2mc/ctan		1000	0 0102
Epoch 341/800	_	13	21113/3 CEP	_		0.0102
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0079
Epoch 342/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0052
Epoch 343/800			•			
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0091
Epoch 344/800					_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0081
Epoch 345/800		1 -	2		1	0 0071
350/350 [==========]	-	IS	2ms/step	-	loss:	0.00/1
Epoch 346/800 350/350 [====================================		1.	2mc/cton		10001	0 0000
Epoch 347/800	-	13	ziiis/step	-	1055.	0.0099
350/350 [============================	_	1s	3ms/sten	_	1055.	0 0055
Epoch 348/800		13	311137 3 CCP		.0551	0.0055
350/350 [==========]	_	1s	3ms/step	_	loss:	0.0051
Epoch 349/800			J5, 5 15p			
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0058
Epoch 350/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0131
Epoch 351/800					_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0056
Epoch 352/800		1 -	2m = / = 4 =		1	0 0000
350/350 [==========]	-	ıs	ziiis/step	-	LOSS:	U.UU82

Epoch 353/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0059
Epoch 354/800		_			_	
350/350 [============] Epoch 355/800	-	1s	2ms/step	-	loss:	0.0071
350/350 [====================================	_	1ς	2ms/sten	_	1055.	0 0068
Epoch 356/800		13	211137 3 CCP			0.0000
350/350 [========]	-	1s	2ms/step	-	loss:	0.0062
Epoch 357/800		_	.		_	
350/350 [===========] Epoch 358/800	-	Is	2ms/step	-	loss:	0.0053
350/350 [====================================	_	1s	2ms/sten	_	loss:	0.0123
Epoch 359/800			-			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0067
Epoch 360/800		1.	2		1	0 0076
350/350 [===========] Epoch 361/800	-	15	zms/step	-	toss:	0.0076
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0056
Epoch 362/800			•			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0063
Epoch 363/800 350/350 [====================================		1.	2mc/cton		10001	0 0072
Epoch 364/800	-	15	ziiis/step	-	1055;	0.0073
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0057
Epoch 365/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0059
Epoch 366/800 350/350 [====================================	_	1 c	2ms/sten	_	1000	0 0103
Epoch 367/800		13	211137 3 CCP			0.0103
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0106
Epoch 368/800			2			0 0001
350/350 [===========] Epoch 369/800	-	IS	2ms/step	-	loss:	0.0061
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0079
Epoch 370/800			•			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0063
Epoch 371/800		1.0	2ms/ston		10001	0 0050
350/350 [===========] Epoch 372/800	-	15	ziiis/s tep	-	1055:	0.0059
350/350 [====================================	-	1s	2ms/step	_	loss:	0.0084
Epoch 373/800			-			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0111
Epoch 374/800 350/350 [====================================		1.	2mc/cton		10001	0 0050
Epoch 375/800	-	15	ziiis/step	-	1055;	0.0039
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0062
Epoch 376/800			-			
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0042
Epoch 377/800 350/350 [====================================		1 c	2mc/ctan	_	1000	0 0220
JJU/JJU [=	-	т2	ziiis/step	-	(055)	0.0220

Epoch 378/800						
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0060
Epoch 379/800			_		_	
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0046
Epoch 380/800 350/350 [====================================	_	1 c	2ms/sten	_	1000	0 0068
Epoch 381/800		13	21113/3 CCP			0.0000
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0051
Epoch 382/800		_			_	
350/350 [===========] Epoch 383/800	-	1s	2ms/step	-	loss:	0.00/5
350/350 [====================================	_	1s	2ms/sten	_	1055:	0.0053
Epoch 384/800			23, 3 ccp			010055
350/350 [========]	-	1s	2ms/step	-	loss:	0.0046
Epoch 385/800			2 / 1		,	0 0000
350/350 [===========] Epoch 386/800	-	IS	3ms/step	-	loss:	0.0062
350/350 [===========]	_	1s	3ms/sten	_	loss:	0.0110
Epoch 387/800			•			
350/350 [========]	-	1s	2ms/step	-	loss:	0.0059
Epoch 388/800			2 / 1		,	0 0054
350/350 [===========] Epoch 389/800	-	IS	2ms/step	-	loss:	0.0054
350/350 [==========]	_	1s	2ms/sten	_	loss:	0.0043
Epoch 390/800			s, s top			0.00.5
350/350 [========]	-	1s	2ms/step	-	loss:	0.0093
Epoch 391/800		1.	2		1	0 0154
350/350 [============] Epoch 392/800	-	15	zms/step	-	loss:	0.0154
350/350 [==========]	_	1s	2ms/step	_	loss:	0.0045
Epoch 393/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0057
Epoch 394/800 350/350 [====================================		1.0	2ms/ston		10001	0 0072
Epoch 395/800	-	15	Ziiis/s tep	-	1055:	0.0072
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0044
Epoch 396/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0047
Epoch 397/800 350/350 [===========]		1.	2mc/cton		10001	0 0041
Epoch 398/800	-	15	ziiis/step	-	1055:	0.0041
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0048
Epoch 399/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0061
Epoch 400/800 350/350 [===========]		1 c	2mc/cton		1000	0 0050
Epoch 401/800	-	т2	21113/31EP	-	10331	0.0000
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0102
Epoch 402/800			·		_	
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0047

Epoch 403/800						
350/350 [====================================	-	1s	2ms/step	_	loss:	0.0057
Epoch 404/800			·			
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0044
Epoch 405/800 350/350 [====================================		1.	2mc/cton		10001	0 0056
Epoch 406/800	-	15	ziiis/step	-	(055;	0.0050
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0041
Epoch 407/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0065
Epoch 408/800		1.	2		1	0 0040
350/350 [===========] Epoch 409/800	-	IS	2ms/step	-	loss:	0.0049
350/350 [====================================	_	1ς	2ms/sten	_	1055.	0 0047
Epoch 410/800		13	211137 3 CCP		(055)	010017
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0070
Epoch 411/800					_	
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0076
Epoch 412/800 350/350 [====================================		1.	2ms/ston		10001	0 0041
Epoch 413/800	-	15	ziiis/step	-	1055;	0.0041
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0045
Epoch 414/800			, 0 10			
350/350 [========]	-	1s	2ms/step	-	loss:	0.0044
Epoch 415/800		_			_	
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0041
Epoch 416/800 350/350 [====================================	_	1 c	2ms/sten	_	1000	n nngo
Epoch 417/800		13	21113/3 CCP		(033.	0.0009
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0035
Epoch 418/800						
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0056
Epoch 419/800 350/350 [====================================		1.	2ms/ston		10001	0 0041
Epoch 420/800	-	15	ziiis/s tep	-	1055:	0.0041
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0088
Epoch 421/800			-			
350/350 [=======]	-	1s	2ms/step	-	loss:	0.0060
Epoch 422/800		_			_	
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0045
Epoch 423/800 350/350 [====================================		1 c	2mc/cton		1000	0 0043
Epoch 424/800	_	13	21113/3 CEP	-	1055.	0.0043
350/350 [====================================	-	1s	2ms/step	_	loss:	0.0046
Epoch 425/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.0061
Epoch 426/800		1 -	2		1	0 0046
350/350 [====================================	-	IS	∠ms/step	-	LOSS:	U.0046
Epoch 427/800 350/350 [====================================	_	1 c	2ms/stan	_	1066.	0 0040
330, 330 []	_	тэ	21113/31Ch	_	.033.	5.0040

Epoch 428/800		
350/350 [====================================	2ms/step - lo	oss: 0.0141
Epoch 429/800	•	
350/350 [=========] - 1s 2	2ms/step - lo	oss: 0.0047
Epoch 430/800	2	0.0000
350/350 [============] - 1s 2 Epoch 431/800	zms/step - lo)SS: 0.0000
350/350 [====================================	2ms/sten - lo	oss: 0.0101
Epoch 432/800	2.113, 3 cop - co	,331 010101
350/350 [===========] - 1s 2	2ms/step - lo	oss: 0.0039
Epoch 433/800	_	
350/350 [====================================	2ms/step - lo	oss: 0.0061
Epoch 434/800 350/350 [====================================	Ome/stop le	25. 0 0047
Epoch 435/800	zms/step - tt	755: 0.0047
350/350 [====================================	2ms/step - lo	oss: 0.0043
Epoch 436/800	•	
350/350 [=======] - 1s 2	2ms/step - lo	oss: 0.0044
Epoch 437/800		
350/350 [====================================	2ms/step - lo)ss: 0.0050
Epoch 438/800 350/350 [====================================	Oms/stan lo	ncc: 0 0058
Epoch 439/800	ZIII3/3CEP - CC	755. 0.0050
350/350 [====================================	2ms/step - lo	oss: 0.0083
Epoch 440/800	•	
350/350 [=========] - 1s 2	2ms/step - lo	oss: 0.0041
Epoch 441/800	O / a.t.a	0.0045
350/350 [============] - 1s 2 Epoch 442/800	zms/step - lo)55: 0.0045
350/350 [====================================	2ms/sten - lo	nss: 0 0034
Epoch 443/800	2m3/3ccp cc	7551 010051
350/350 [====================================	2ms/step - lo	oss: 0.0044
Epoch 444/800		
350/350 [====================================	2ms/step - lo	oss: 0.0084
Epoch 445/800	2ma/a+an 1a	occ. 0 00E1
350/350 [============] - 1s 2 Epoch 446/800	zms/step - to)55: 0.0051
350/350 [====================================	2ms/step - lo	oss: 0.0037
Epoch 447/800	о, о сор	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
350/350 [=========] - 1s 2	2ms/step - lo	oss: 0.0039
Epoch 448/800	_	
350/350 [====================================	2ms/step - lo	ss: 0.0040
Epoch 449/800 350/350 [====================================	Ome/stop le	acci 0 0020
Epoch 450/800	ZIIIS/Step - tt	755. 0.0030
350/350 [====================================	2ms/step - lo	oss: 0.0047
Epoch 451/800		
350/350 [=======] - 1s 2	2ms/step - lo	oss: 0.0038
Epoch 452/800		
350/350 [===========] - 1s 2	2ms/step - lo	ss: 0.0035

Epoch 453/800						
350/350 [========]	-	1s	2ms/step	-	loss:	0.0036
Epoch 454/800						
350/350 [========]	-	1s	2ms/step	-	loss:	0.0088
Epoch 455/800 350/350 [=======]		1.	2mc/cton		10001	0 0057
Epoch 456/800	-	15	ziiis/step	-	1055;	0.0057
350/350 [========]	_	1s	2ms/step	_	loss:	0.0043
Epoch 457/800			•			
350/350 [=======]	-	1s	2ms/step	-	loss:	0.0040
Epoch 458/800		٦.	2		1	0 0000
350/350 [=========]	-	IS	3ms/step	-	loss:	0.0033
350/350 [========]	_	1s	3ms/sten	_	loss:	0.0037
Epoch 460/800			311137 3 CCP			010037
350/350 [=======]	-	1s	3ms/step	-	loss:	0.0029
Epoch 461/800		_			_	
350/350 [========] ·	-	1s	2ms/step	-	loss:	0.0035
Epoch 462/800 350/350 [=======]		1 c	2mc/ctan		1000	0 0061
Epoch 463/800	-	13	21113/3 Leb	-	1055.	0.0001
350/350 [========]	-	1s	2ms/step	-	loss:	0.0110
Epoch 464/800			·			
350/350 [========]	-	1s	2ms/step	-	loss:	0.0039
Epoch 465/800		1 _	2		1	0 0044
350/350 [=========]	-	15	zms/step	-	toss:	0.0044
350/350 [=========]	_	1s	2ms/step	_	loss:	0.0033
Epoch 467/800			0, 0 10 0			
350/350 [======]	-	1s	2ms/step	-	loss:	0.0029
Epoch 468/800			2 / 1		,	0 0000
350/350 [=========]	-	IS	2ms/step	-	loss:	0.0069
350/350 [=========]	_	1ς	2ms/sten	_	1055.	0 0037
Epoch 470/800		13	211137 3 CCP		(055)	0.0057
350/350 [========]	-	1s	2ms/step	-	loss:	0.0058
Epoch 471/800					_	
350/350 [========]	-	1s	2ms/step	-	loss:	0.0034
Epoch 472/800 350/350 [=======]		1 c	2mc/ctan		1000	0 00/6
Epoch 473/800	-	12	ziiis/step	-	1055.	0.0040
350/350 [========]	-	1s	2ms/step	_	loss:	0.0152
Epoch 474/800			-			
350/350 [========]	-	1s	2ms/step	-	loss:	0.0077
Epoch 475/800		1 _	2		1	0 0042
350/350 [=========]	-	ΤS	ziis/step	-	coss:	U.UU43
350/350 [=========]	_	1s	2ms/sten	_	loss:	0.0036
Epoch 477/800			•			
350/350 [======]	-	1s	2ms/step	-	loss:	0.0046

Epoch 478/800						
350/350 [===========]	_	1s	2ms/step	_	loss:	0.0027
Epoch 479/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0034
Epoch 480/800			_			
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0034
Epoch 481/800					_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0160
Epoch 482/800		-	2 / 1		,	0 0101
350/350 [===========]	-	IS	2ms/step	-	loss:	0.0101
Epoch 483/800 350/350 [===========]		1.0	2mc/cton		1000.	0 0000
Epoch 484/800	-	15	ziiis/s cep	-	1055:	0.0099
350/350 [====================================		1 c	2mc/ctan	_	1000	0 0033
Epoch 485/800		13	21113/3 CEP		(033.	0.0055
350/350 [===========]	_	1s	2ms/sten	_	loss:	0.0038
Epoch 486/800			o, o cop			0.0000
350/350 [====================================	_	1s	2ms/step	-	loss:	0.0042
Epoch 487/800			•			
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0037
Epoch 488/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0034
Epoch 489/800		-	2		-	0 0042
350/350 [==========]	-	IS	2ms/step	-	loss:	0.0043
Epoch 490/800 350/350 [=========]		1.0	2mc/cton		1000.	0 0025
Epoch 491/800	-	15	ziiis/step	-	1055;	0.0025
350/350 [============]	_	1s	2ms/sten	_	1055:	0.0033
Epoch 492/800			23, 3 ccp			010055
350/350 [====================================	_	1s	2ms/step	-	loss:	0.0038
Epoch 493/800			_			
350/350 [========]	-	1s	2ms/step	-	loss:	0.0029
Epoch 494/800					_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0036
Epoch 495/800		1 -	2		1	0 0001
350/350 [==========] Epoch 496/800	-	15	2ms/step	-	LOSS:	0.0031
350/350 [====================================		1 c	2mc/sten		1000	0 0035
Epoch 497/800	_	13	21113/3 CEP	-	1055.	0.0055
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0046
Epoch 498/800			5, 5 15 p			
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0037
Epoch 499/800			_			
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0023
Epoch 500/800		_			_	
350/350 [==========]	-	ls	∠ms/step	-	loss:	0.0036
Epoch 501/800		1 ~	2mc/c+c=		1000	0 0027
350/350 [==========] Epoch 502/800	-	12	ziiis/step	-	1055:	/ שטייטיי
350/350 [====================================	_	1 s	2ms/sten	_	1055.	0.0033
			5, 5 ccp			3.0033

Epoch 503/800	
350/350 [====================================	.0039
Epoch 504/800	
350/350 [====================================	.0030
Epoch 505/800 350/350 [====================================	0049
Epoch 506/800	10043
350/350 [====================================	. 0036
Epoch 507/800	
350/350 [====================================	.0024
350/350 [====================================	.0028
Epoch 509/800	
350/350 [====================================	.0026
Epoch 510/800	0020
350/350 [====================================	.0028
350/350 [====================================	. 0023
Epoch 512/800	
350/350 [====================================	.0030
Epoch 513/800	0020
350/350 [====================================	. 0039
350/350 [====================================	. 0022
Epoch 515/800	
350/350 [====================================	.0022
Epoch 516/800	0022
350/350 [====================================	.0033
350/350 [====================================	. 0063
Epoch 518/800	
350/350 [====================================	.0038
Epoch 519/800	0024
350/350 [====================================	.0034
350/350 [====================================	.0051
Epoch 521/800	
350/350 [====================================	.0039
Epoch 522/800	0022
350/350 [====================================	.0022
350/350 [====================================	. 0020
Epoch 524/800	
350/350 [====================================	.0026
Epoch 525/800	0020
350/350 [====================================	.0028
350/350 [====================================	.0024
Epoch 527/800	– .
350/350 [====================================	.0026

Epoch 528/800						
350/350 [====================================	-	1s	3ms/step	_	loss:	0.0044
Epoch 529/800			-			
350/350 [===========]	-	1s	3ms/step	-	loss:	0.0028
Epoch 530/800 350/350 [====================================	_	1 c	3ms/sten	_	1055	0 0035
Epoch 531/800		13	Jiii3/3 cep			0.0055
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0019
Epoch 532/800		_	.		_	
350/350 [===========] Epoch 533/800	-	Is	2ms/step	-	loss:	0.0022
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0034
Epoch 534/800			-			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0019
Epoch 535/800 350/350 [====================================		1.	2ms/ston		1	0 0027
Epoch 536/800	-	15	zms/step	-	toss:	0.0027
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0022
Epoch 537/800			•			
350/350 [===========]	-	1s	2ms/step	-	loss:	0.0022
Epoch 538/800 350/350 [====================================		1.	2mc/cton		10001	0 0026
Epoch 539/800	-	15	ziiis/step	-	1055;	0.0030
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0028
Epoch 540/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0031
Epoch 541/800 350/350 [====================================	_	1 c	2ms/sten	_	1055.	0 0028
Epoch 542/800		13	211137 3 CCP			0.0020
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0025
Epoch 543/800			2 ()		,	0 0070
350/350 [===========] Epoch 544/800	-	IS	2ms/step	-	loss:	0.0078
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0029
Epoch 545/800			•			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0023
Epoch 546/800		1.0	2ms/ston		10001	0 0022
350/350 [===========] Epoch 547/800	-	15	ziiis/s tep	-	1055:	0.0023
350/350 [====================================	-	1s	2ms/step	_	loss:	0.0024
Epoch 548/800			-			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0030
Epoch 549/800 350/350 [============]		1.	2mc/cton		10001	0 0027
Epoch 550/800	-	15	ziiis/step	-	1055;	0.0027
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0056
Epoch 551/800			-			
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0026
Epoch 552/800 350/350 [====================================	_	1 c	2mc/ctan	_	1000	0 0021
330, 330 []	_	тэ	2113/3 CCh	-	(033)	0.0021

Epoch 553/800						
350/350 [====================================	_	1s	2ms/step	-	loss:	0.0020
Epoch 554/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0018
Epoch 555/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0019
Epoch 556/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0019
Epoch 557/800						
350/350 [========]	-	1s	2ms/step	-	loss:	0.0018
Epoch 558/800		_			_	
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0018
Epoch 559/800		_			-	
350/350 [=========]	-	IS	2ms/step	-	loss:	0.0018
Epoch 560/800		1.	2		1	0 0004
350/350 [===========]	-	15	2ms/step	-	loss:	0.0024
Epoch 561/800		1.	2ms/s+on		1000.	0 0020
350/350 [==========]	-	15	zms/step	-	toss:	0.0020
Epoch 562/800 350/350 [===========]		1.	2ms/s+on		1000.	0 0020
	-	15	ziiis/s cep	-	1055:	0.0020
Epoch 563/800 350/350 [====================================		1.	2mc/cton		10001	0 0010
Epoch 564/800	-	15	ziiis/step	-	(055)	0.0010
350/350 [==========]		1 c	2mc/sten		1000	0 0010
Epoch 565/800	_	13	21113/3 LEP	_	1055.	0.0019
350/350 [==========]	_	1 c	2mc/ctan	_	1000	0 0021
Epoch 566/800	_	13	21113/3 CEP	_	(033.	0.0021
350/350 [============================	_	1s	2ms/sten	_	1055.	0 0022
Epoch 567/800		13	211137 3 CCP			010022
350/350 [===========================	_	1s	2ms/step	_	loss:	0.0020
Epoch 568/800			,			0.00=0
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0016
Epoch 569/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0041
Epoch 570/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0024
Epoch 571/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0016
Epoch 572/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0019
Epoch 573/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0027
Epoch 574/800					_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0023
Epoch 575/800		_			_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0039
Epoch 576/800		1 -	2		1	0 0000
350/350 [====================================	-	TS	∠ms/step	-	coss:	U.UU26
Epoch 577/800		1 -	2mc/s+==		1000	0 0016
350/350 [===========]	-	12	ziiis/step	-	1055:	טוטט.ט

Epoch 578/800						
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0013
Epoch 579/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0014
Epoch 580/800		-	2 / 1		,	0 0005
350/350 [====================================	-	IS	2ms/step	-	loss:	0.0065
Epoch 581/800 350/350 [====================================		1 c	2mc/cton		10001	0 0015
Epoch 582/800	-	12	Ziiis/step	-	1055.	0.0013
350/350 [====================================	_	1s	2ms/sten	_	loss:	0.0021
Epoch 583/800			o, o cop			0.0021
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0017
Epoch 584/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0025
Epoch 585/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.0015
Epoch 586/800		_			_	
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0021
Epoch 587/800			2 / 1		,	0 0010
350/350 [==========]	-	IS	2ms/step	-	loss:	0.0019
Epoch 588/800 350/350 [====================================		1.0	2mc/ston		10001	0 0020
Epoch 589/800	-	15	ziiis/s cep	-	1055:	0.0029
350/350 [====================================		1 c	2mc/sten		1000	0 0015
Epoch 590/800	_	13	21113/3 CEP	-	1055.	0.0013
350/350 [====================================	_	1s	2ms/sten	_	1055.	0 0016
Epoch 591/800		13	211137 3 CCP			0.0010
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0019
Epoch 592/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0023
Epoch 593/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.0019
Epoch 594/800		_			_	
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0016
Epoch 595/800		٦.	2		1	0 0007
350/350 [==========]	-	IS	2ms/step	-	loss:	0.002/
Epoch 596/800 350/350 [====================================		1.0	2mc/cton		10001	0 0022
Epoch 597/800	-	12	ziiis/step	-	1055;	0.0022
350/350 [====================================	_	1 c	2ms/sten	_	1000	0 0017
Epoch 598/800		13	21113/3 CEP		1033.	0.0017
350/350 [====================================	_	1s	2ms/sten	_	1055.	0 0025
Epoch 599/800		13	211137 3 CCP			010023
350/350 [====================================	_	1s	3ms/step	_	loss:	0.0023
Epoch 600/800			,,			
350/350 [====================================	-	1s	3ms/step	-	loss:	0.0020
Epoch 601/800						
350/350 [=======]	-	1s	3ms/step	-	loss:	0.0020
Epoch 602/800		_	_		_	
350/350 [=======]	-	ls	2ms/step	-	loss:	0.0019

Epoch 603/800						
350/350 [===========]	_	1s	2ms/step	_	loss:	0.0017
Epoch 604/800			о, о тор			
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0016
Epoch 605/800						
350/350 [========]	-	1s	2ms/step	-	loss:	0.0022
Epoch 606/800		_			_	
350/350 [=========]	-	ls	2ms/step	-	loss:	0.0023
Epoch 607/800 350/350 [========]		1.0	2mc/cton		10001	0 0016
Epoch 608/800	-	15	ziiis/step	-	1055;	0.0010
350/350 [===========]	_	1 c	2ms/sten	_	1055.	0 0016
Epoch 609/800		13	2m3/3ccp			0.0010
350/350 [==========]	_	1s	2ms/step	_	loss:	0.0023
Epoch 610/800			-			
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0020
Epoch 611/800					_	
350/350 [========]	-	1s	2ms/step	-	loss:	0.0014
Epoch 612/800		_	.		-	
350/350 [=========]	-	IS	2ms/step	-	loss:	0.0019
Epoch 613/800 350/350 [========]		1.0	2mc/cton		10001	0 0010
Epoch 614/800	-	15	ziiis/step	-	1055	0.0010
350/350 [===========]	_	1s	2ms/sten	_	1055:	0.0015
Epoch 615/800			2m3, 3 ccp			010015
350/350 [===========]	_	1s	2ms/step	-	loss:	0.0033
Epoch 616/800			-			
350/350 [========]	-	1s	2ms/step	-	loss:	0.0021
Epoch 617/800		_	_		_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0018
Epoch 618/800 350/350 [=========]		1.	2ms/stan		1000.	0 0015
Epoch 619/800	-	15	ziiis/s cep	-	LOSS:	0.0015
350/350 [============]	_	1 c	2mc/sten	_	1000	0 0016
Epoch 620/800		13	21113/3 CCP			0.0010
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0016
Epoch 621/800						
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0017
Epoch 622/800		_	_		_	
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0014
Epoch 623/800		1.	2== /=+==		1	0 0050
350/350 [==========] Epoch 624/800	-	15	zms/step	-	toss:	0.0050
350/350 [===========]	_	1 c	3mc/cten	_	1000	0 0013
Epoch 625/800		13	3m3/3ccp			0.0015
350/350 [===========]	_	1s	3ms/step	_	loss:	0.0017
Epoch 626/800			-			
350/350 [=======]	-	1s	3ms/step	-	loss:	0.0014
Epoch 627/800		_			_	
350/350 [=======]	-	ls	2ms/step	-	loss:	0.0017

Epoch 628/800						
350/350 [====================================	_	1s	2ms/sten	_	loss:	0.0022
Epoch 629/800			s, s top			0.0022
350/350 [========]	-	1s	2ms/step	-	loss:	0.0013
Epoch 630/800					_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0015
Epoch 631/800 350/350 [====================================		1.	2mc/ston		1000.	0 0020
Epoch 632/800	-	15	ziiis/s cep	-	1055:	0.0030
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0017
Epoch 633/800			5, 5 15 5			
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0012
Epoch 634/800					_	
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0016
Epoch 635/800		1.0	2mc/ston		10001	0 0011
350/350 [===========] Epoch 636/800	-	15	ziiis/s cep	-	1055:	0.0011
350/350 [====================================	_	1s	2ms/sten	_	loss:	0.0029
Epoch 637/800			o, o cop			0.0025
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0017
Epoch 638/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0013
Epoch 639/800		٦.	2		1	0 0007
350/350 [===========] Epoch 640/800	-	15	2ms/step	-	loss:	0.0027
350/350 [====================================	_	1 s	2ms/sten	_	1055.	0 0023
Epoch 641/800		13	211137 3 CCP			010025
350/350 [====================================	-	1s	2ms/step	-	loss:	0.0018
Epoch 642/800						
350/350 [==========]	-	1s	2ms/step	-	loss:	0.0018
Epoch 643/800 350/350 [====================================		1.0	2mc/ston		10001	0 0015
Epoch 644/800	-	15	ziiis/step	-	1055	0.0013
350/350 [====================================	_	1s	2ms/step	_	loss:	0.0014
Epoch 645/800			5, 5 15 5			
350/350 [==========]	-	1s	2ms/step	-	loss:	
9.3587e-04						
Epoch 646/800		٦.	2		1	0 0015
350/350 [===========] Epoch 647/800	-	IS	2ms/step	-	loss:	0.0015
350/350 [====================================		1 c	2mc/sten	_	1000	0 001/
Epoch 648/800		13	21113/3 CEP		1033.	0.0014
350/350 [====================================	-	1s	2ms/step	_	loss:	0.0014
Epoch 649/800						
350/350 [=======]	-	1s	2ms/step	-	loss:	0.0014
Epoch 650/800		1 -	2ma / = 1 = :		1	0 0014
350/350 [===========] Epoch 651/800	-	TS	ziiis/step	-	LOSS:	U.UU14
350/350 [====================================	_	1 c	2ms/sten	_	1055.	0.0015
Epoch 652/800		13	<i>5, 5 ccp</i>			3.0013
1 ,						

350/350 [==========]	-	1s	2ms/step	-	loss:	0.0013
Epoch 653/800 350/350 [===========]	-	1s	2ms/step	-	loss:	0.0020
Epoch 654/800 350/350 [====================================	_	1s	2ms/step	_	loss:	0.0016
Epoch 655/800 350/350 [========]						
Epoch 656/800			-			
350/350 [===========] Epoch 657/800	-	1s	2ms/step	-	loss:	0.0016
350/350 [===========] Epoch 658/800	-	1s	2ms/step	-	loss:	0.0013
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0017
Epoch 659/800 350/350 [===========]	-	1s	2ms/step	_	loss:	0.0014
Epoch 660/800 350/350 [========]			-			
Epoch 661/800						
350/350 [===========] Epoch 662/800	-	1s	2ms/step	-	loss:	0.0012
350/350 [===========] Epoch 663/800	-	1s	2ms/step	-	loss:	0.0020
350/350 [========]	-	1s	2ms/step	-	loss:	0.0013
Epoch 664/800 350/350 [===========]	_	1s	2ms/step	_	loss:	0.0020
Epoch 665/800 350/350 [===========]						
Epoch 666/800						
350/350 [==========] Epoch 667/800			•			
350/350 [===========] Epoch 668/800	-	1s	2ms/step	-	loss:	0.0014
350/350 [========]	-	1s	3ms/step	-	loss:	0.0018
Epoch 669/800 350/350 [===========]	_	1s	3ms/step	_	loss:	0.0032
Epoch 670/800 350/350 [=========]						
Epoch 671/800						
350/350 [==========] Epoch 672/800	-	1s	2ms/step	-	loss:	0.0010
350/350 [===========] Epoch 673/800	-	1s	2ms/step	-	loss:	0.0015
350/350 [=========]	-	1s	2ms/step	-	loss:	0.0011
Epoch 674/800 350/350 [============]	_	1s	3ms/step	_	loss:	0.0018
Epoch 675/800 350/350 [========]						
Epoch 676/800						
350/350 [==========] Epoch 677/800	-	1s	2ms/step	-	loss:	0.0011

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Epoch 678/800
Epoch 679/800
350/350 [============= ] - 1s 2ms/step - loss: 0.0010
Epoch 680/800
Epoch 681/800
9.3206e-04
Epoch 682/800
Epoch 683/800
Epoch 684/800
Epoch 685/800
Epoch 686/800
350/350 [============= ] - 1s 2ms/step - loss: 0.0010
Epoch 687/800
Epoch 688/800
Epoch 689/800
Epoch 690/800
9.9719e-04
Epoch 691/800
Epoch 692/800
Epoch 693/800
9.6206e-04
Epoch 694/800
Epoch 695/800
9.3476e-04
Epoch 696/800
Epoch 697/800
Epoch 698/800
Epoch 699/800
7.9381e-04
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```
Epoch 700/800
Epoch 701/800
9.5845e-04
Epoch 702/800
Epoch 703/800
Epoch 704/800
Epoch 705/800
8.3591e-04
Epoch 706/800
Epoch 707/800
Epoch 708/800
350/350 [============== ] - 1s 2ms/step - loss: 0.0021
Epoch 709/800
8.6956e-04
Epoch 710/800
Epoch 711/800
8.3028e-04
Epoch 712/800
8.0481e-04
Epoch 713/800
Epoch 714/800
Epoch 715/800
9.1614e-04
Epoch 716/800
Epoch 717/800
9.6677e-04
Epoch 718/800
8.1430e-04
Epoch 719/800
Epoch 720/800
```

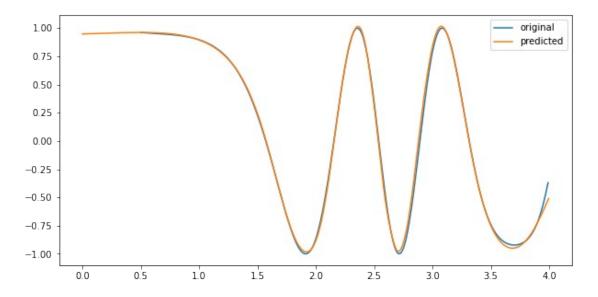
```
Epoch 721/800
9.4881e-04
Epoch 722/800
6.9262e-04
Epoch 723/800
Epoch 724/800
Epoch 725/800
Epoch 726/800
Epoch 727/800
9.5004e-04
Epoch 728/800
8.8748e-04
Epoch 729/800
Epoch 730/800
9.8984e-04
Epoch 731/800
Epoch 732/800
8.7373e-04
Epoch 733/800
Epoch 734/800
350/350 [============= ] - 1s 2ms/step - loss:
7.8442e-04
Epoch 735/800
7.0813e-04
Epoch 736/800
9.5913e-04
Epoch 737/800
Epoch 738/800
Epoch 739/800
9.2120e-04
Epoch 740/800
```

```
Epoch 741/800
8.4516e-04
Epoch 742/800
Epoch 743/800
7.4660e-04
Epoch 744/800
Epoch 745/800
Epoch 746/800
Epoch 747/800
Epoch 748/800
7.2634e-04
Epoch 749/800
6.3182e-04
Epoch 750/800
8.9157e-04
Epoch 751/800
Epoch 752/800
6.0161e-04
Epoch 753/800
Epoch 754/800
8.6108e-04
Epoch 755/800
Epoch 756/800
Epoch 757/800
6.9152e-04
Epoch 758/800
350/350 [============= ] - 1s 2ms/step - loss:
5.6172e-04
Epoch 759/800
5.5525e-04
Epoch 760/800
```

```
6.7732e-04
Epoch 761/800
8.4986e-04
Epoch 762/800
7.8464e-04
Epoch 763/800
7.4059e-04
Epoch 764/800
5.6138e-04
Epoch 765/800
8.7897e-04
Epoch 766/800
8.1439e-04
Epoch 767/800
8.9323e-04
Epoch 768/800
Epoch 769/800
Epoch 770/800
6.6673e-04
Epoch 771/800
5.5027e-04
Epoch 772/800
6.0599e-04
Epoch 773/800
9.7681e-04
Epoch 774/800
9.3716e-04
Epoch 775/800
Epoch 776/800
Epoch 777/800
Epoch 778/800
5.2221e-04
```

```
Epoch 779/800
Epoch 780/800
9.0880e-04
Epoch 781/800
7.9067e-04
Epoch 782/800
Epoch 783/800
5.8098e-04
Epoch 784/800
9.9081e-04
Epoch 785/800
350/350 [============= ] - 1s 2ms/step - loss: 0.0037
Epoch 786/800
8.1819e-04
Epoch 787/800
Epoch 788/800
8.7010e-04
Epoch 789/800
9.9239e-04
Epoch 790/800
5.2091e-04
Epoch 791/800
Epoch 792/800
Epoch 793/800
Epoch 794/800
8.0755e-04
Epoch 795/800
6.3493e-04
Epoch 796/800
9.4799e-04
Epoch 797/800
5.7771e-04
```

```
Epoch 798/800
                    ========= ] - 1s 2ms/step - loss:
350/350 [=======
8.4552e-04
Epoch 799/800
7.5395e-04
Epoch 800/800
figure = plt.figure(figsize = (10, 5))
histx = []
for i in range(len(hist.history['loss'])):
   histx.append(i)
plt.plot(histx, hist.history['loss'])
plt.title("loss")
plt.show()
                           loss
 0.4
 0.3
 0.2
 0.1
 0.0
           100
                           400
                200
                      300
                                 500
                                       600
                                            700
                                                  800
t2 = np.arange(0, 4.0, 0.005)
pred = model.predict(t2)
figure = plt.figure(figsize = (10, 5))
plt.plot(train_x, train_y, label = 'original')
plt.plot(t2, pred, label = 'predicted')
plt.legend()
plt.show()
25/25 [========= ] - Os 2ms/step
```



Вывод

Выполнив данную лабораторную работу, я вспомнил, как устроены многослойные сети также я реализовал многослойные нейронные сети для решения задач фильтрации и аппроксимации с помощью фреймворка TensorFlow